Galactic Observer

John J. McCarthy Observatory

Volume 8, No. 10 October 2015

Blood Moon

An image of the Total Lunar eclipse of September 27 2015 , captured from the McCarthy Observatory and enhanced by our JJMO imaging team. For more information, see inside, page 17

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
Doug Delisle
Cecilia Detrich
Dirk Feather
Randy Fender
Randy Finden
John Gebauer
Elaine Green
Tina Hartzell
Tom Heydenburg
Jim Johnstone
Carly KleinStern
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Marc Polansky
Joe Privitera
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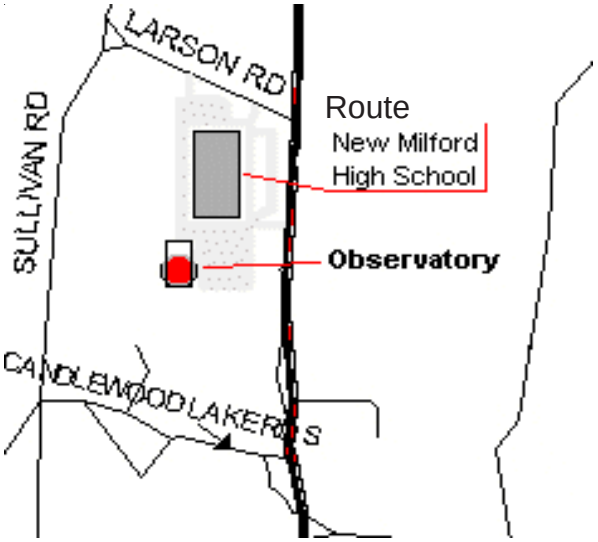
Don Ross
Gene Schilling
Katie Shusdock
Paul Woodell
Amy Ziffer



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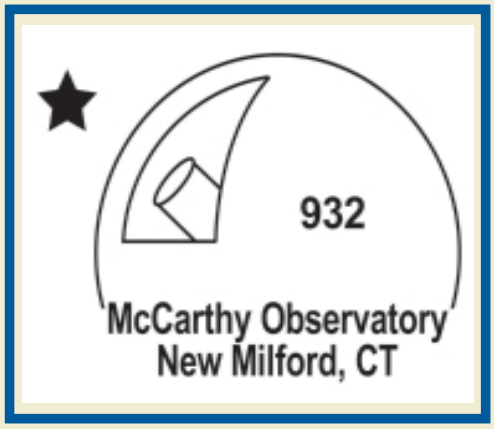
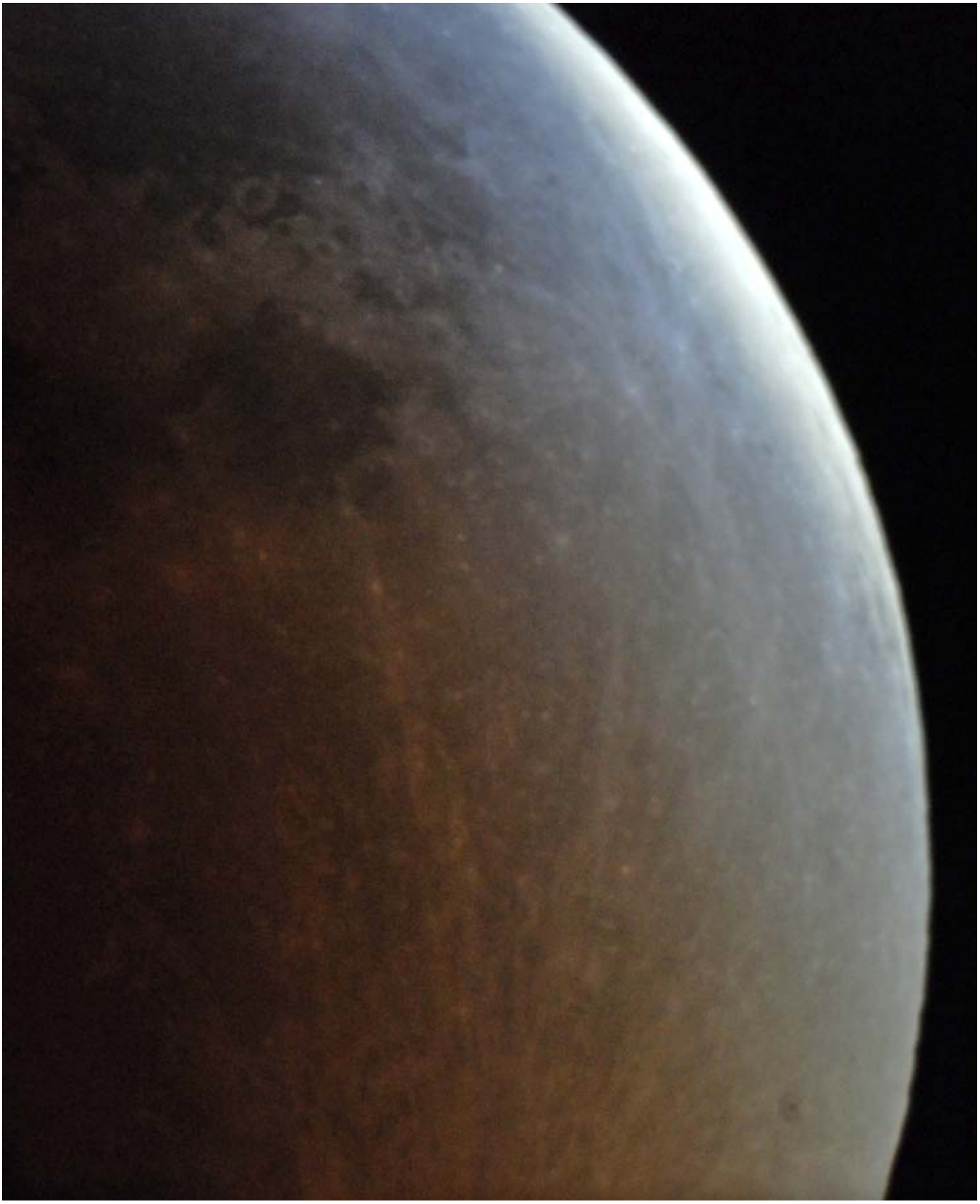


October Astronomy Calendar and Space Exploration Almanac



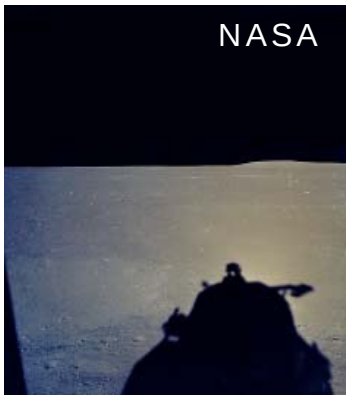
"Out the Window on Your Left"

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

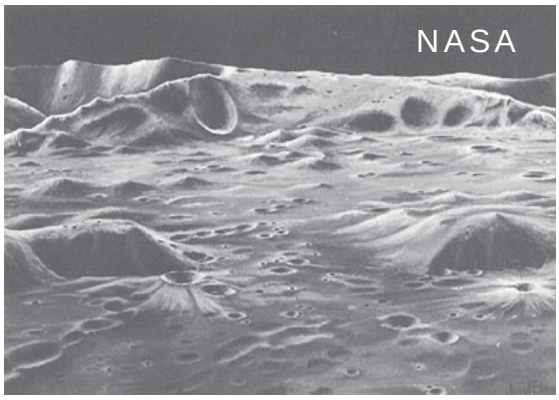
Mare or lunar "seas" are actually expansive low-lying plains formed by ancient lava flows

column may provide some thoughts to ponder when planning your visit (if only in your imagination).

The view this month extends from the southern shore of Mare Tranquillitatis (Sea of Tranquility) and the landing site of Apollo 11 to the cratered highlands and the landing site of Apollo 16. The southeastern (lower left) side of the image is dominated by three large craters (from north to south and youngest to oldest), Theophilus, Cyrillus and Catharina. The craters are situated just to the south of Sinus Asperitatis (the Bay of Roughness) which connects Mare Tranquillitatis with Mare Nectaris (Sea of Nectar). The high sun angle illuminates the crater's interior, showing a well preserved central peak in Theophilus, but little detail in the battered and lava flooded Catharina.



Apollo 11 view taken from the Lunar Module.



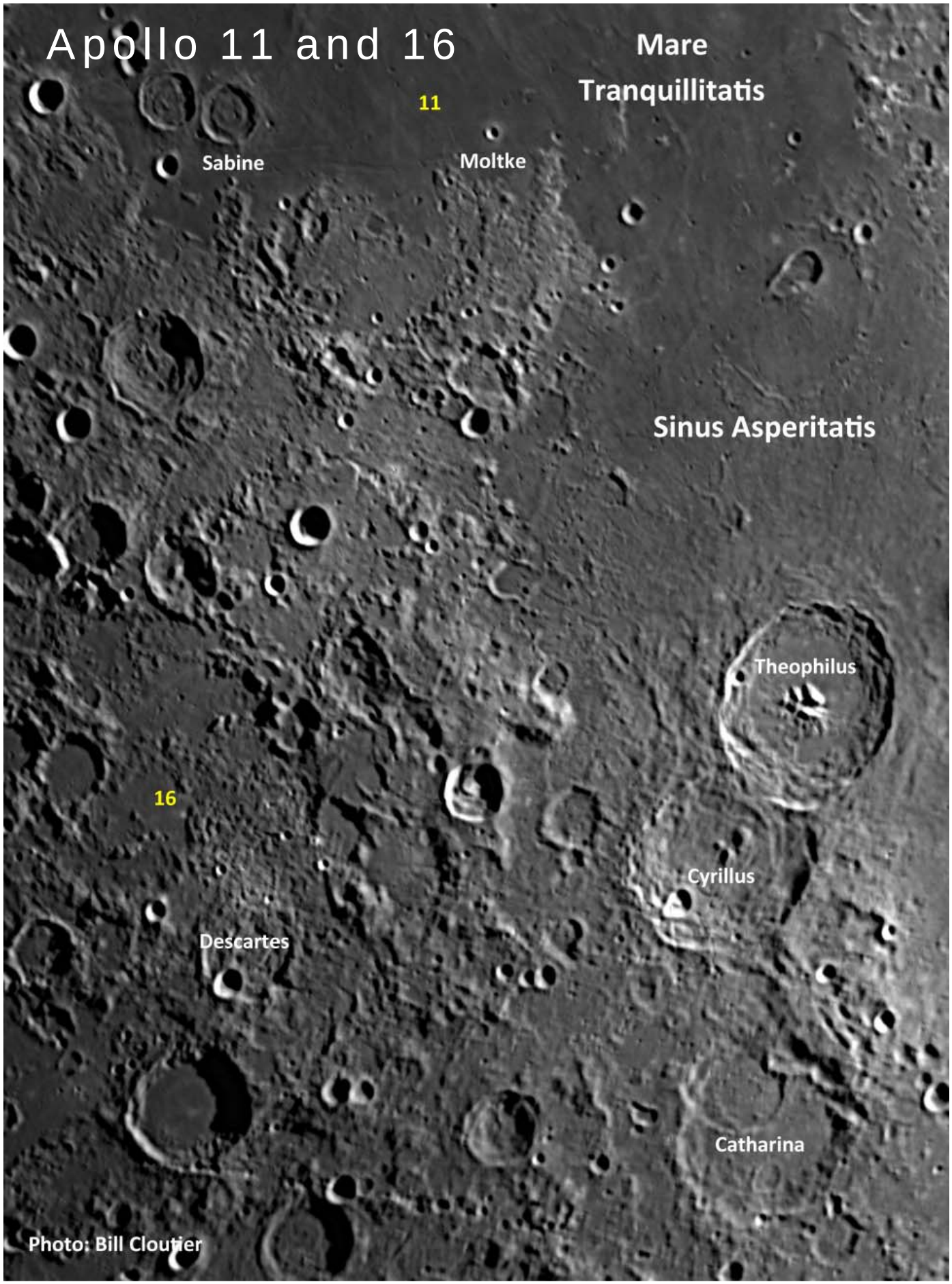
The Descartes region. Apollo 16 landing site

The Apollo 11 landing site was selected for the first lunar landing based upon criteria that included: no large craters and boulders to maneuver around, no mountains, cliffs or valleys that might interfere with the lunar module's landing radar, a relatively flat terrain, and a level approach and landing site.

Apollo 16 was the first mission to the lunar highlands (the previous four missions targeted various sites on the lunar maria). Among the objectives of the mission was the return of samples from the Descartes and Cayley formations. Both formations were thought to be volcanic in origin. Instead, samples returned by Apollo 16 found the material to be from impacts (for example, rock, mineral fragments and glassy melt from the excavation of the underlying bedrock by direct meteor/meteoroid impacts or crater ejecta from nearby impacts).

Volcanic material (besides mare basalts) was eventually collected and returned for study by the Apollo 17 mission. The crew set down their lunar module in a deep valley on the eastern rim of the Serenitatis basin. Exploration of the rim of the impact crater Shorty by geologist-astronaut Harrison Schmitt uncovered a deposit of volcanic glass. The orange and black glass predated the crater and most likely formed deep below the surface more than 3.6 billion years ago before erupting from a volcanic vent in a lava fountain.

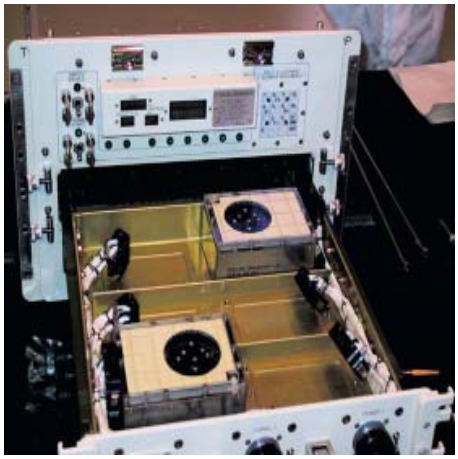
Apollo 17 astronauts Schmitt and Cernan approaching crater Shorty during the Apollo 17 mission. Schmitt, a geologist, found strange orange soil during the excursion. Source: NASA


Apollo 11 and 16
Mare
Tranquillitatis
11
Sabine
Moltke
Sinus Asperitatis
Theophilus
16
Cyrillus
Descartes
Catharina
Photo: Bill Cloutier

The Secret to a Long and Healthy Life May be in the Stars

Passing overhead approximately 16 times each 24-hour day, the crew of the International Space Station (ISS) is diligently conducting research, monitoring experiments, taking observations, performing station repairs and keeping up with general housekeeping tasks as automatic spacecraft carrying cargo and crew periodically arrive and depart. Within the choreographed chaos, described as "routine operations," the crew conducts and/or monitors a number of medical research activities that have the potential of greatly improving the quality of life on Earth for individuals with debilitating diseases.

Proteins, long polymers made of amino acids in the human body, are critical for proper cell function. The proteins are folded into a complex three-dimensional geometry based upon the properties of the amino acids. Occasionally, proteins misfold. If propagated, the misfolded proteins can become toxic and have been linked to degenerative diseases such as Alzheimer's and Parkinson's. Mapping the protein's structure is key to designing structure-based drugs that can activate or inhibit a protein's function.



Protein Crystallization Research Facility, or PCRF, is a sub-rack payload used for the protein crystallization experiments, which provides controlled temperature and can hold six cell units (up to 144 proteins) inside. Credits: JAXA

In the laboratory, proteins are crystallized to produce a well-ordered crystal that produces a diffraction pattern when hit with x-rays. X-ray crystallography visualizes a protein's internal structure at the atomic level. However, the information that can be obtained on the protein's crystalline structure is greatly dependent upon the crystal's degree of perfection.

Protein crystals grown on Earth are irregular in shape and weight and generally small in size, being affected by fluid convection and sedimentation (causing heavier structures to sink). Conversely, protein crystals grown in microgravity are uniform in size and weight. They are also of a higher quality and larger than can be produced on Earth. The most powerful medical research tool on the ISS may be its microgravity.

Since 2003, the Japan Aerospace Exploration Agency, or JAXA, has been conducting protein crystallization experiments, most recently with the support of the Russian Federal Space Agency. Researchers have been successful in crystallizing proteins (for example, hematopoietic prostaglandin D synthase or H-PGDS) that are associated with diseases such as Duchenne Muscular Dystrophy (DMD), the most common form of muscular dystrophy.

H-PGDS has been crystallized several times in space. Analysis of the high-quality crystals has allowed researchers to identify a new inhibitor several times stronger than previous drugs. While still in clinical trials, the inhibitor drug has the potential to double the potential lifespan of many DMD patients.

The ISS resupply mission launched in January 2015 included an innocuous four-inch cube containing an experiment labeled SABOL, or "Self-Assembly in Biology and the Origin of Life: A Study into Alzheimer's."

JAXA astronaut Satoshi Furukawa, and Russian cosmonaut Sergei Volkov work on the JAXA PCG investigation. Source: NASA.

Brains of Alzheimer's patients have shown an accumulation of Amyloid fibers that over time become entangled. It is not clear at this time whether the fibers are the cause of the disease or only a symptom. However, the study of the fibers on Earth is hindered by gravity as lab-grown fibers tend to settle before they can become fully entangled. In weightlessness, the growth process is expected to continue with the fibers remaining suspended. Analysis of the resulting microgravity-grown fiber tangles or bundles is expected to aid in our understanding of their internal structure and in identifying potential means of controlling the formative processes.

Space based research has the potential to discover new and innovative drug therapies and accelerate the time in which these potential remedies are made available to the general public – something to consider that next time you look up at the night sky.

Moving on Down

The Dawn spacecraft has moved into its third of four progressively lower mapping orbits. It will spend more than two months imaging Ceres at an altitude of 900 miles (1,450 km) before descending to its final orbit 230 miles (375 km) above the surface in December (where it will remain until mission end). In this closest-yet view of Occator crater, the bright features on the crater floor are shown with a resolution of 450 feet (140 meters) per pixel.

Occator crater is about 60 miles (90 km) across and 2 miles (4 km) deep, similar in size to Copernicus crater on Earth's moon. While the lower orbit has provided images of greater resolution, the composition and source of the bright material has still not been determined.

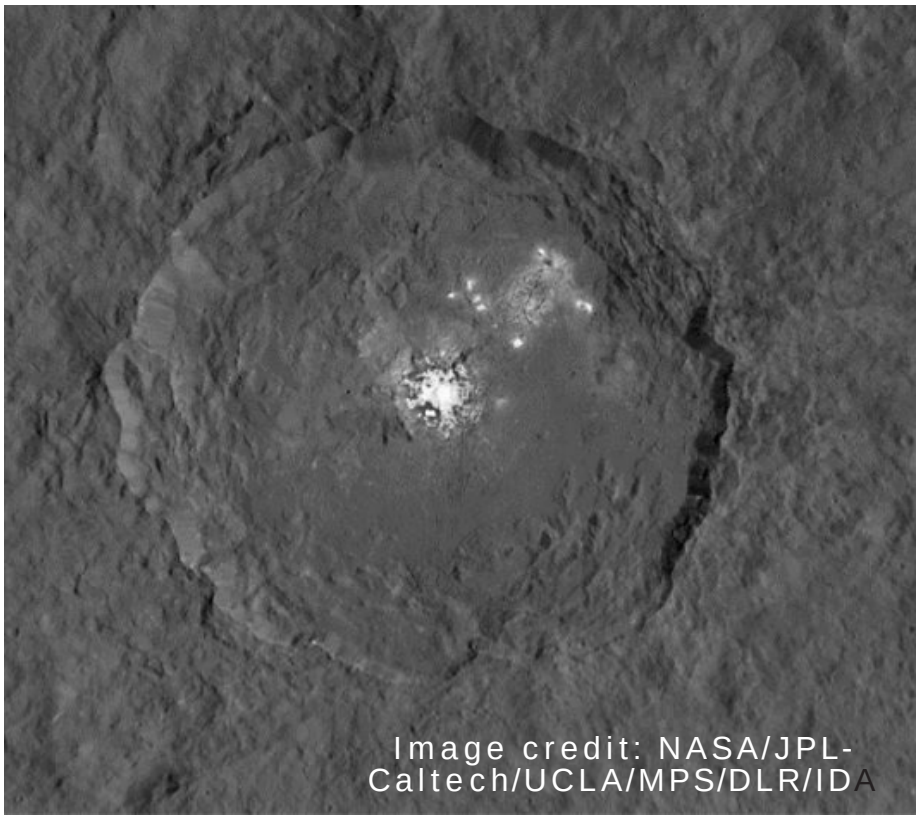
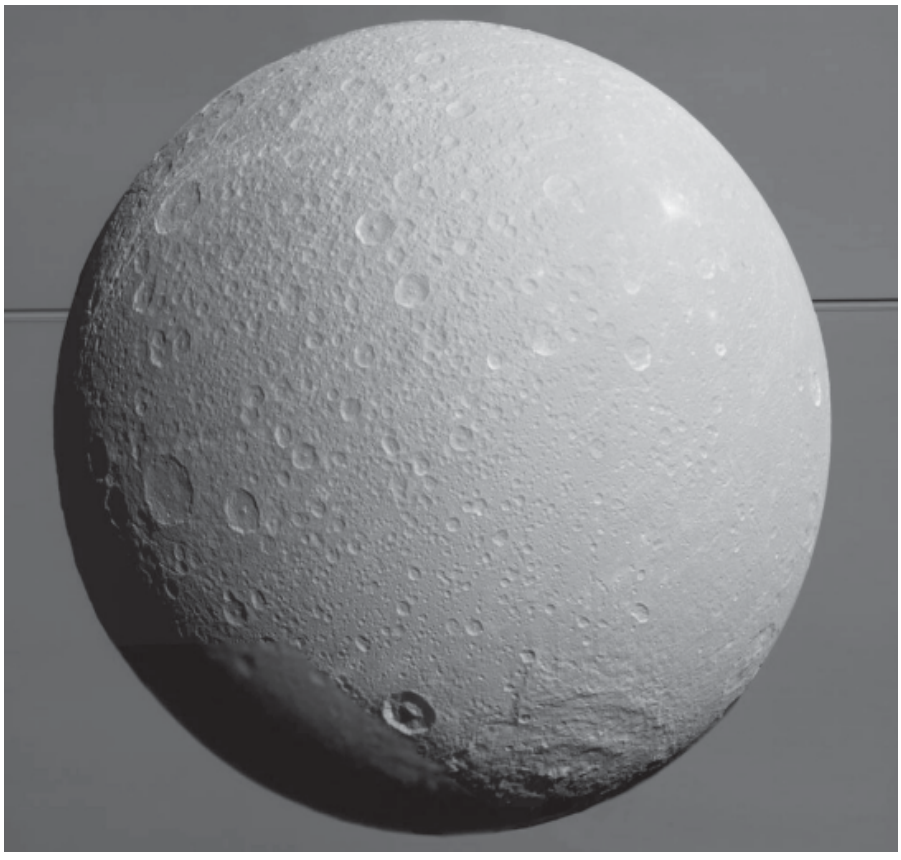


Image credit: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA

Dione

The Cassini spacecraft has entered into its final two years of a thirteen-year-long mission in orbit around Saturn. In its final orbits, before the spacecraft is deliberately destroyed in the upper atmosphere of the gas giant, science planners are taking one last look at Saturn's many icy satellites.



Credits: NASA/JPL-Caltech/Space Science Institute

A final close flyby of Saturn's moon Dione was conducted in August and produced the image of the cratered moon (above). The image was taken at a distance of 295 miles (474 km) above the icy surface. The primary objective of the flyby was to gather data from the spacecraft's gravity science experiment and magnetosphere and plasma science instruments – data to be used in modeling the interior of the moon. The image of Dione was set against the cloud tops of Saturn, the rings seen edge-on as a dark line dividing the photo.

This month (October 2015), the spacecraft is scheduled to fly through the icy plumes of Saturn's geologically active moon Enceladus (on the 14th and 28th). The October 28th flyby will be the closest yet, at an altitude of only 30 miles (49 km) above the moon's surface.

Pluto

During the flyby of Pluto and its moons in July, only a handful of images were transmitted by the New Horizons spacecraft as it collected and stored data from its suite of instruments. Many of the images received were in a compressed form for rapid and efficient transmittal. Starting in September, the spacecraft started the download of its full complement of images and data, a process that will take a year to complete. Close-up and higher resolution images of the dwarf planet's surface have revealed new and surprising features.

The sunset image, taken just after closest approach and from a distance of 11,000 miles (18,000 km), shows Pluto's icy plains, jagged mountains and layers of a hazy atmosphere. The mountains in the image rises up to 11,000 feet (3,500 meters) in elevation.

The higher resolution image of Pluto's moon Charon reveals surface features as small as 2.9 miles (4.6 km) in size. Most surprising to project scientists is the evidence of geologic activity on the diminutive moon (which is only 750 miles or 1,200 km in diameter). The image was taken from a distance of 290,000 miles (470,000 km), a distance slightly further than Earth's moon is from Earth.

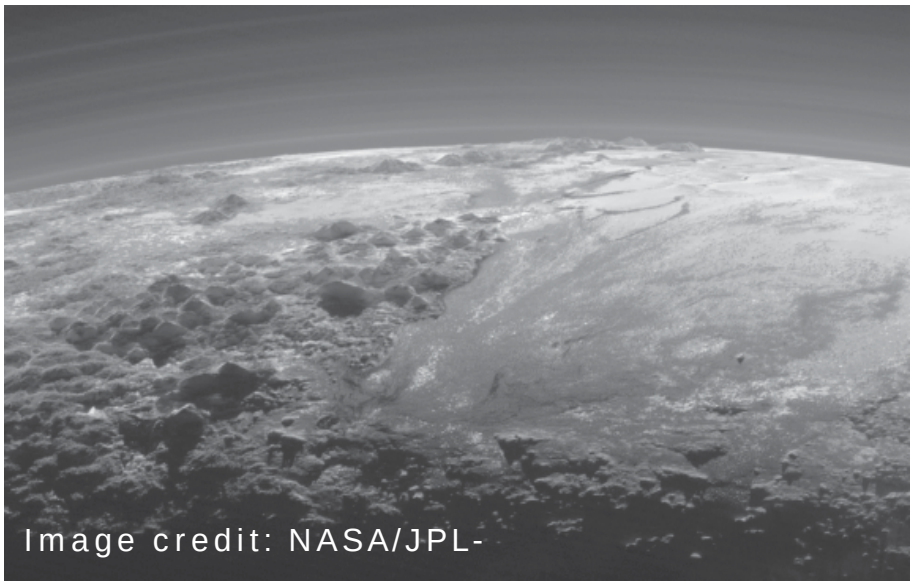


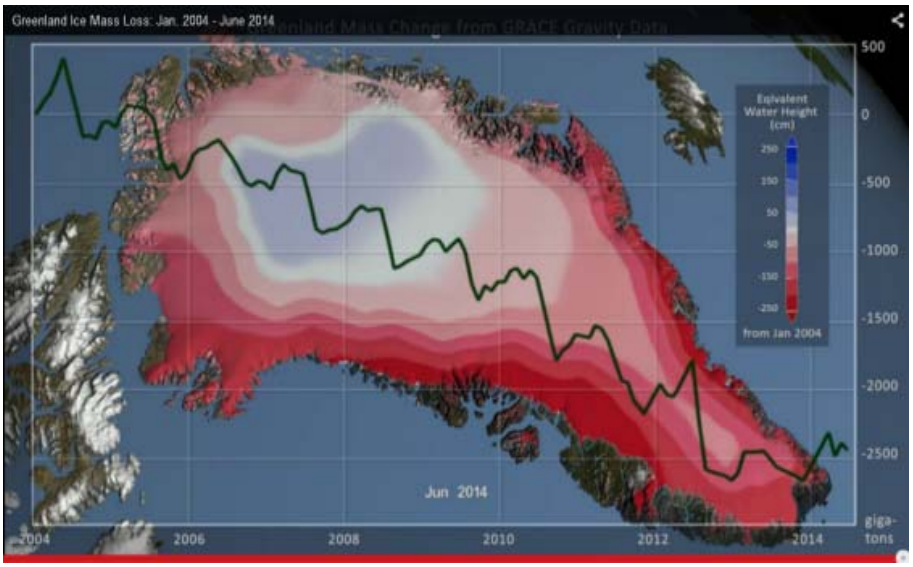
Image credit: NASA/JPL-

Enhanced color image of Charon Credits: NASA/JHUAPL/SwRI

Rising Seas

NASA has been monitoring changes in ocean level from low-Earth orbit since 1992. The original satellite, Topex/Poseidon, was a collaborative effect with the French space agency CNES. Topex/Poseidon, along with its successors Jason 1 and Jason 2, have recorded an average rise in sea level of almost 3 inches (7.4 centimeters). The rise is the result of the warming of oceans (warm water expands) and the melting of land ice. The largest, single source of land ice is the glaciers of Greenland, estimated to be releasing 300 gigatons of ice into the ocean each year.

The loss of land ice is measured by another set of satellites, the Gravity Recovery and Climate Experiment or GRACE. Launched in 2002, the NASA and German space agency satellites measure the change in mass on Earth's surface, of which water or ice is the primary variable. Complementing the eyes in the sky



Ice Loss from the Greenland Ice Sheet Credits: NASA Goddard's Scientific Visualization Studio

is Argo, an array of 3,000 floating sensors placed around the globe.

Climates change and have changed over the Earth's 4 billion history. What alarms scientists is the rate of change over such a short time. In particular, the ice loss from Greenland's glaciers has accelerated by 31 gigatons each year (since 2004), mirrored by losses in West Antarctica's ice sheet (28 gigatons per year).

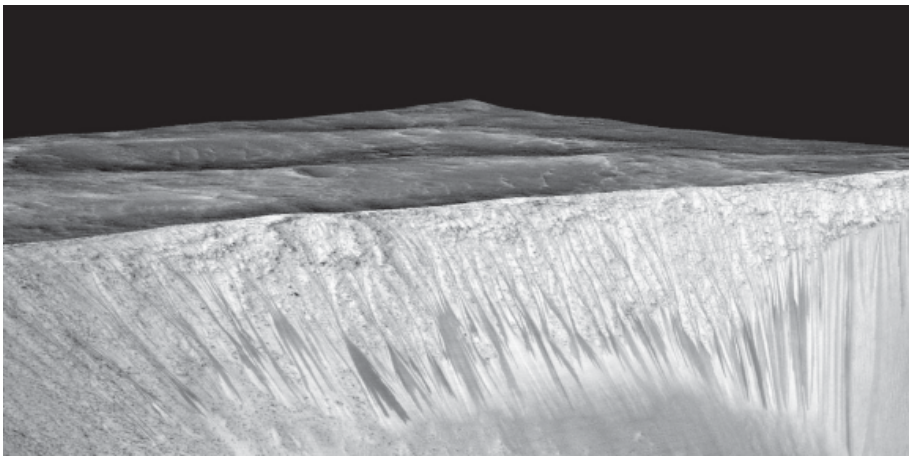
The melt season for Greenland's glaciers is now more than two months longer today than it was 40 years ago. Since the 1990's, the glaciers have lost more ice during the summer melt season than gained back in the winter. Warmer ocean water around Greenland, and in the Antarctic, is undermining the glaciers from below, destabilizing the ice sheets.

Later this year, the Jason-3 satellite is scheduled to join NASA's eyes in the sky. Combined with a three-year air and sea campaign to study Greenland's ice sheet from above and below, the information gathered by organizations such as NASA will continue to improve our understanding of the Earth's changing climate, quantify the effect and identify those variables that are within our ability to control or mitigate.

Glaciers are considered "canaries in the coal mine" as they provide a measure of environmental changes in the Earth's heat balance.

Salty Brine Flows on Mars

Long suspected, but only recently confirmed, NASA announced on September 28th that reoccurring streaks on the Martian landscape appear to be caused by the seasonal flow of subsurface water. The findings are based upon data collected by NASA's Mars Reconnaissance Orbiter's (MRO) imaging spectrometer. The instrument has detected hydrated salts on the slopes where the streaks have appeared. The streaks ebb and flow, darkening and growing longer in the warmer seasons, receding and fading in the colder temperatures.



Dark streaks on the walls of Garni crater. The streaks are up to a few hundred yards in length and believed to be caused by the outflow of a briny liquid in warmer temperatures. The 3-D terrain was created from multiple HiRISE observations over which the crater image was draped.
Image Credit: NASA/JPL-Caltech/Univ. of Arizona

The hydrated salts, likely a mixture of magnesium perchlorate, magnesium chlorate and sodium perchlorate, would suppress the freezing point of the briny liquid, allowing it to flow and remain liquid on the freezing Martian surface. The streaks were first discovered in 2010 in images taken by MRO's High Resolution Imaging Science Experiment (HiRISE). Since that time, working in tandem with the orbiter's spectrometer, more than a dozen outflow sites have been documented.

That liquid water exists on or near the surface suggests that life may still be viable on Mars today. The components of this briny fluid could also be a source of drinking water, breathing air and even rocket fuel for future colonists.

Retrospective: Halloween 2008

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

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 approximately 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

Sun	Sunrise	Sunset
October 1st (EDT)	06:50	18:36
October 15th	07:05	18:13
October 31st	07:24	17:50

Astronomical and Historical Events

1st Scheduled launch of a Russian cargo-carrying Progress spacecraft from the Baikonur Cosmodrome in Kazakhstan to the International Space Station
1st Distant flyby of Saturn's moon Rhea by the Cassini spacecraft
1st History: NASA created by the National Aeronautics and Space Act (1958)
2nd History: opening of the Hayden Planetarium (1935)
3rd History: launch of the fifth Mercury flight, piloted by astronaut Walter Schirra (1962)
3rd 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)
3rd History: fall of the Chassigny Martian meteorite in Haute-Marne province, France; the meteorite is distinctly different from other Martian meteorites (shergottites and nakhilites) and is classified as its own subgroup – "chassignites" (1815)
4th Last Quarter Moon
4th 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)
4th History: SpaceShipOne rockets to an altitude of almost 70 miles to win the $10 million Ansari X Prize (2004)
4th History: launch of Luna 3; Soviet spacecraft was first to photograph the far side of the Moon (1959)
4th History: launch of Sputnik 1, world's first artificial satellite (1957)
5th History: launch of the space shuttle Challenger (STS-41-G), crew included astronaut Kathryn Sullivan, first American women to walk in space (1984)
5th History: Robert Goddard born, founding father of modern rocketry (1882)
6th Kuiper Belt Object 2008 ST291 at Opposition (58.708 AU)
6th 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)
6th History: launch of the space shuttle Discovery and the solar polar orbiter spacecraft Ulysses (1990)
8th History: discovery of Supernova 1604 (Kepler's Nova) (1604)
9th Connecticut Star Party (CSP), Goshen, Connecticut (through the 11th)
9th Draconids Meteor Shower peak (produced by debris from Comet Giacobini-Zinner)
9th History: LCROSS impacts crater Cabeus near the Moon's south pole in search of water (2009)
9th History: Peekskill meteorite fall; 27 pound meteorite hits a 1980 Chevy Malibu sitting in its driveway in Peekskill, NY (1992)
10th **Second Saturday Stars** at the McCarthy Observatory (7:00 PM)

Astronomical and Historical Events (continued)

- 10th Kuiper Belt Object 303775 (2005 QU182) at Opposition (50.300 AU)
- 10th Jet Propulsion Laboratory (JPL) Open House, Pasadena, California (and 11th)
- 10th History: inauguration of the Very Large Array, one of the world's premier astronomical radio observatories; located west of Socorro, New Mexico (1980)
- 10th 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)
- 10th History: discovery of Neptune's moon Triton by William Lassell (1846)
- 11th Moon at apogee (furthest distance from Earth in its orbit)
- 11th Uranus at Opposition (rising with the setting Sun and visible all night)
- 11th Kuiper Belt Object 19308 (1996 TO66) at Opposition (46.242 AU)
- 11th History: NASA's historic 100th space shuttle flight as Discovery carries the Z1 Truss (first piece of the ISS structural backbone) into space (2000)
- 11th History: Magellan spacecraft burns up in the Venusian atmosphere after completing its mission to map the planet with its imaging radar (1994)
- 11th History: launch of first manned Apollo mission (Apollo 7) with astronauts Schirra, Eisele and Cunningham (1968)
- 11th History: launch of WAC Corporal, first man-made object (16 foot rocket) to escape Earth's atmosphere (1945)
- 12th New Moon
- 12th 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)
- 12th 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)
- 13th Distant flyby of Saturn's largest moon *Titan* by the Cassini spacecraft
- 13th History: launch of Shenzhou 6, China's second manned spacecraft (2005)
- 13th History: launch of Explorer 7; spacecraft measured solar X-rays, energetic particles, and cosmic rays (1959)
- 13th History: formation of the British Interplanetary Society by Phillip Cleator in Liverpool (1933)
- 14th Flyby of Saturn's moon *Enceladus* by the Cassini spacecraft
- 14th Distant flyby of Saturn's moons *Polydeuces*, *Methone*, *Prometheus* and *Helene* by the Cassini spacecraft
- 14th 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)
- 14th History: launch of Shenzhou 5, first Chinese manned spacecraft (2003)
- 14th 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)
- 15th History: launch of the Cassini spacecraft to the planet Saturn (1997)
- 16th Mercury at its greatest western elongation – apparent separation from the Sun in the sky (18°)
- 16th Kuiper Belt Object 202421 (2005 UQ513) at Opposition (47.390 AU)
- 16th History: launch of GOES 1, first weather satellite placed in geosynchronous orbit (1975)
- 17th Mars Passes 0.4° from Jupiter in the early morning sky
- 17th Dwarf Planet 136199 Eris Eris (formally 2003 UB313 and/or Xena) at Opposition (95.337 AU)
- 18th History: launch of the space shuttle Atlantis (STS-34) and Galileo spacecraft to Jupiter (1989)

Astronomical and Historical Events (continued)

18th 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)
18th History: Soviet spacecraft Venera 4 enters the atmosphere of Venus; first probe to analyze the environment (in-situ) of another planet (1967)
18th History: discovery of Asteroid 8 Flora by John Hind (1847)
19th History: flyby of the planet Venus by the Mariner 5 spacecraft (1967)
19th 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)
20th First Quarter Moon
20th Kuiper Belt Object 308379 (2005 RS43) at Opposition (42.210 AU)
20th History: launch of the Soviet spacecraft Zond 8; moon flyby mission (1970)
20th History: discovery of asteroid 577 Rhea by Max Wolf (1905)
21st History: NASA's Mars Atmosphere and Volatile Evolution (MAVEN) spacecraft successfully entered orbit around Mars - first spacecraft dedicated to studying the Martian atmosphere and its connection to the Red Planet's climate (2014)
21st Orionids meteor shower peak (produced by debris from Comet Halley)
21st 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)
22nd History launch of Chandrayaan-1, India's first mission to the Moon (2008)
22nd History: Soviet spacecraft Venera 9 touches down on Venus and transmits first pictures (black and white) of its surface (1975)
22nd History: launch of the Soviet Moon orbiter Luna 12 to take high-resolution photos of the Moon's surface from lunar orbit (1966)
23rd History: India's Mars Orbiter Mission (MOM) entered orbit around Mars (2014)
23rd Neptune Trojan 2001 QR322 at Opposition (29.035 AU)
23rd Kuiper Belt Object 55636 (2002 TX300) at Opposition (41.326 AU)
23rd 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)
24th History: launch of Chang'e-1, Chinese lunar orbiter, from the Xichang Satellite Launch Center in the southwestern province of Sichuan (2007)
24th 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)
24th History: Over 100 people killed in a launch pad explosion when Air Marshal Mitrofan Nedelin, commander of the USSR's Strategic Rocket Forces, orders workers back to the pad to repair a defective R-16 missile without first unloading the unstable fuel (1960)
24th History: discovery of Uranus' moons Umbriel and Ariel by William Lassell (1851)
25th Asteroid 29 Amphitrite at Opposition (8.5 Magnitude)
25th History: launch of the twin Solar Terrestrial Relations Observatories (STEREO A and B); 3-D studies of the Sun and coronal mass ejections (2006)
25th 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)
25th History: discovery of Saturn's moon Iapetus by Giovanni Cassini (1671)
26th Moon at perigee (closest distance to Earth)
26th Venus at its greatest western elongation – apparent separation from the Sun in the morning sky (46°)
27th Full Moon (Full Hunter's Moon)

Astronomical and Historical Events (continued)

27th Kuiper Belt Object 15760 (1992 QB1); first resident of the Kuiper Belt found beyond Pluto, at Opposition (40.251 AU)
27th History: first test flight of the Saturn I rocket (1961)
27th History: Canon City meteorite fall; hit garage (1973)
28th History: first (and last) test flight of the Ares I-X rocket; a two minute powered suborbital flight (2009)
28th Distant flyby of Saturn's moon *Polydeuces*, *Telesto*, *Daphnis*, *Pan* and *Helene* by the Cassini spacecraft
28th Flyby of Saturn's moon *Enceladus* by the Cassini spacecraft
28th Plutino 47171 (1999 TC36) at Opposition (29.571 AU). Three trans-Neptunian objects comprise the system. It is classified as a plutino with a 2:3 mean motion resonance with Neptune
28th Kuiper Belt Object 42301 (2001 UR163) at Opposition (51.280 AU)
28th History: launch of Prospero spacecraft, Great Britain's first space launch (1971)
29th Distant Flyby of Saturn's largest moon *Titan* by the Cassini spacecraft
29th History: launch of the space shuttle Discovery (STS-95) with astronaut and then U.S. Senator, John Glenn (1998)
29th History: flyby of asteroid Gaspra by the Galileo spacecraft on mission to Jupiter (1991)
30th History: discovery of the Los Angeles (Mars) Meteorite (1999)
30th 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)
30th History: Mercury Theatre broadcasts Orson Welles' adaptation of H.G. Wells "War of the Worlds" (1938)
31st Kuiper Belt Object 120348 (2004 TY364) at Opposition (38.244 AU)
31st History: Walter Baade's discovery of the first Centaur Object, 944 Hidalgo (1920)
31st History: birthday of Apollo 11 Command Module pilot Michael Collins (1930)
31st 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 (½°), less than the width of your little finger at arm's length which covers approximately one degree (1°); three fingers span approximately five degrees (5°)

• One astronomical unit (AU) is the distance from the Sun to the Earth or approximately 93 million miles

International Space Station/Space Shuttle/Iridium Satellites

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

Solar Activity

For the latest on what's happening on the Sun and the current forecast for flares and aurora, check out *www.spaceweather.com.*

Image Credits

Front page design and graphic calendars: Allan Ostergren

Cover image: Photo by Marc Polansky, taken with a modified Canon EOS 6D DSLR, with a luminance filter, on the 16" Meade telescope at JJMO. Editing was just minor sharpening, brightness/contrast, color balance, and noise reduction in Photoshop.

Page 3 Image: September 27, 2015 Lunar Eclipse. Southeast quadrant of the Moon, taken less than 2 minutes before completely entering into the Earth's shadow (totality). The turquoise color visible in the image is from light passing through Earth's upper stratosphere where ozone absorbs the red wavelengths, allowing the blue wavelengths of light to pass through and illuminate the lunar surface. Photo by Bill Cloutier

Second Saturday Stars poster: Marc Polansky

Front Page image:

Second Saturday Stars

FREE EVENT

Every Month at the

John J. McCarthy Observatory

Behind the New Milford High School

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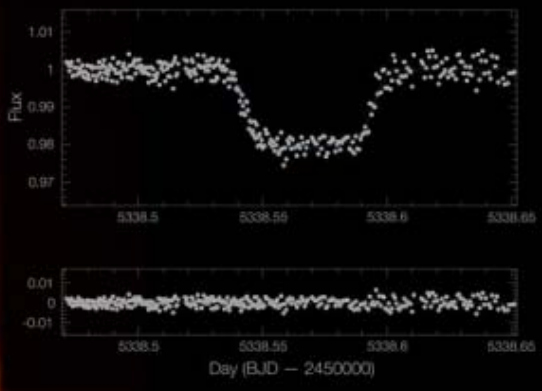
www.mccarthyobservatory.org

October 10th

7:00 - 9:00 pm



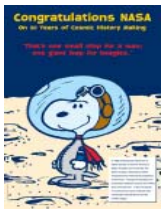
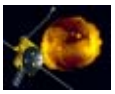
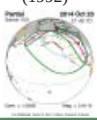
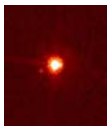
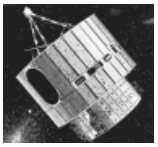
the Search for Exoplanets

Refreshments
Family Entertainment
Handicapped Accessible
ASL Interpretation Available with Prior Notice
Rain or Shine

Map

October 2015

Celestial Calendar

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Phases of the Moon  Sept 4 Sept 12  Sept 20 Sept 27				1  NASA created by the National Aeronautics and Space Act (1958)	2  Hayden Planetarium founded (1935)	3 Launch of Mercury-Atlas 8 with Walter Schirra (1962)   Chassigny meteorite, determined origin of Mars (1815) Zagami Martian meteorite in Katsina Province, Nigeria (1962) 
4  Luna 3; Soviet spacecraft, first to photograph the far side of the Moon (1959) SpaceShipOne, 70 miles up, to win Ansari X Prize (2004)   World Space Week, Oct. 4-10 "The Era of Deep Space Discovery" Launch of first manned Apollo mission (1968) 	5  Robert Goddard born, founding father of modern rocketry (1882)	6  Launch of space shuttle Discovery and solar polar orbiter spacecraft Ulysses (1990) Asteroid 2008 TC3, tracked by McCarthy Observatory, explodes over Sudan (2008) 	7  Launch of Explorer 6, with "paddlewheel satellite," a photocell scanner transmitting a crude picture of the earth's surface and cloud cover (1959))	8  Discovery of Supernova 1604 - Kepler's Nova (1604) Pioneer Venus orbiter concludes mission and begins fiery plunge into Venusian atosphere (1992)   Total Lunar Eclipse, with totality beginning shortly before sunrise on the east coast	9  Draconids meteor shower peak LCROSS impacts Moon's south pole (2009)   Peekskill meteorite hits Chevy Malibu (1992)  Connecticut Star Party Goshen, CT, Oct 9-11	10 Enactment of outerspace treaty (1967)  Inauguration of the Very Large array in New Mexico (1980)  2nd Saturday Stars Open House McCarthy Observatory 
11 Moon at Apogee (farthest from earth)   WAC Corporal, first rocket to escape Earth's atmosphere (1945) 100th space shuttle flight carries Z1 Truss, backbone of the ISS (2000) 	12  First symposium on space travel, held at Hayden Planetarium (1951)  Launch of Voskhod 1, Soviet spacecraft, first to carry multiple cosmonauts (1964)	13  Launch of Explorer 7 spacecraft (1959) Launch of Shenzou 6, China's 2nd manned spacecraft (2005)   British Interplanetary Society founded (1933)	14  Launch of Shenzou 5, China's 1st manned spacecraft (2003) Chuck Yeager breaks sound barrier (1947)   Three main belt asteroids discovered by McCarthy Observatory (2003)	15 Dwarf Planet Eris (formally 2003 UB313 and/or Xena) at Opposition (95.542 AU)   Launch of Cassini spacecraft to planet Saturn (1997)	16  Launch of GOES 1, first weather satellite in geosynchronous orbit (1975)	17  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)
18 Soviet spacecraft Venera 4 probes atmosphere of Venus; (1967) Discovery of Asteroid 8 Flora by John Hind (1847) Discovery of asteroid/comet Chiron in Taurus by Charles Kowal (1977) Launch of space shuttle Atlantis and Galileo spacecraft to Jupiter (1989) 	19 launch of IBEX (Interstellar Boundary Explorer) to explore the edge of solar system (2008) Subrahamanyan Chandrasekar wins Nobel physics prize for study of star evolution (1983) 	20 Discovery of asteroid 577 Rhea by Max Wolf (1905) Launch of Soviet spacecraft Zond 8, Moon flyby mission (1970)	21 Opening of the Yerkes Observatory, Williams Bay, Wisonsin, with world's largest refractor lens (40") (1897) Orionids meteor shower peak	Soviet spacecraft Venera 9 lands on Venus, takes first b/w pictures of Venus' surface(1975) 22 Launch of the Soviet orbiter Luna 12 to take high-resolution photos of the Moon's surface from lunar orbit (1966) Launch of India's first Moon mission Chandrayaan-1 (2008) 	23 Partial Solar Eclipse, visible from eastern United States Pamela Melroy and Peggy Whitson first women to lead two missions at same time (shuttle and space station) (2007)	24 Launch of Deep Space 1 (1998) Launch of Chang'e-1, Chinese lunar orbiter (2007) Discovery of Uranus' moons Umbriel and Ariel by William Lassell (1851)
25 Discovery of Saturn's moon Iapetus by Giovanni Cassini (1671) Launch of twin Solar Terrestrial Relations Observatories (STEREO A&B) for 3-D studies of Sun (2006) Soviet spacecraft Venera 10 touches down on Venus (1975)	Moon at Perigee (closest to earth) 26 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)	27 first test flight of the Saturn I rocket (1961) Cañon City, Colorado meteor hits garage - 1973	28 First test flight of the Ares I-X rocket; a two minute powered suborbital flight (2009) Launch of Prospero, Britain's first space mission (1971)	29 Launch of space shuttle Discovery (STS-95) with astronaut and former senator John Glenn (1998) Flyby of asteroid Gaspra by the Galileo spacecraft on mission to Jupiter (1991)	30 Mercury Theatre War of Worlds broadcast with Orson Welles produces panic(1938) Discovery of the Los Angeles (Mars) Meteorite (1999) Launch of Venera 13, Soviet Venus lander; survived for 127 minutes on the surface where the temperature was recorded at 855 °F (1981) 	31 Apollo 11 Command module pilot Michael Collins born (1930) First rocket engine tests that spawned the Jet Propulsion Laboratory (1936)