

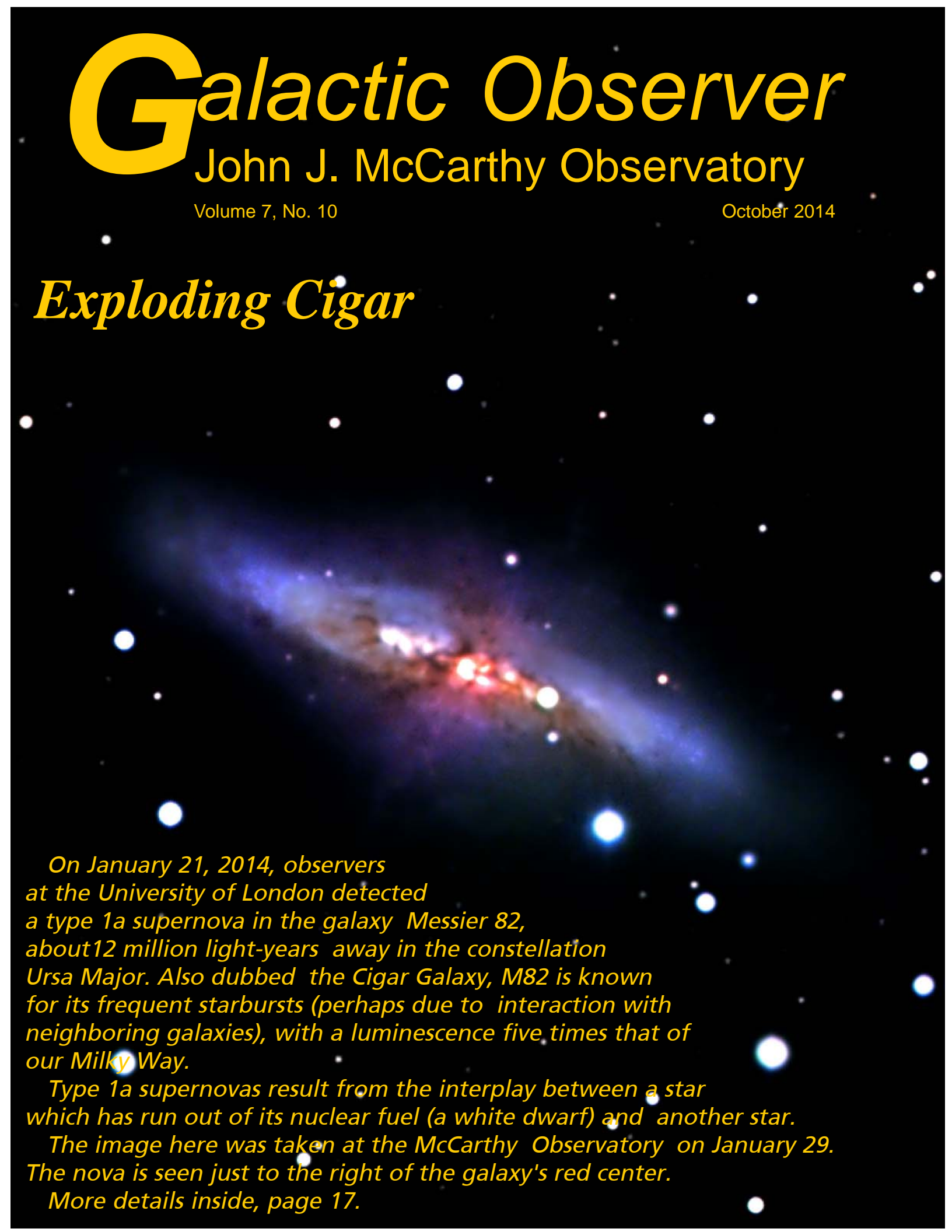
# *Galactic Observer*

John J. McCarthy Observatory

Volume 7, No. 10

October 2014

## *Exploding Cigar*



*On January 21, 2014, observers at the University of London detected a type 1a supernova in the galaxy Messier 82, about 12 million light-years away in the constellation Ursa Major. Also dubbed the Cigar Galaxy, M82 is known for its frequent starbursts (perhaps due to interaction with neighboring galaxies), with a luminescence five times that of our Milky Way.*

*Type 1a supernovas result from the interplay between a star which has run out of its nuclear fuel (a white dwarf) and another star.*

*The image here was taken at the McCarthy Observatory on January 29. The nova is seen just to the right of the galaxy's red center.*

*More details inside, page 17.*

## The John J. McCarthy Observatory

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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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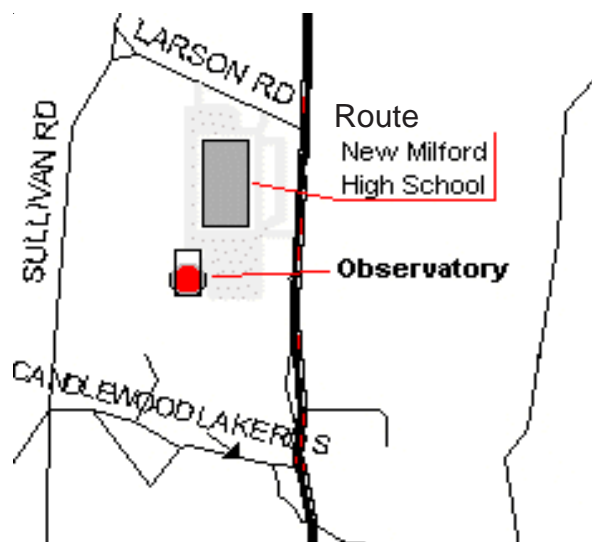
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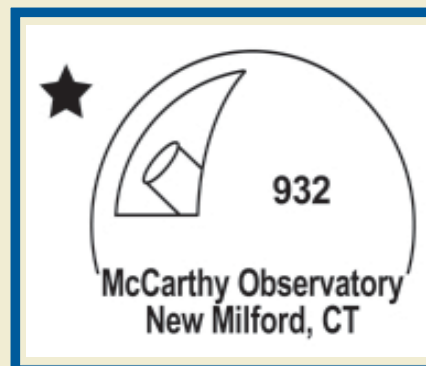
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# October Astronomy Calendar and Space Exploration Almanac



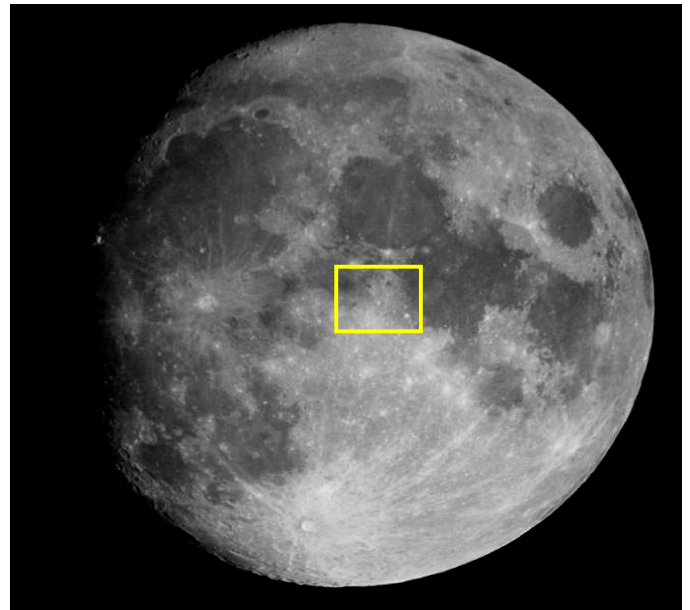


## Lunar Eclipse

In the early morning of October 08<sup>th</sup>, the full Moon will slip into the Earth's shadow. Once in the shadow, the Earth will block all direct sunlight from illuminating the lunar surface. This arrangement, with the Earth in line between the Sun and the Moon, produces a lunar eclipse.



The image above was taken at the McCarthy Observatory on October 27, 2004. It shows the moon nearing the completion of its travel through the darkest part of the Earth's shadow (or umbra). The

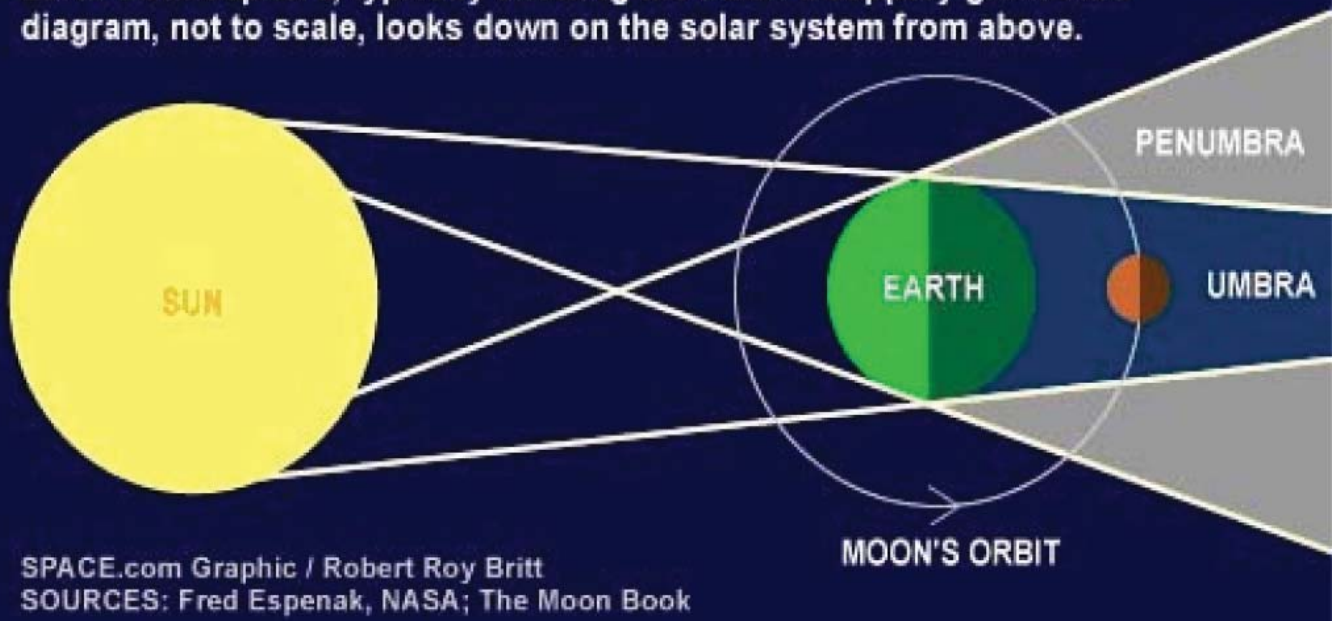


Mare or lunar "seas" are actually expansive low-lying plains formed by ancient lava flows

crimson glow is from sunlight scattered by the Earth's atmosphere that has filtered out most of the blue colored light. The northern limb of the Moon is brighter as it is closest to the edge of the umbra. Similar to the 2004 eclipse, the Moon will travel through the northern half of umbra on the 8<sup>th</sup>. The eclipse will be visible (weather permitting) for observers in North America, with totality starting at 6:25 am EDT and lasting 59 minutes. Unfortunately,

## Anatomy of a Lunar Eclipse

A total lunar eclipse can only occur at Full Moon, when Earth blocks the sunlight normally reflected by the Moon. Some sunlight is bent through Earth's atmosphere, typically allowing the Moon a coppery glow. This diagram, not to scale, looks down on the solar system from above.



the Moon will set on the western horizon during totality for viewers on the east coast.

### "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

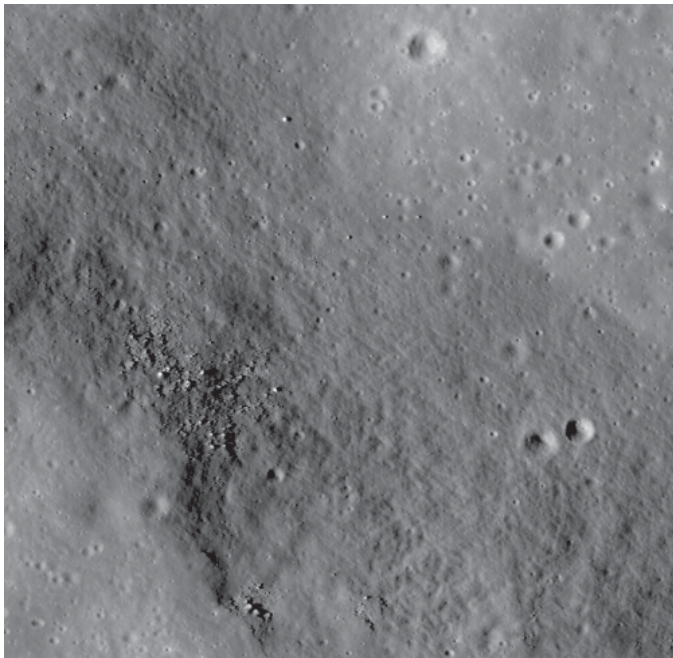


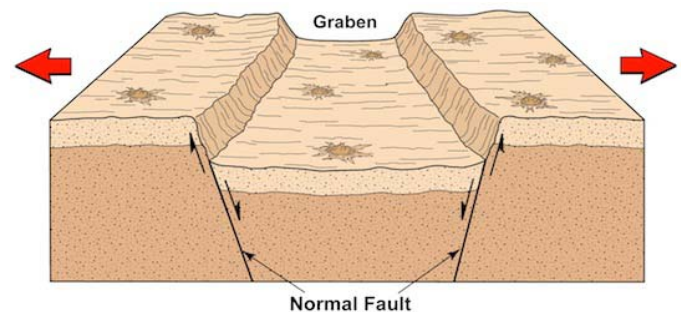
Image of the linear rille Rima Ariadaeus, taken from the Lunar Reconnaissance Orbiter Credit: NASA/Goddard Space Flight Center/Arizona State University

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).

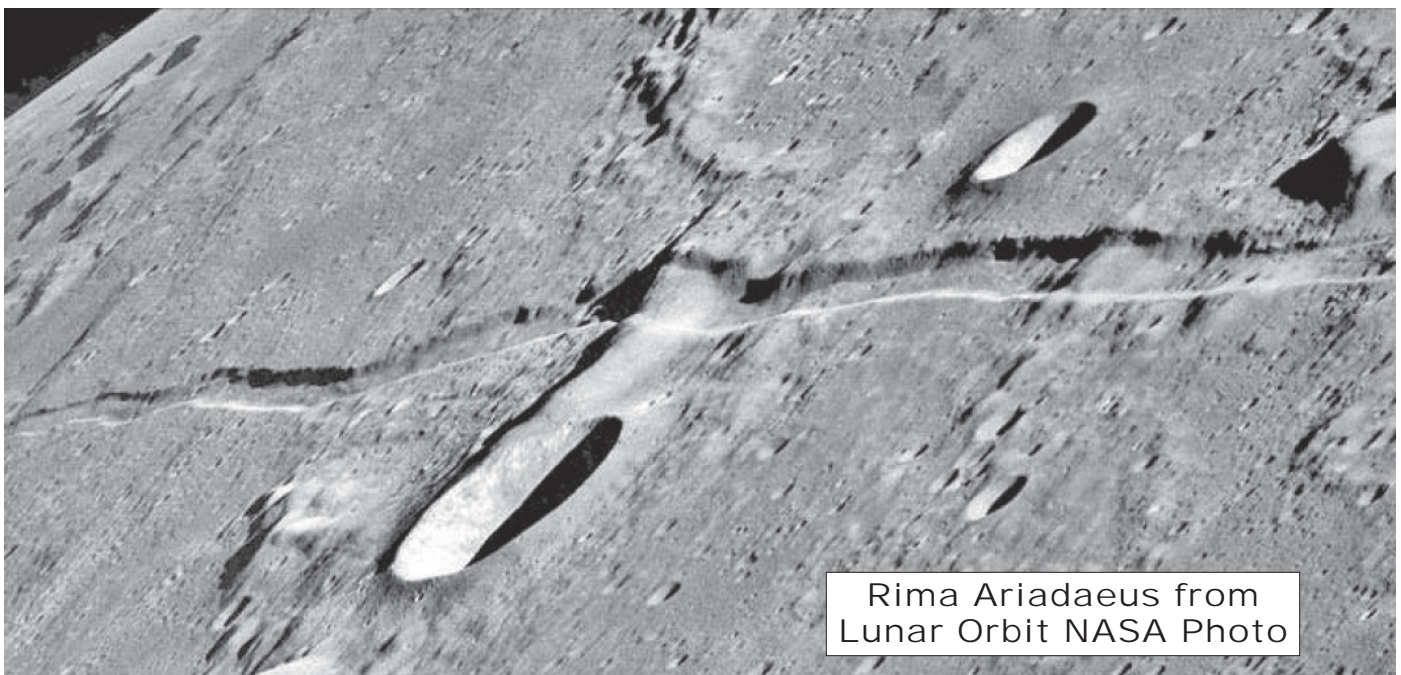
Rima Ariadaeus dominates the view this month, running from Mare Tranquillitatis in the east towards Mare Vaporum in the west. The linear fault or graben is 186.4 miles (300 km) in length.

Averaging 3.1 miles (5 km) in width, Rima Ariadaeus slices through other, presumably older, geologic features. A graben is created when the surface collapses between two parallel faults. The collapse could have been triggered by volcanic activity when rising magma forces the lunar crust apart.

The view below was captured from lunar orbit by Apollo 10 and shows the graben at an oblique angle. The angle accentuates the slope of the graben's walls, estimated at 55 degrees at some locations.

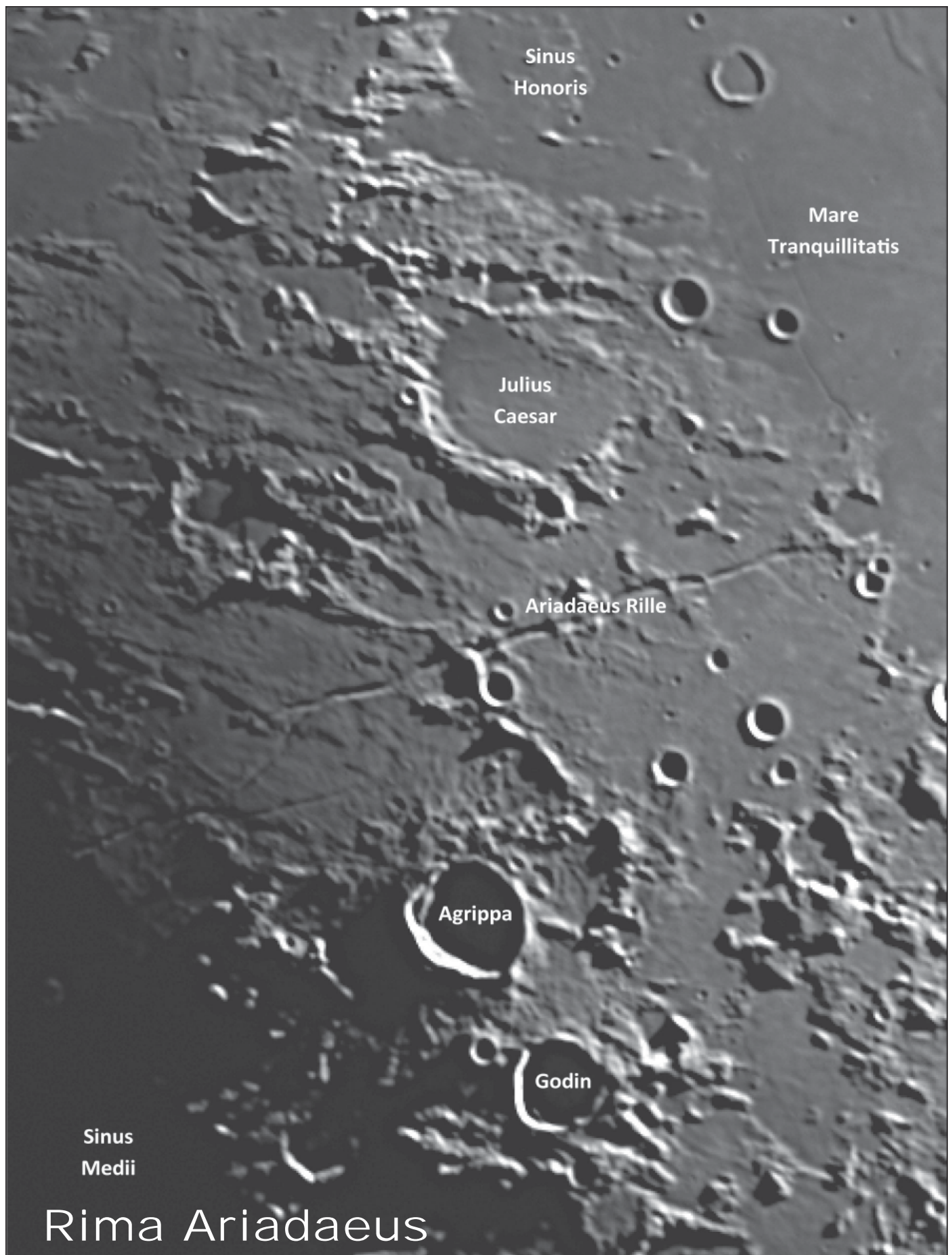


A graben is a valley, or trough, created when parallel fault lines are pulled apart, and the crust between them collapses. (Credit: Arizona State University/Smithsonian Institution)



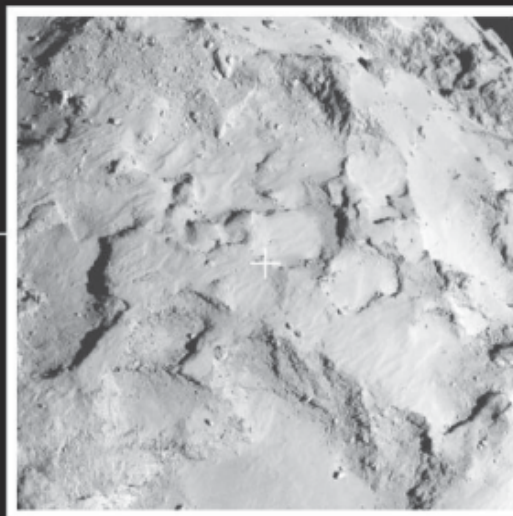
Rima Ariadaeus from Lunar Orbit NASA Photo





## Rima Ariadaeus

## → PHILAE'S LANDING SITE



www.esa.int

ESA/Rosetta/MPS for OSIRIS Team MPS/UPD/LAM/IAA/SSO/INTA/UPM/DASP/IDA

European Space Agency

### Rosetta Update

The European Space Agency (ESA) has selected a landing site on Comet 67P/Churyumov–Gerasimenko for Rosetta’s lander “Philae.” Designated “J,” the site offers a well-illuminated landing area with relatively few large hazards. Landing is scheduled for early November, before the comet becomes too active (the heating of the surface will intensify and the surface will become increasingly unstable as the comet gets closer to the Sun).

Since Philae is solar powered, the landing site needed sufficient illumination for lander operations and communications. Philae will use harpoons and ice screws to secure itself to the comet (so as to not bounce off). Once settled, the lander will explore its environment and collect subsurface samples by drilling into the icy surface.

Comets are notoriously unpredictable in their reaction to the Sun’s heat each time they journey into the inner solar system. ESA’s mission plans are contingent upon the comet maintaining its composure until Rosetta and Philae can execute the landing.

### MAVEN in Orbit

NASA’s Mars Atmosphere and Volatile Evolution (MAVEN) spacecraft successfully entered orbit around Mars on Sunday, September 21<sup>st</sup> after a 10 month journey. MAVEN is the first spacecraft dedicated to studying the Martian atmosphere and its connection to the Red Planet’s climate, both today and in the distant past when Mars was warmer and water flowed across its surface.



Artist's concept of MAVEN. Credit: Lockheed Martin



## India's Mars Orbiter

Two days after MAVEN's arrival, India's Mars Orbiter Mission (MOM) entered orbit around the Red Planet. India joins the United States, the former Soviet Union and the European Space Agency as the only entities that have successfully placed a spacecraft in Martian orbit.

MOM's highly elliptical orbit will bring the spacecraft within 227 miles (365 kilometers) of the planet's surface, and as far away as 49,710 miles (80,000 km). Science instruments on the spacecraft include a methane detector. The majority of methane in the Earth's atmosphere is produced by living things and methane is considered a key indicator in the search for signs of life on Mars today.

## Orion Update

NASA recently rolled out its Orion deep-space crew module (stacked upon its service module) as the spacecraft was transferred from one facility to another at the Kennedy Space Center for final processing and fueling. The spacecraft is scheduled to be launched on a United Launch Alliance Delta IV Heavy rocket in early December to test critical safety systems.

The unmanned Orion module will travel 3,600 miles into space before returning to Earth at a speed in excess

of 20,000 miles per hour. The test flight will evaluate the spacecraft's high speed re-entry systems and heat shield. Orion's ablative head shield will experience temperatures up to 4,000° F.



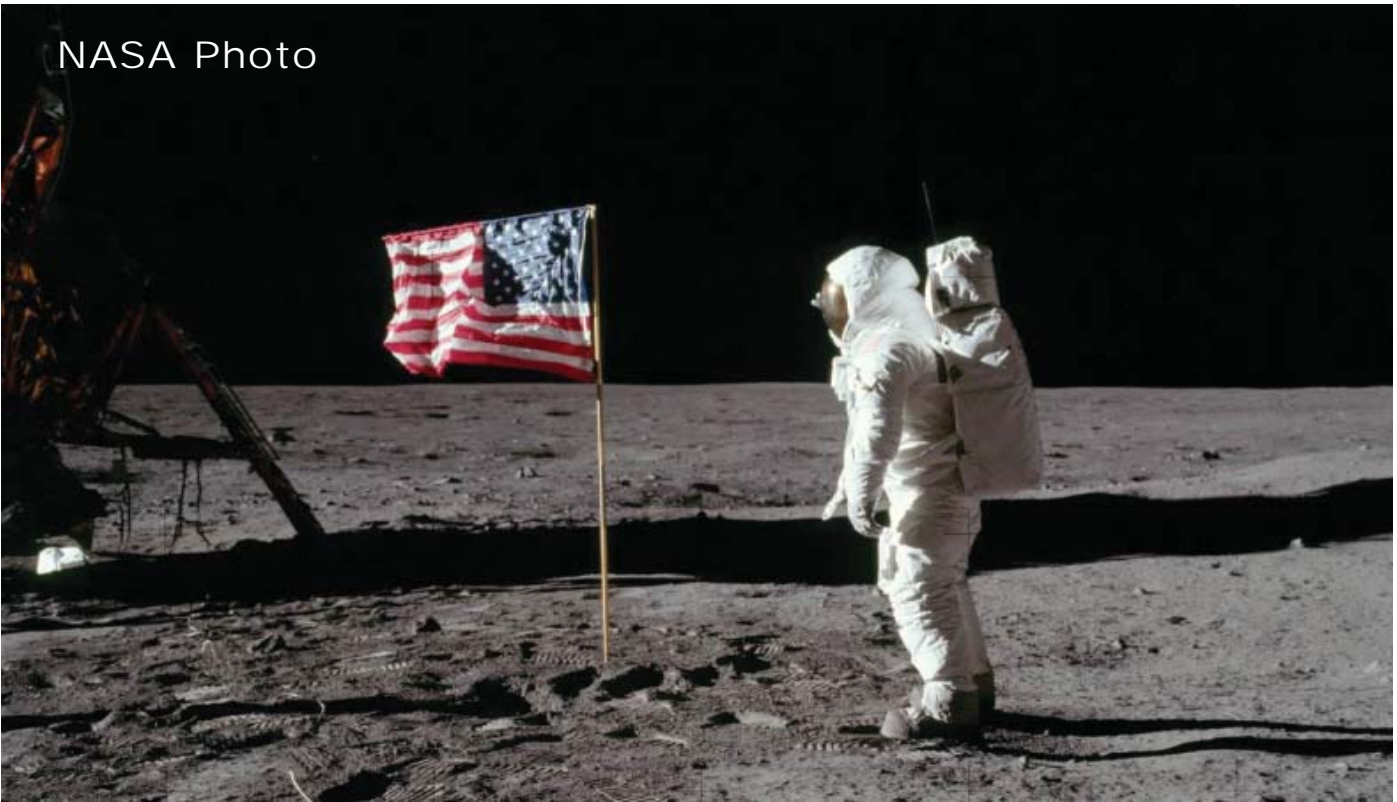
Orion Rollout  
Image Credit:  
NASA/Dan Casper



Engineers working on two of the three common booster cores of the Orion spacecraft, each 134 feet in length and generating 656,000 pounds of thrust. Image Credit: NASA/Ben Smegelsky



## NASA Photo



### Long May She Wave

September 14, 2014 marked the 200<sup>th</sup> anniversary of the penning of the Star-Spangled Banner by Francis Scott Key. The lyrics were inspired by the American flag that flew over Fort McHenry, in Baltimore harbor, after 25 hours of bombardment by British naval forces. The original flag, after undergoing an extensive effort to stabilize and preserve the remnants, is currently on display at the National Museum of American History on the National Mall in Washington, D.C.

The American flag became a symbol of national pride during the space race with the former Soviet Union. The flag adorned John Glenn's Mercury space capsule. Ed White, the first American to walk in space, purchased the flag patch he had sewn onto the arm of his spacesuit (NASA subsequently made the flag patch a standard feature).

The flag that flew on Apollo 11 was a standard 3-by-5-foot nylon flag from a government supply catalog at a cost of \$5.50. The only alteration was the addition of a top hem into which a horizontal pole was inserted to support the flag on the airless Moon. The one-inch aluminum horizontal and vertical poles were anodized with a gold color. The height of the flagpole was based upon the maximum reach of the astronauts in their spacesuits. The poles cost a total of \$75. The flag assembly was

stored next to the Lunar Module's ladder, in an insulated case for protection from the engine's exhaust.

Astronauts Armstrong and Aldrin found it difficult to set the flag pole more than a few inches into the lunar regolith. As such, it is likely that the flag was toppled by the exhaust of the ascent engine. The Lunar Reconnaissance Orbiter imaged the Apollo landing sites, providing evidence that the flags at the other sites are still standing. Unfortunately, after 45 years of harsh conditions and solar radiation, they are likely in a severely deteriorated condition.

### Commercial Crew Program News

NASA selected two companies to provide crew transportation to and from the International Space Station (ISS): Boeing and Space X. NASA's goal is to end its reliance on the Russians for near-Earth travel by 2017. The contracts awarded to the two companies include at least one crewed test flight to the ISS and two, to as many as six, follow-on missions to deliver astronauts to the station. The spacecraft will remain on station to serve as a lifeboat in the case of an emergency.

Boeing is developing its CST-100 crew module in Texas. The pressure vessel for the reusable crew cap-

CST-100  
Credit: Boeing



Dragon Credit:  
SpaceX



sule will be manufactured using a friction stir welding process (weld-free) by the Spincraft company in Massachusetts.

The service module will be fabricated in Florida. The completed crew and service modules will be launched from the Kennedy Space Center on top of an Atlas V launch vehicle.

Space X will launch its crew module from the Kennedy Space Center on top of its Falcon 9 launch vehicle. The reusable Dragon capsule is designed to carry seven passengers and land almost anywhere on Earth with its landing legs and backup parachute.

### Imagination and Vision

One hundred and fifteen years ago (1899), on a quiet October afternoon in Worcester, Massachusetts, a 17 year old Robert Goddard climbed a tall cherry tree in the backyard to trim some dead limbs. From high in the tree, he looked out upon the horizon and imagined how wonderful it would be to create a means

of traveling to the planet Mars. Twenty-seven years later, in 1926, Goddard would launch the world's first liquid fuel rocket from a field in nearby Auburn. Today he is considered one of the founding fathers of modern rocketry.

### Martian Invasion

In the late 1930s, a critically acclaimed New York drama company was founded by Orson Welles and John Houseman (with total monetary assets of \$100). Together, they produced "The Mercury Theatre on the Air." The first show was broadcast on CBS radio in July 1938. Originally without a sponsor, the program was picked up by Campbell's Soup after the October 30<sup>th</sup> broadcast of H.G. Wells' "War of the Worlds." Orson Welles' adaptation incorporated simulated news bulletins of a Martian invasion during a seemingly ordinary broadcast of a local orchestra. Many listeners panicked, fearing a real Martian invasion and the reported destruction of Grovers Mill, New Jersey. While the production was strongly denounced for its deceptive tactics, it did propel the 23 year old Welles on his way to fame and fortune. You can download the complete radio broadcast at <http://www.mercurytheatre.info/>.



### The Hazards of Space Travel

Meanwhile, out in the asteroid belt, the Dawn spacecraft shut down its ion thrusters and entered a safe mode on September 11<sup>th</sup>. Complicating the resolution of the root cause was the loss of pointing control of the main communications antenna. Three years ago, during its approach to Vesta, the spacecraft experienced a similar event. At that time, damage from a high-energy particle was determined to be the cause of the failure of an electronic component in the propulsion system. However, with the antenna problem, the JPL team decided to switch engine controllers and reset the main computer. The actions appeared successful and the Dawn is under ion thrust once again and in communication with its handlers on Earth.

The brief shutdown will delay Dawn's arrival by about a month (April 2015).





Dawn and its ion engine  
Credit: NASA/JPL-Caltech

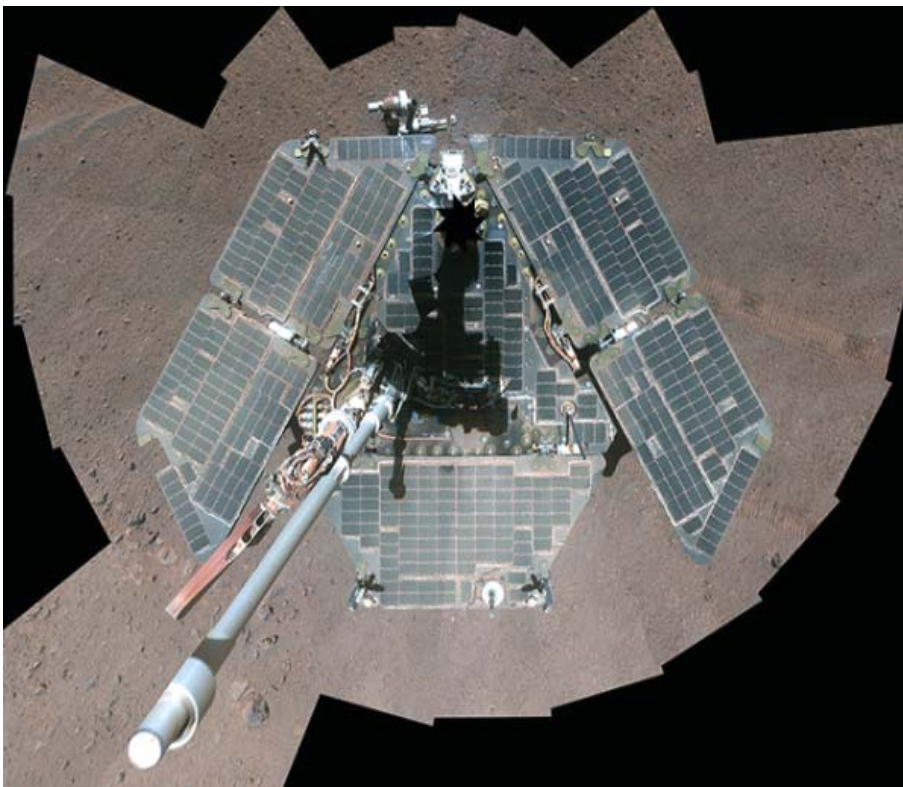
## The Perils of a Martian Rover

Science operations conducted by the Mars Exploration Rover (MER) Opportunity were crippled by a number of computer resets during the month of August. The increase in the reset rate prompted the MER team at JPL to cease rover surface opera-

tions while the source of the problem was diagnosed (from a distance of 135 million miles) and potential corrective actions explored and tested on Earth-based models.

Worn-out cells in the rover's flash memory was the suspected cause of the resets. While flash memory retains data even when the power is shut off, the memory can be damaged by repeated use (Opportunity has been operating on the surface of Mars for over 10 years). By re-formatting the memory, any bad sectors of the flash memory could be identified and quarantined.

The rover's memory was successfully reformatted on September 4<sup>th</sup>, followed by the uploading of the operating and configuration files. Opportunity has been performing normally since the reformat and is ready to resume its drive along the rim of Endeavor Crater to Marathon Valley, about a mile from its current location. Marathon Valley has been targeted by orbiting spacecraft due to presence of clay mineral deposits (likely formed in the presence of water).



Opportunity Selfie after a dust clearing wind gust Image Credit: NASA/JPL-Caltech/Cornell Univ./Arizona State University.

# Retrospective: Halloween 2008



Venus chases a crescent moon into the  
deepening pumpkin-colored twilight





### Lost Opportunity

On Wednesday, October 28<sup>th</sup> (2009), the Ares I-X test vehicle took to the Florida skies for its first and only flight. As part of NASA's Constellation Program, the Ares I rockets were designed to launch the Orion crew exploration vehicles to low-Earth orbit and beyond. Cost overruns, and the decision by the Obama administration to entrust the ferrying of astronauts to private companies, led to the program's cancellation. The photo below shows the various components of the 308 foot high rocket in the Vehicle Assembly Building in early May (2009).

## October Nights

As the nights grow longer and cooler our view of the night sky begins to change. Summer evenings showcase our own galaxy, the Milky Way. The center of our spiral galaxy is in the direction of the constellation Sagittarius, which appears in the southern sky throughout the summer. In the autumn, as Sagittarius disappears into the west, the stars forming the Great Square of Pegasus rise in the east. Following Pegasus is the Andromeda Galaxy, one of the most distant objects that can be seen with the unaided eye at approxi-

mately 2.5 million light years (14.7 million trillion miles). With the rising of Andromeda, we begin to look outward to the outer arms of our own galaxy and to other galaxies far, far away.

## Sunrise and Sunset

<u>Sun</u>	<u>Sunrise</u>	<u>Sunset</u>
October 1 <sup>st</sup> (EDT)	06:50	18:35
October 15 <sup>th</sup>	07:06	18:13
October 31 <sup>st</sup>	07:24	17:50

## Astronomical and Historical Events

- 1<sup>st</sup> First Quarter Moon
- 1<sup>st</sup> History: NASA created by the National Aeronautics and Space Act (1958)
- 2<sup>nd</sup> History: opening of the Hayden Planetarium (1935)
- 3<sup>rd</sup> History: launch of the fifth Mercury flight, piloted by astronaut Walter Schirra (1962)
- 3<sup>rd</sup> History: fall of the Zagami Martian meteorite in Katsina Province, Nigeria; the meteorite is classified as a Shergottite and is the largest single individual Mars meteorite ever found at 40 pounds (1962)
- 3<sup>rd</sup> History: fall of the Chassigny Martian meteorite in Haute-Marne province, France; the meteorite is distinctly different from other Martian meteorites (shergottites and nakhlites) and is classified as its own subgroup – “chassignites” (1815)
- 4<sup>th</sup> History: Japanese lunar probe “Selenological and Engineering Explorer” (SELENE) enters lunar orbit; also known as Kaguya, the spacecraft was designed to study the geologic evolution of the Moon (2007)
- 4<sup>th</sup> History: SpaceShipOne rockets to an altitude of almost 70 miles to win the \$10 million Ansari X Prize (2004)
- 4<sup>th</sup> History: launch of Luna 3; Soviet spacecraft was first to photograph the far side of the Moon (1959)
- 4<sup>th</sup> History: launch of Sputnik 1, world’s first artificial satellite (1957)
- 5<sup>th</sup> History: launch of the space shuttle Challenger (STS-41-G), crew included astronaut Kathryn Sullivan, first American women to walk in space (1984)
- 5<sup>th</sup> History: Robert Goddard born, founding father of modern rocketry (1882)
- 6<sup>th</sup> Moon at perigee (closest distance to Earth)
- 6<sup>th</sup> History: Asteroid 2008 TC3 discovered by astronomers on Mt. Lemmon less than 24 hours before exploding over the Sudan. The McCarthy Observatory submitted the last accepted observation. Fragments of the asteroid were eventually recovered. (2008)
- 6<sup>th</sup> History: launch of the space shuttle Discovery and the solar polar orbiter spacecraft Ulysses (1990)
- 7<sup>th</sup> Uranus at Opposition, rising with the setting Sun and visible all night
- 8<sup>th</sup> Full Moon (Full Hunter’s Moon)
- 8<sup>th</sup> Total Lunar Eclipse, with totality beginning shortly before sunrise on the east coast
- 8<sup>th</sup> Kuiper Belt Object 303775 (2005 QU182) at Opposition (49.789 AU)
- 8<sup>th</sup> History: discovery of Supernova 1604 (Kepler’s Nova) (1604)
- 9<sup>th</sup> Draconids Meteor Shower peak (produced by debris from Comet Giacobini-Zinner)
- 9<sup>th</sup> Kuiper Belt Object 19308 (1996 TO66) at Opposition (46.173 AU)
- 9<sup>th</sup> History: LCROSS impacts crater Cabeus near the Moon’s south pole in search of water (2009)
- 9<sup>th</sup> History: Peekskill meteorite fall; 27 pound meteorite hits a 1980 Chevy Malibu sitting in its driveway in Peekskill, NY (1992)
- 10<sup>th</sup> History: inauguration of the Very Large Array, one of the world’s premier astronomical radio observatories; located west of Socorro, New Mexico (1980)



### Astronomical and Historical Events (continued)

- 10<sup>th</sup> History: enactment of the Outer Space Treaty: 1) prohibited placement of nuclear and other weapons of mass destruction in orbit, on the Moon or other celestial body and 2) limited the use of the Moon and other celestial bodies to peaceful purposes (1967)
- 10<sup>th</sup> History: discovery of Neptune's moon Triton by William Lassell (1846)
- 11<sup>th</sup> Second Saturday Stars** at the McCarthy Observatory (7:00 PM)
- 11<sup>th</sup> History: NASA's historic 100<sup>th</sup> space shuttle flight as Discovery carries the Z1 Truss (first piece of the ISS structural backbone) into space (2000)
- 11<sup>th</sup> History: Magellan spacecraft burns up in the Venusian atmosphere after completing its mission to map the planet with its imaging radar (1994)
- 11<sup>th</sup> History: launch of first manned Apollo mission (Apollo 7) with astronauts Schirra, Eisele and Cunningham (1968)
- 11<sup>th</sup> History: launch of WAC Corporal, first man-made object (16 foot rocket) to escape Earth's atmosphere (1945)
- 12<sup>th</sup> History: launch of Voskhod 1; Soviet spacecraft was first to carry multiple (3) cosmonauts (a pilot, scientist and physician) into space. Due to the cramped conditions the crew flew without spacesuits, ejection seats, or an escape tower (1964)
- 12<sup>th</sup> History: first Symposium on Space Flight held at the Hayden Planetarium in New York City; participants included Wernher von Braun, Willy Ley, and Fred L. Whipple; topics included an orbiting astronomical observatory, survival in space, circumlunar flight, a manned orbiting space station, and the question of sovereignty in outer space (1951)
- 13<sup>th</sup> History: launch of Shenzhou 6, China's second manned spacecraft (2005)
- 13<sup>th</sup> History: launch of Explorer 7; spacecraft measured solar X-rays, energetic particles, and cosmic rays (1959)
- 13<sup>th</sup> History: formation of the British Interplanetary Society by Phillip Cleator in Liverpool (1933)
- 14<sup>th</sup> Scheduled launch of an Orbital Sciences Cygnus cargo freighter from Wallops Island, Virginia to the International Space Station
- 14<sup>th</sup> Kuiper Belt Object 202421 (2005 UQ513) at Opposition (47.467 AU)
- 14<sup>th</sup> History: three main belt asteroids discovered by the McCarthy Observatory while searching for NEOs. 2003 TG10 (its provisional name) was subsequently named after Monty Robson (115449 Robson), the founder and director of the observatory (2003)
- 14<sup>th</sup> History: launch of Shenzhou 5, first Chinese manned spacecraft (2003)
- 14<sup>th</sup> History: Air Force Captain Chuck Yeager breaks the sound barrier in the Bell X-1 rocket plane (called "Glamorous Glennis" as a tribute to his wife). The plane reached a speed of 700 miles per hour after being launched from the bomb bay of a Boeing B-29 (1947)
- 15<sup>th</sup> Last Quarter Moon
- 15<sup>th</sup> History: launch of the Cassini spacecraft to the planet Saturn (1997)
- 16<sup>th</sup> Asteroid 55 Pandora closest approach to Earth (1.376 AU)
- 16<sup>th</sup> Dwarf Planet 136199 Eris (formally 2003 UB313 and/or Xena) at Opposition; first Kuiper Belt object discovered to be larger than Pluto (95.407 AU)
- 16<sup>th</sup> History: launch of GOES 1, first weather satellite placed in geosynchronous orbit (1975)
- 18<sup>th</sup> Moon at apogee (furthest distance from Earth in its orbit)
- 18<sup>th</sup> History: launch of the space shuttle Atlantis (STS-34) and Galileo spacecraft to Jupiter (1989)
- 18<sup>th</sup> History: discovery of Chiron by Charles Kowal; Chiron has the characteristics of both a comet and an asteroid. These types of objects are called Centaurs after a mythological being that are half human/half horse (1977)
- 18<sup>th</sup> History: Soviet spacecraft Venera 4 enters the atmosphere of Venus; first probe to analyze the environment (in-situ) of another planet (1967)
- 18<sup>th</sup> History: discovery of Asteroid 8 Flora by John Hind (1847)
- 19<sup>th</sup> Comet 2013 A1 (Siding Spring) near-Mars flyby

### Astronomical and Historical Events (continued)

- 19<sup>th</sup> History: flyby of the planet Venus by the Mariner 5 spacecraft (1967)
- 19<sup>th</sup> History: Subrahmanyan Chandrasekhar born; awarded Nobel Prize in Physics (1983) for studies of the structure and evolution of stars; NASA named its premier X-ray observatory the Chandra X-ray telescope in his honor (1910)
- 20<sup>th</sup> History: launch of the Soviet spacecraft Zond 8; moon flyby mission (1970)
- 20<sup>th</sup> History: discovery of asteroid 577 Rhea by Max Wolf (1905)
- 21<sup>st</sup> Orionids meteor shower peak (produced by debris from Comet Halley)
- 21<sup>st</sup> Kuiper Belt Object 55636 (2002 TX300), discovered by the Palomar Mountain Near-Earth Asteroid Tracking (NEAT) program in 2002, at Opposition (41.206 AU)
- 21<sup>st</sup> History: opening of the Yerkes Observatory in Williams Bay, Wisconsin; home of the world's largest refractor with its 40-inch objective lens manufactured by Alvan Clark and Sons (1897)
- 22<sup>nd</sup> History launch of Chandrayaan-1, India's first mission to the Moon (2008)
- 22<sup>nd</sup> History: Soviet spacecraft Venera 9 touches down on Venus and transmits first pictures (black and white) of its surface (1975)
- 22<sup>nd</sup> History: launch of the Soviet Moon orbiter Luna 12 to take high-resolution photos of the Moon's surface from lunar orbit (1966)
- 23<sup>rd</sup> New Moon
- 23<sup>rd</sup> Partial Solar Eclipse, visible from eastern United States
- 23<sup>rd</sup> History: first time female commanders led orbital missions at the same time: Pamela Melroy commanded space shuttle Discovery (STS-120) to the ISS while Peggy Whitson led the Expedition 16 team aboard the ISS in the installation of a new orbital node (2007)
- 24<sup>th</sup> Scheduled flyby of Saturn's largest moon Titan by the Cassini spacecraft
- 24<sup>th</sup> History: launch of Chang'e-1, Chinese lunar orbiter, from the Xichang Satellite Launch Center in the southwestern province of Sichuan (2007)
- 24<sup>th</sup> History: launch of Deep Space 1; first of a series of technology demonstration probes developed by NASA's New Millennium Program; propulsion was provided by a xenon ion engine that operated for a total of 16,265 hours (1998)
- 24<sup>th</sup> History: discovery of Uranus' moons Umbriel and Ariel by William Lassell (1851)
- 25<sup>th</sup> Plutino 47171 (1999 TC36) at Opposition (29.572 AU). Three trans-Neptunian objects comprise the system. It is classified as a plutino with a 2:3 mean motion resonance with Neptune.
- 25<sup>th</sup> Kuiper Belt Object 15760 (1992 QB1); first resident of the Kuiper Belt found beyond Pluto at Opposition (40.217 AU)
- 25<sup>th</sup> History: launch of the twin Solar Terrestrial Relations Observatories (STEREO A and B); 3-D studies of the Sun and coronal mass ejections (2006)
- 25<sup>th</sup> History: Soviet spacecraft Venera 10 touches down on Venus 2,200 km from its twin Venera 9; lands on a flat boulder that was determined to be similar in composition to basalt on Earth (1975)
- 25<sup>th</sup> History: discovery of Saturn's moon Iapetus by Giovanni Cassini (1671)
- 27<sup>th</sup> Kuiper Belt Object 42301 (2001 UR163) at Opposition (51.039 AU)
- 27<sup>th</sup> History: first test flight of the Saturn I rocket (1961)
- 27<sup>th</sup> History: Canon City meteorite fall; hit garage (1973)
- 28<sup>th</sup> History: first (and last) test flight of the Ares I-X rocket; a two minute powered suborbital flight (2009)
- 28<sup>th</sup> History: launch of Prospero spacecraft, Great Britain's first space launch (1971)
- 29<sup>th</sup> Scheduled launch of a Russian cargo-carrying Progress spacecraft from the Baikonur Cosmodrome, Kazakhstan
- 29<sup>th</sup> Centaur Object 54598 Bienor at Opposition (15.116 AU)
- 29<sup>th</sup> History: launch of the space shuttle Discovery (STS-95) with astronaut and then U.S. Senator, John Glenn (1998)
- 29<sup>th</sup> History: flyby of asteroid Gaspra by the Galileo spacecraft on mission to Jupiter (1991)
- 30<sup>th</sup> First Quarter Moon



### Astronomical and Historical Events (continued)

- 30<sup>th</sup> History: discovery of the Los Angeles (Mars) Meteorite (1999)
- 30<sup>th</sup> History: launch of Venera 13, Soviet Venus lander; lander survived for 127 minutes on the surface where the temperature was recorded at 855 °F (1981)
- 30<sup>th</sup> History: Mercury Theatre broadcasts Orson Welles' adaptation of H.G. Wells "War of the Worlds" (1938)
- 31<sup>st</sup> Plutino 144897 (2004 UX10) at Opposition (38.147 AU)
- 31<sup>st</sup> History: birthday of Apollo 11 Command Module pilot Michael Collins (1930)
- 31<sup>st</sup> History: first rocket engine tests by three young rocketeers that would be the beginning of what would become the Jet Propulsion Laboratory (1936)

### References on Distances

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

### International Space Station/Space Shuttle/Iridium Satellites

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

### Solar Activity

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

### Image Credits

Front page design and graphic calendar: Allan Ostergren

Second Saturday Stars poster: Sean Ross, Ross Designs

Cover Photo: a luminance, red, green, blue composite taken at McCarthur Observatory on January 29th, 2014 with the ST-10XME camera on the Meade 16" with the 0.5x focal reducer. Total exposure time was roughly an hour and a half between the 4 filters, with over an hour of it being luminance. Image taken by Marc Polansky and the JJMO imaging team.

American flag on the body of the space shuttle orbiter Discovery. The shuttle is currently on display at the James S. McDonnell Space Hangar at the National Air and Space Museum's Steven F. Udvar-Hazy Center. Photo by Bill Cloutier





**FREE EVENT**

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

[www.mccarthyobservatory.org](http://www.mccarthyobservatory.org)

**October 11th**  
**7:00 - 9:00 pm**

# ASTEROID IMPACTS WITH EARTH



Refreshments  
Family Entertainment  
Activity Center  
Stars & Planets  
Rain or shine

S. Ross

Map

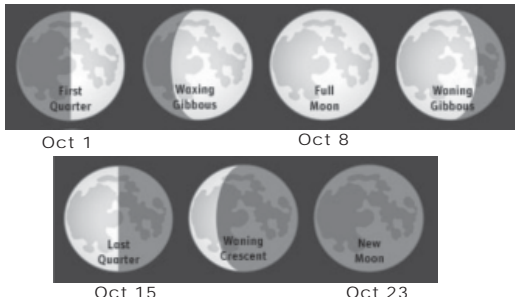













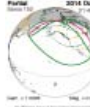



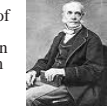












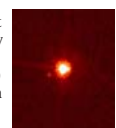

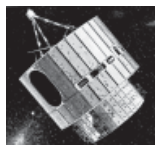







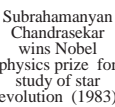



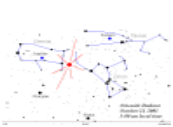





















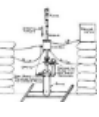


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# October 2014

## Celestial Calendar

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
<b>Phases of the Moon</b>  <p>Oct 1                      Oct 8</p> <p>Oct 15                      Oct 23</p>			<p><b>1</b></p>  <p>NASA created by the National Aeronautics and Space Act (1958)</p>	<p><b>2</b></p>  <p>Hayden Planetarium founded (1935)</p>	<p><b>3</b></p> <p>Launch of Mercury-Atlas 8 with Walter Schirra (1962)</p>  <p>Chassigny meteorite, determined origin of Mars (1815)</p>  <p>Zagami Martian meteorite in Katsina Province, Nigeria (1962)</p>	<p><b>4</b></p>  <p>Luna 3; Soviet spacecraft, was first to photograph the far side of the Moon (1959)</p>  <p>SpaceShipOne, 70 miles up, to win Ansari X Prize (2004)</p>  <p>World Space Week, Oct. 4-10 "The benefits of satellite navigation to society"</p>
<p><b>5</b></p>  <p>Robert Goddard born, founding father of modern rocketry (1882)</p>	<p><b>6</b></p> <p>Moon at Perigee (closest to Earth)</p>  <p>Launch of space shuttle Discovery and solar polar orbiter spacecraft Ulysses (1990)</p>  <p>Asteroid 2008 TC3, tracked by McCarthy Observatory, explodes over Sudan (2008)</p>	<p><b>7</b></p>  <p>Launch of Explorer 6, with "paddlewheel satellite," a photocell scanner transmitting a crude picture of the earth's surface and cloud cover (1959)</p>	<p><b>8</b></p>  <p>Pioneer Venus orbiter concludes mission and begins fiery plunge into Venusian atmosphere (1992)</p>  <p>Total Lunar Eclipse, with totality beginning shortly before sunrise on the east coast</p>  <p>LCROSS impacts Moon's south pole (2009)</p>	<p><b>9</b></p>  <p>Draconids meteor shower peak</p>  <p>Peekskill meteorite hits Chevy Malibu (1992)</p>	<p><b>10</b></p> <p>Enactment of outerspace treaty (1967)</p>  <p>Inauguration of the Very Large array in New Mexico (1980)</p>  <p>Discovery of Uranus' moon Triton by William Lassell (1846)</p>	<p><b>11</b></p>  <p>Launch of first manned Apollo mission (1968)</p>  <p>WAC Corporal, first rocket to escape Earth's atmosphere (1945)</p>  <p>100th space shuttle flight carries Z1 Truss, backbone of the ISS (2000)</p>  <p>2nd Saturday Stars Open House McCarthy Observatory</p>
<p><b>12</b></p>  <p>First symposium on space travel, held at Hayden Planetarium (1951)</p>  <p>Launch of Voskhod 1, Soviet spacecraft, first to carry multiple cosmonauts (1964)</p>	<p><b>13</b></p>  <p>Launch of Explorer 7 spacecraft (1959)</p>  <p>Launch of Shenzhou 6, China's 2nd manned spacecraft (2005)</p>  <p>British Interplanetary Society founded (1933)</p>	<p><b>14</b></p>  <p>Launch of Shenzhou 5, China's 1st manned spacecraft (2003)</p>  <p>Chuck Yeager breaks sound barrier (1947)</p>  <p>Three main belt asteroids discovered by McCarthy Observatory (2003)</p>	<p><b>15</b></p>  <p>Dwarf Planet Eris (formally 2003 UB313 and/or Xena) at Opposition (95.542 AU)</p>  <p>Launch of Cassini spacecraft to planet Saturn (1997)</p>	<p><b>16</b></p>  <p>Launch of GOES 1, first weather satellite in geosynchronous orbit (1975)</p>	<p><b>17</b></p>  <p>Mae Carol Jemison born, American physician and NASA astronaut; became first black woman in space aboard the Shuttle Endeavour on September 12, 1992; has appeared on television several times, including an episode of Star Trek: The Next Generation. (1956)</p>	<p><b>18</b></p>  <p>Moon at apogee (farthest from Earth)</p>  <p>Soviet spacecraft Venera 4 probes atmosphere of Venus; (1967)</p>  <p>Discovery of Asteroid 8 Flora by John Hind (1847)</p>  <p>Discovery of comet Chiron in Taurus by Charles Kowal (1977)</p>  <p>Launch of space shuttle Atlantis and Galileo spacecraft to Jupiter (1989)</p>
<p><b>19</b></p>  <p>launch of IBEX (Interstellar Boundary Explorer) to explore the edge of solar system (2008)</p>  <p>Subrahmanyan Chandrasekar wins Nobel physics prize for study of star evolution (1983)</p>	<p><b>20</b></p>  <p>Discovery of asteroid 577 Rhea by Max Wolf (1905)</p>  <p>Launch of Soviet spacecraft Zond 8, Moon flyby mission (1970)</p>	<p><b>21</b></p>  <p>Opening of the Yerkes Observatory, Williams Bay, Wisconsin, with world's largest refractor lens (40") (1897)</p>  <p>Orionids meteor shower peak</p>	<p><b>22</b></p>  <p>Launch of the Soviet orbiter Luna 12 to take high-resolution photos of the Moon's surface from lunar orbit (1966)</p>  <p>Launch of India's first Moon mission Chandrayaan-1 (2008)</p>	<p><b>23</b></p>  <p>Partial Solar Eclipse, visible from eastern United States</p>  <p>Pamela Melroy and Peggy Whitson first women to lead two missions at same time (shuttle and space station) (2007)</p>	<p><b>24</b></p>  <p>Launch of Deep Space 1 (1998)</p>  <p>Launch of Chang'e-1, Chinese lunar orbiter (2007)</p>  <p>Discovery of Uranus' moons Umbriel and Ariel by William Lassell (1851)</p>	<p><b>25</b></p>  <p>Discovery of Saturn's moon Iapetus by Giovanni Cassini (1671)</p>  <p>Launch of twin Solar Terrestrial Relations Observatories (STEREO A&amp;B) for 3-D studies of Sun (2006)</p>  <p>Soviet spacecraft Venera 10 touches down on Venus (1975)</p>
<p><b>26</b></p>  <p>Soviet Union releases first images of the far side of the Moon, taken by Luna III spacecraft, showing a more mountainous terrain than seen from Earth and only two dark, low-lying regions. (1959)</p>	<p><b>27</b></p>  <p>first test flight of the Saturn I rocket (1961)</p>  <p>Cañon City, Colorado meteor hits garage - 1973</p>	<p><b>28</b></p>  <p>First test flight of the Ares I-X rocket; a two minute powered suborbital flight (2009)</p>  <p>Launch of Prospero, Britain's first space mission (1971)</p>	<p><b>29</b></p>  <p>Launch of space shuttle Discovery (STS-95) with astronaut and former senator John Glenn (1998)</p>  <p>Flyby of asteroid Gaspra by the Galileo spacecraft on mission to Jupiter (1991)</p>	<p><b>30</b></p>  <p>Mercury Theatre War of Worlds broadcast with Orson Welles produces panic (1938)</p>  <p>Discovery of the Los Angeles (Mars) Meteorite (1999)</p>  <p>Launch of Venera 13, Soviet Venus lander; survived for 127 minutes on the surface where the temperature was recorded at 855 °F (1981)</p>	<p><b>31</b></p>  <p>Apollo 11 Command module pilot Michael Collins born (1930)</p>  <p>First rocket test engine that spawned the Jet Propulsion Laboratory (1936)</p>	