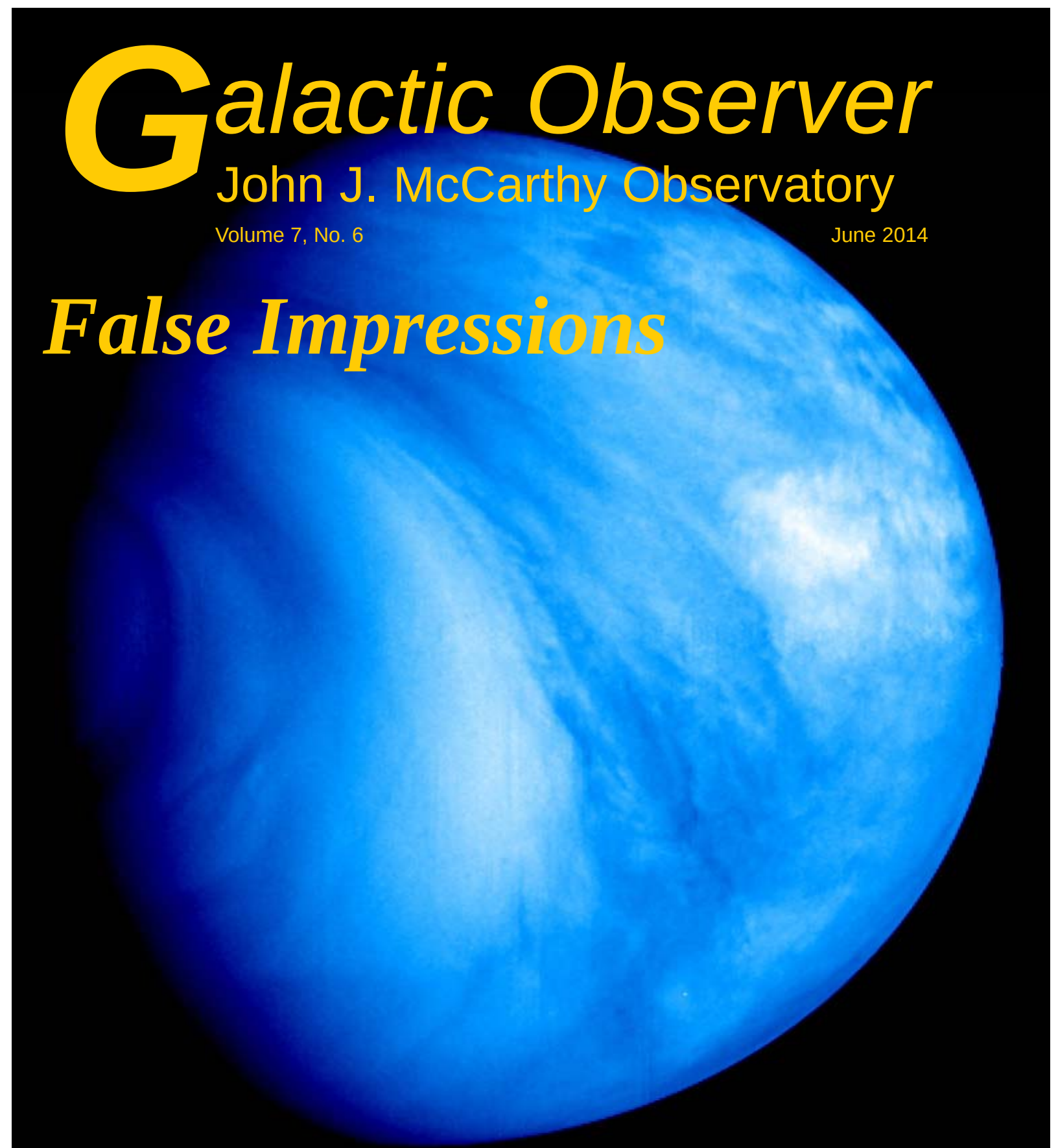
Galactic Observer

John J. McCarthy Observatory

Volume 7, No. 6 June 2014

False Impressions



A false-color image of the southern hemisphere of Venus, taken by the European Space Agency's ESA Venus Express. The blue is not water, which does not exist on the planet's surface, but the atmosphere composed primarily of nitrogen and carbon dioxide and blurred by clouds of sulfuric acid and metallic snow. About 4 billion years ago, the Venusian climate may have supported life, but the erosion of its magnetic field and a runaway greenhouse effect evolved a dark, windswept desert on a surface shielded from the Sun. Strangely, the weird atmosphere which doomed the planet could possibly harbour life within its narrow, temperate regions. *(See more on page 10)*

Credits: ESA Š 2007 MPS/DLR-PF/IDA

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
Elaine Green
Tina Hartzell
Tom Heydenburg
Jim Johnstone
Carly KleinStern
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Roger Moore
Parker Moreland, PhD
Allan Ostergren
Marc Polansky
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Monty Robson
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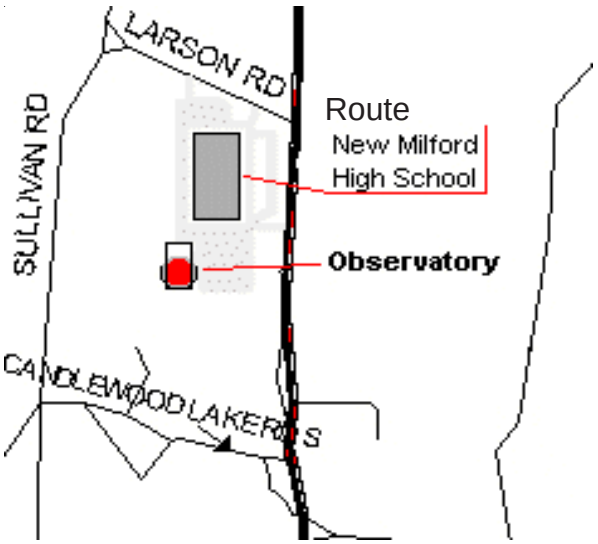
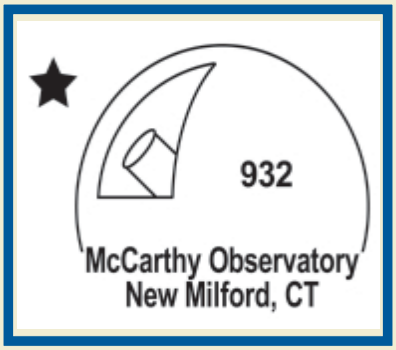
Amy Ziffer



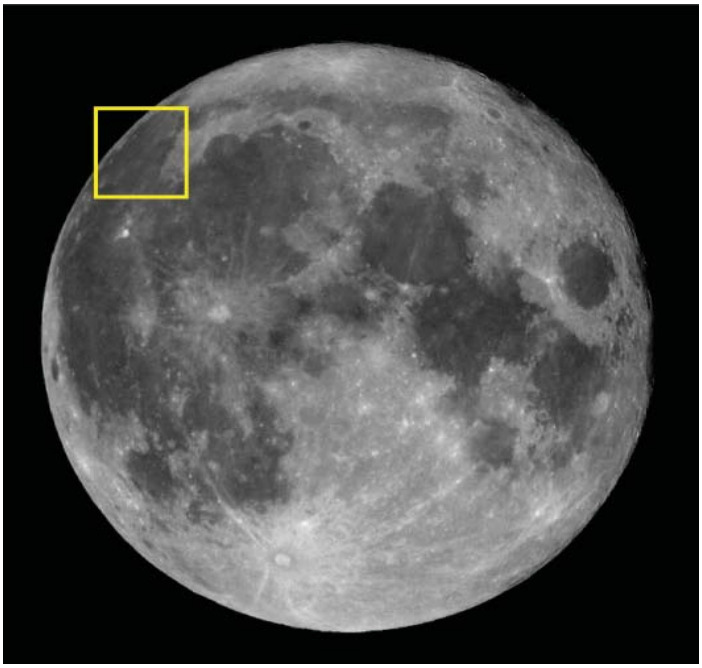
In This Issue



June AstronomyCalendar and Space Exploration Almanac

"Out the Window on Your Left"

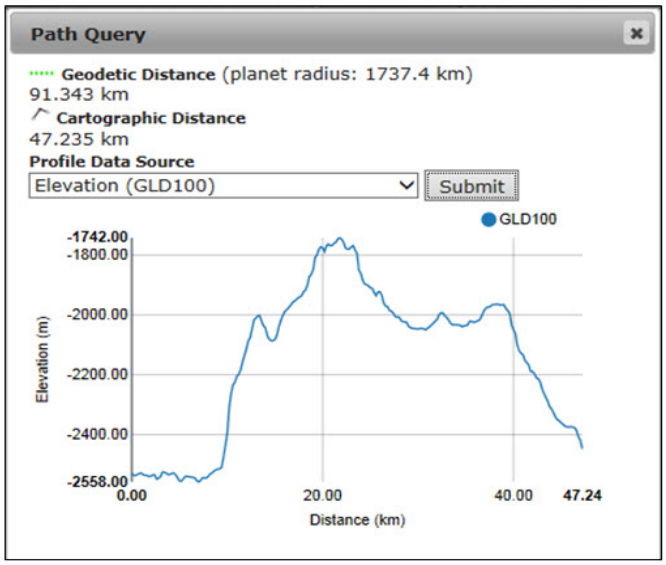
IT'S BEEN OVER 40 YEARS since we left the last footprint on the dusty lunar surface. Sadly, as a nation founded on exploration and the conquest of new frontiers, we appear to have lost our will to lead as a space-faring nation. But, what if the average citizen had the means to visit our only natural satellite; what would they see out the window of their spacecraft as they entered orbit around the Moon? This column may provide some thoughts to ponder when planning your visit (if only in your imagination).



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

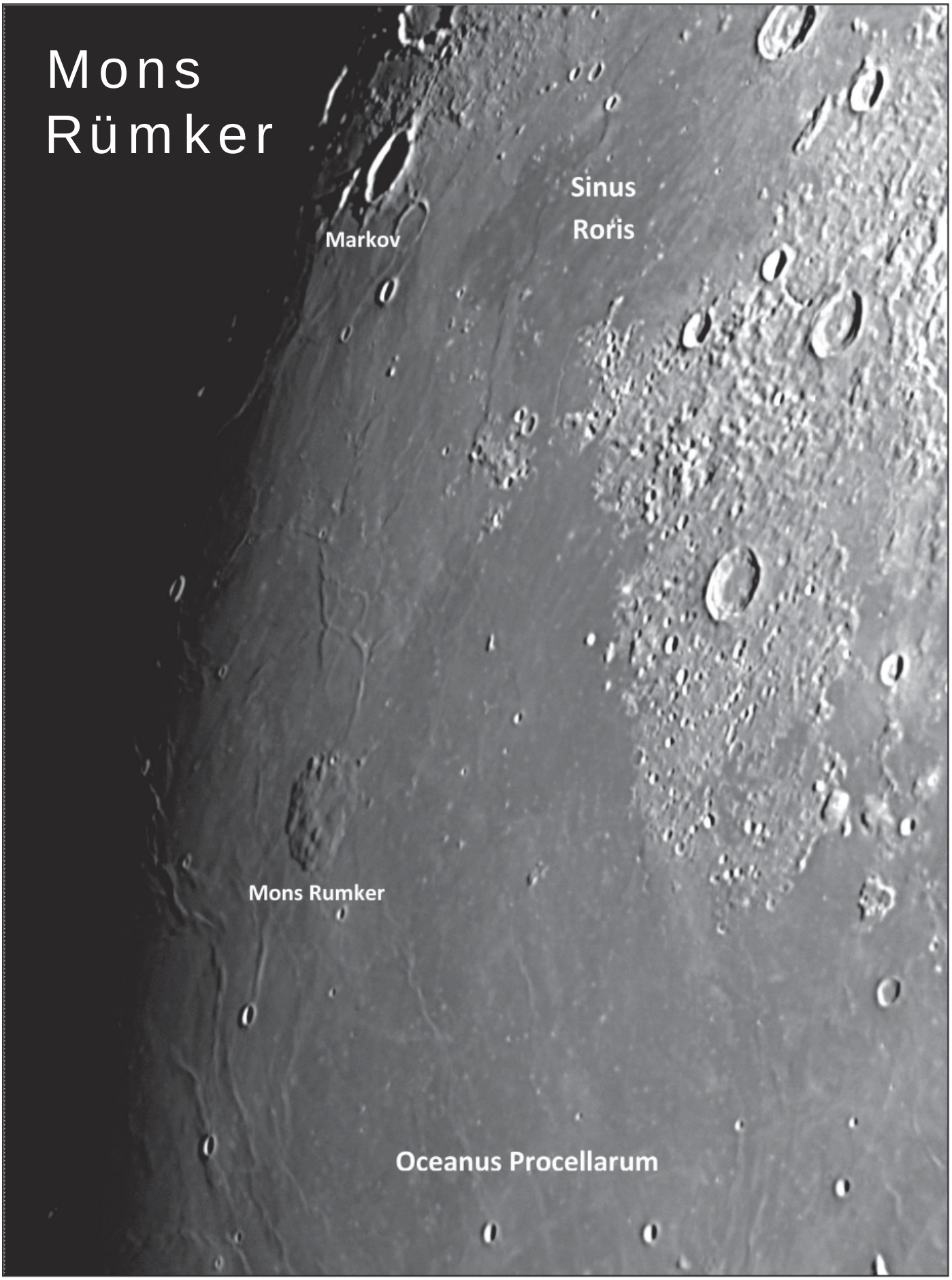
The view this month includes the northwest region of Oceanus Procellarum (Ocean of Storms), a vast expanse of lava flows and a peculiar feature often overlooked by the casual lunar observer due to its low profile. Rising out of the surrounding and younger lava flows is a collection of 30 or more volcanic domes -Mons Rümker. It is the largest known volcanic complex on the Moon with a diameter of approximately 40 miles (65 km). It is best viewed around sunrise, approximately 3 days before the Full Moon.

The Mons Rümker complex may be as old as 3.4 billion years, more than 2 billion years older than the surrounding mare. While its origin remains unclear, the volcanic complex may be related to two other features in the area, the Aristarchus Plateau, with the largest sinuous rille on the Moon, and the Marius Hills, a field of 300 volcanic domes and cones.



The screenshot above shows the elevation profile of a 29 mile (47 km) cross section of Mons Rümker. The total rise in elevation is approximately 2,700 feet (816 meters). The path query tool is available at http://target.lroc.asu.edu/q3/ and relies upon a data base and global photographic mosaic assembled from information collected by the Lunar Reconnaissance Orbiter over the past five years.

LRO image of Rümker domes R3 and R4 from NASA/GSFC/ASU. Image processing by Kurt Fisher (white bar is 3.5 km in length)


Mons
Rümker
Sinus
Roris
Markov
Mons Rumker
Oceanus Procellarum

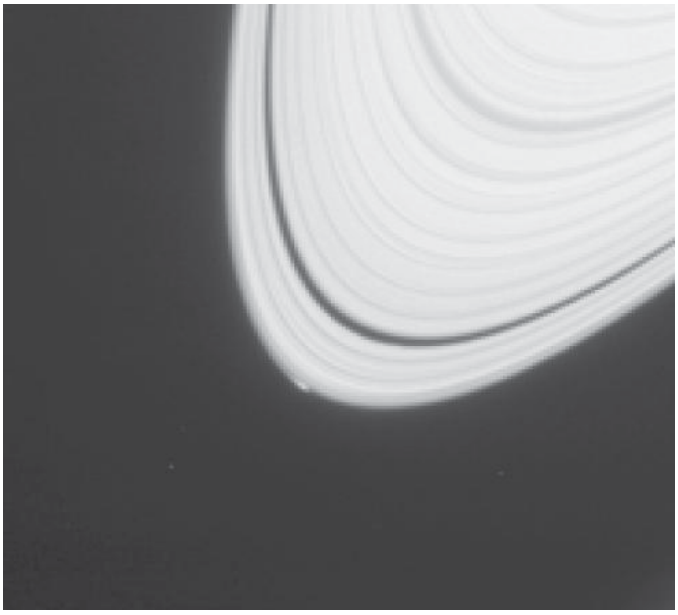
Saturn

While the distance between the Earth and Saturn is increasing, the ringed planet is still well placed for evening observers in June. As shown on the sky map below, Saturn can be found in the constellation Libra, east of Virgo and the planet Mars, and west of Scorpio.

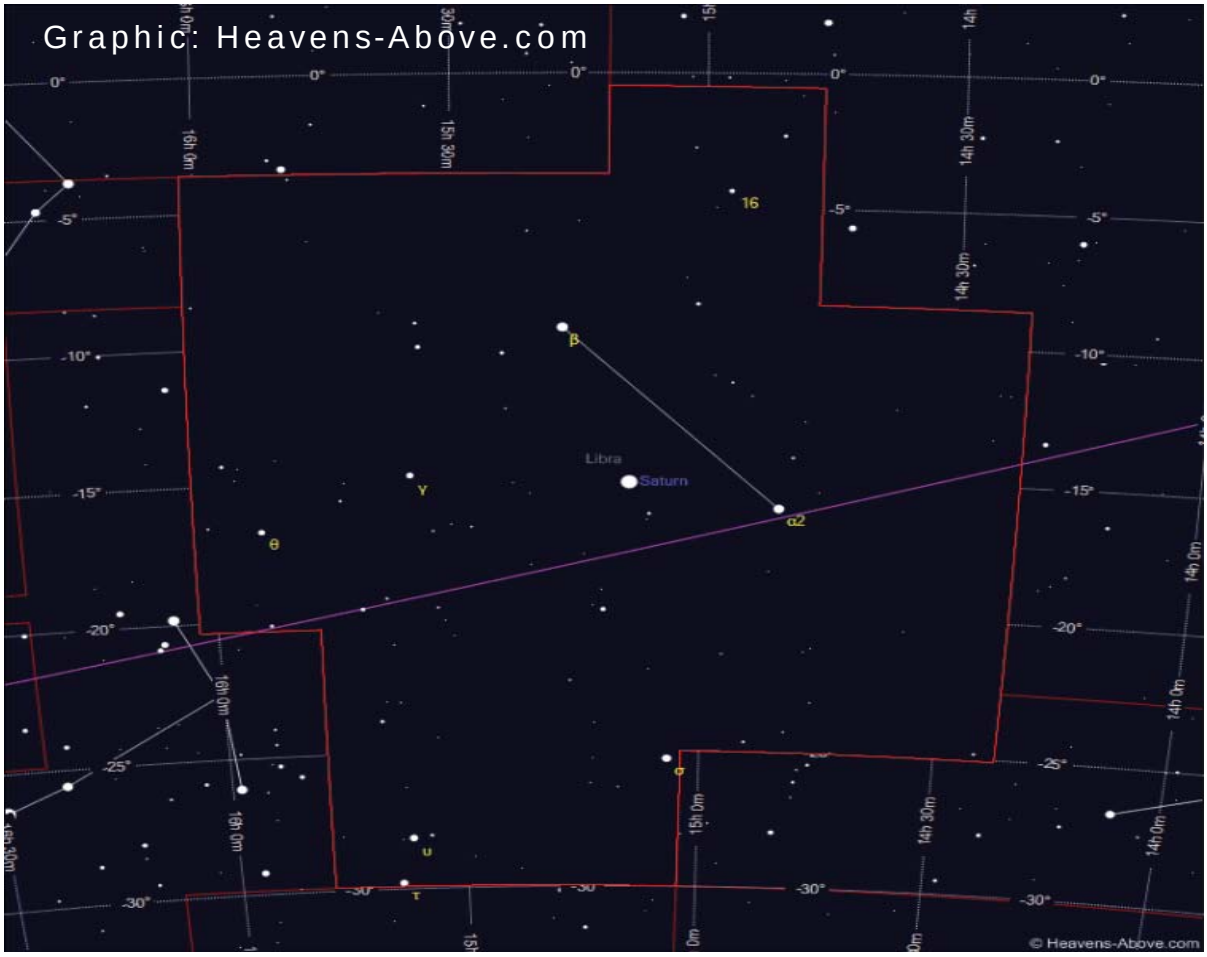
Saturn's north pole is now in sunlight (seasons on Saturn are due to its 27° axial tilt and last seven Earth years). Sunlight has illuminated a large stationary hurricane at the north pole, spinning inside a hexagonal weather pattern. Cassini had previous found a polar vortex at Saturn's south pole.

June 30th marks the 10th anniversary of the arrival of the Cassini spacecraft at the Saturnian system.

Cassini's images of Saturn's ring system in April may have caught the birth of a small moon in progress



on the very edge of Saturn's A ring, the outermost of Saturn's bright rings. While the rings may have contained enough material in the past to produce large moons, this process would have depleted the rings over time. It is unlikely that a new moon would acquire significant mass today and may already be falling apart, to be reabsorbed by the icy swarm.



Celebrate the Summer Solstice at the Observatory

Join us at the John J. McCarthy Observatory on Saturday, June 21st for a rare daytime event. Weather permitting, the Observatory will be celebrating the Summer Solstice from 11:00 am to 2:00 pm.

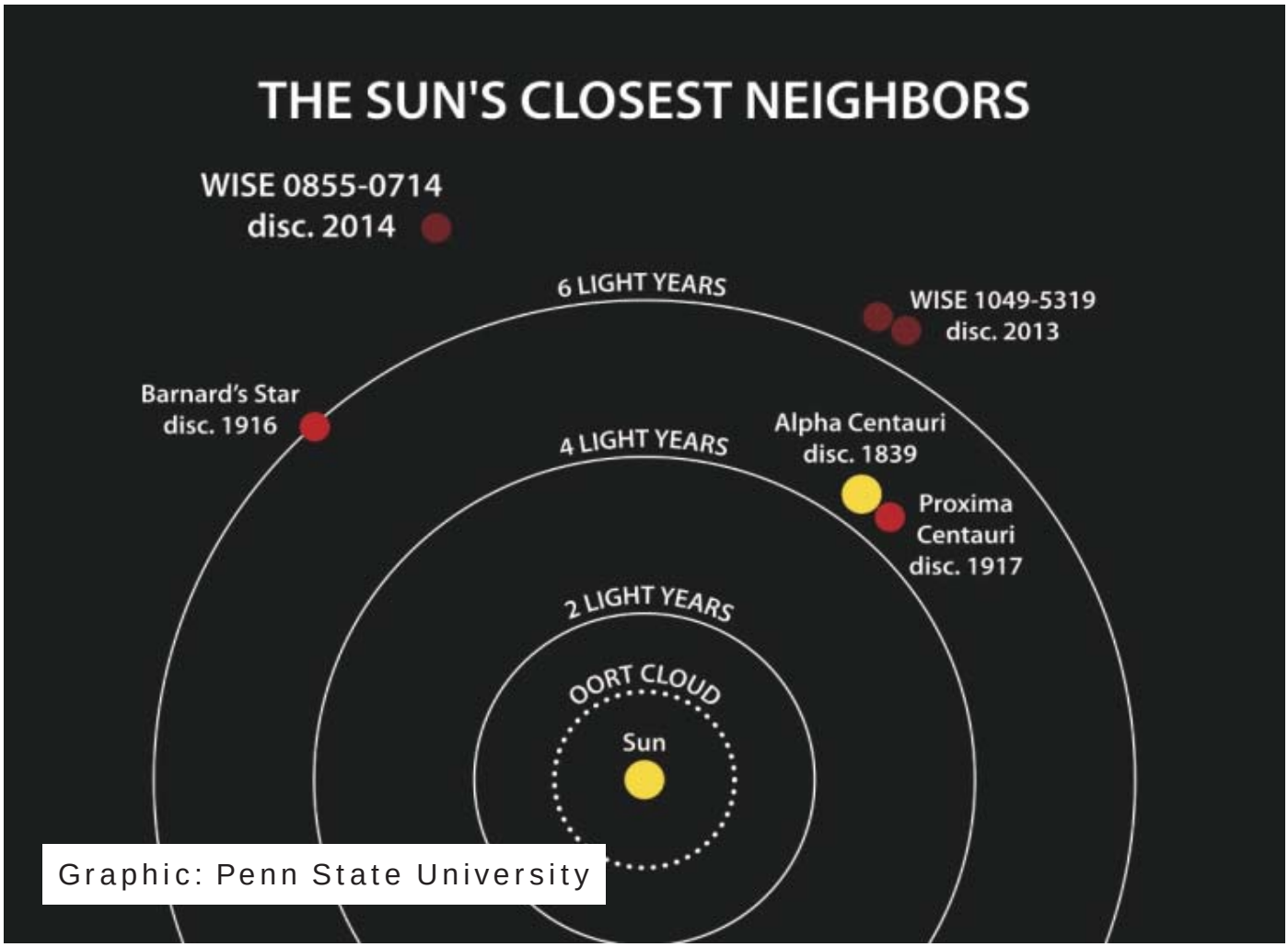
Activities and topics will include tours of the inner (scale model) solar system, safe solar viewing, sunspot observation, an introduction to the analemma, listening to the Sun via a radio telescope, learning about heliotropism (sun-following plants), solar energy demonstrations, space weather, and telling time with a sundial. Classroom presentations will cover a range of topics about our nearest star including its life-giving energy, as well as its destructive power.

Since fair weather is essential for solar viewing, the event will be rescheduled in the case of inclement weather. If you are planning on attending, and the weather is unsettled, please check the Observatory's website for the latest news: www.mccarthyobservatory.org.

The Observatory is conveniently located behind New Milford High School on Route 7.

Failed Stars

When you think of stars, you typically envision blazing, glowing spheres of high temperature plasma. But stars come in all flavors; from small, cool dwarfs to raging supergiants. At the lowest end of the size and temperature scale are "brown dwarfs," objects larger than the largest planet but smaller than the smallest star. Brown dwarfs failed to attain sufficient mass during their formation to sustain the fusion of hydrogen. While they radiate little energy, brown dwarfs may be common and therefore an important contributor to the total mass of the galaxy.



Graphic: Penn State University

The low temperature of these smallest and coolest protostars presents a challenge to astronomers surveying the local cosmic neighborhood. Brown dwarfs can be invisible when viewed by telescopes operating in the visible spectrum and barely distinguishable in the infrared. However, NASA's Wide-field Infrared Survey Explorer (WISE) and the Spitzer Space Telescope have recently found the coldest brown dwarf discovered to date. The newly discovered "failed star" is only 7.2 light years away, less than twice as far as the nearest star system is from the Sun.

WISE J085510.83-071442.5 (WISE 0855–0714) is estimated to be between 3 and 10 times the mass of Jupiter, one of the least massive brown dwarfs. Its temperature has been estimated between minus 54 and 9 degrees Fahrenheit (minus 48 to minus 13 degrees Celsius), colder than a frigid winter night in New England.

Solar System Secrets: Oort Cloud Comets

The graphic in the previous article included a dotted line labeled "Oort Cloud," shown at a distance of approximately one light year from the Sun. The "cloud" represents a vast, spherical reservoir of icy bodies and had been hypothesized as early as 1932 by the Estonian astronomer Ernst Öpik as the source of long-period comets. The idea was re-introduced and refined in 1950 by Dutch astronomer Jan Oort.

While the cloud is postulated to contain upwards of 2 trillion icy bodies, it has not been directly observed due to its great distance from the Sun and the relatively small size of its icy residents. As such, our limited knowledge of the Oort Cloud comes from infrequent visits by icy bodies from this region of space.

Ms. Carly KleinStern (a Senior at New Milford High School) will be presenting the Observatory's Second Saturday Program on June 14th. She will be discussing her work on long-period comets and how the information that we collect on these denizens of deep space have increased our understanding of the formative processes and dynamics of the early solar system.

The composite photo (below) captures the long-period Comet ISON (C/2012 S1) as it traveled through the inner solar system. Imaged by Ms. KleinStern and Mr. Marc Polansky from the McCarthy Observatory, it shows ISON shortly before the comet was destroyed in a close encounter with the Sun. The orbital parameters calculated for ISON by Ms. KleinStern were virtually indistinguishable from those published by the Jet Propulsion Laboratory and Minor Planet Center – a most remarkable accomplishment.

Portrait in Red and Green

Scientists routinely bounce lasers off the reflectors left behind on the Moon by the Apollo astronauts and those mounted on the Soviet lunar rovers to measure the distance from the Earth to the Moon. Precision measurements are used to test Einstein's theory of General Relativity and to measure the ever-increasing distance to the Moon.

In the past 35 years, return signals have faded. While accumulating dust is suspected, the process by which the dust is "kicked up" around the reflectors is not fully understood since there is no wind on the Moon. If dust is the culprit, the idea of locating a large telescope on the far side might have to be reconsidered or at least redesigned.

A more curious observation was the precipitous drop in the return signal on full moon nights. Coincidently, due to the location of the prisms that comprise the reflectors (deep inside cylinders), the prisms would only be exposed to direct sunlight on full moon nights. This led scientists to suspect that localized heating by the Sun was altering the refractive properties of the prisms causing the photos to scatter rather than being returned.

To test their theory, scientists at the Apache Point Observatory in southern New Mexico conducted an experiment on the night of December 21, 2010 and a total lunar eclipse. The Sun's heat would be effectively "turned off" during that time that the Moon traversed the Earth's shadow, allowing the prisms to cool. Lasers were directed to three different Apollo reflectors and a fourth mounted on a Soviet rover as they entered and reemerged from the shadow. As predicted, the return signal increased (by a factor of ten) once the reflector was in the Earth's shadow, at a signal level comparable to non-full-moon nights.

A green laser beam from the Apache Point Observatory targets the reflector at the Apollo 15 landing site during the April 15th total lunar eclipse. Photo credit: Dan Long (Apache Point Observatory

Venus - Stranger Than We Can Imagine

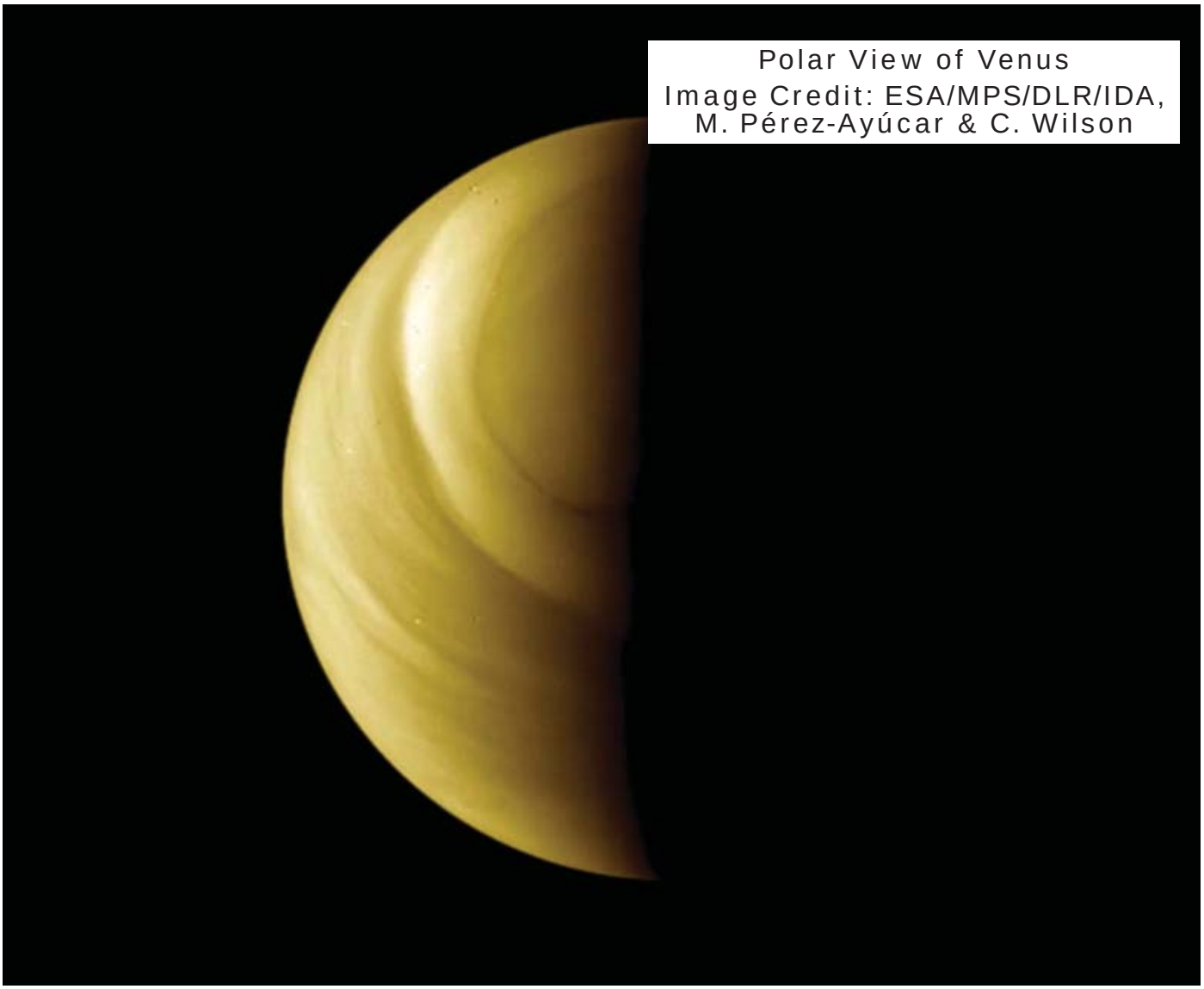
THE EUROPEAN SPACE AGENCY'S (ESA) spacecraft Venus Express entered orbit around Venus in April 2006. Eight years later and running low on fuel, scientists are planning the spacecraft's final act.

Venus Express' observations have revealed a very peculiar greenhouse world with a tantalizing past. Its surface is hotter than an oven, with a thick, choking acid atmosphere that has lost an ocean of water over its history. Winds have intensified in the past eight years and the length of day has increased. Active volcanoes churn the surface, while a region of the upper atmosphere is cold enough for carbon dioxide snow.

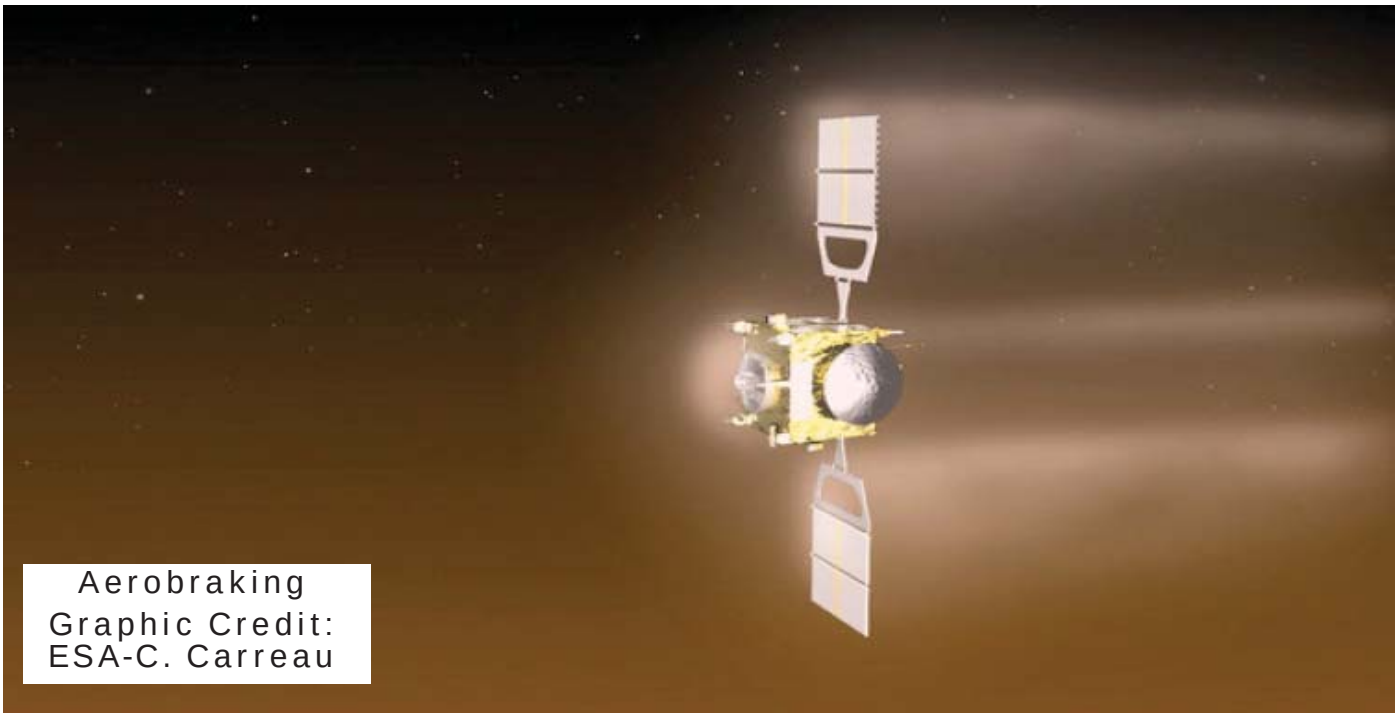

Source: ESA

Once considered Earth's twin, something went terribly wrong on the planet's evolutionary track, a path the Earth can't afford to follow.

Tops on the enigma list are the increasing winds and lengthening day. When the Venus Express arrived in 2006, winds near the equator were measured at an average speed of 186 miles per hour (300 km/hour). Eight years later the winds in that same region are howling at 250 miles per hour (400 km/hour). Conversely, the planet's rotation appears to be slowing, based upon the displacement of features observed by NASA's Magellan orbiter 16 years earlier. While the Earth is slowing down due to tidal forces (approximately 1.4 milliseconds per day per century), Venus has apparently slowed a whopping ***6½ minutes*** in less than two decades.



Polar View of Venus
Image Credit: ESA/MPS/DLR/IDA,
M. Pérez-Ayúcar & C. Wilson

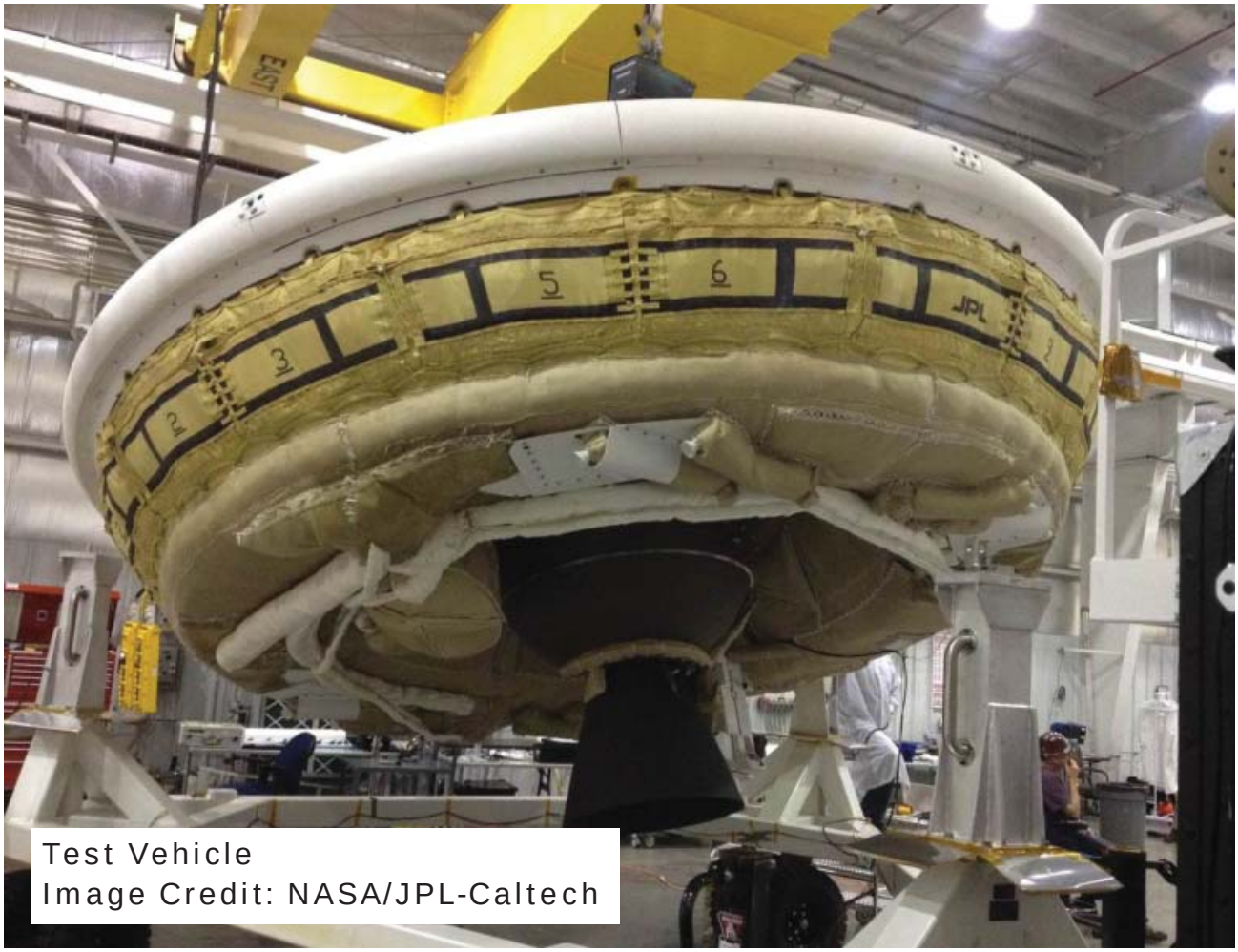


Aerobraking
Graphic Credit:
ESA-C. Carreau

Starting in June, ESA plans to modify the spacecraft's elliptical orbit to plunge deep into the atmosphere. If successful (the spacecraft survives) the deep dives will be used to test aerobraking techniques as well as gather scientific data about typically inaccessible regions of the atmosphere.

Pushing the Envelope

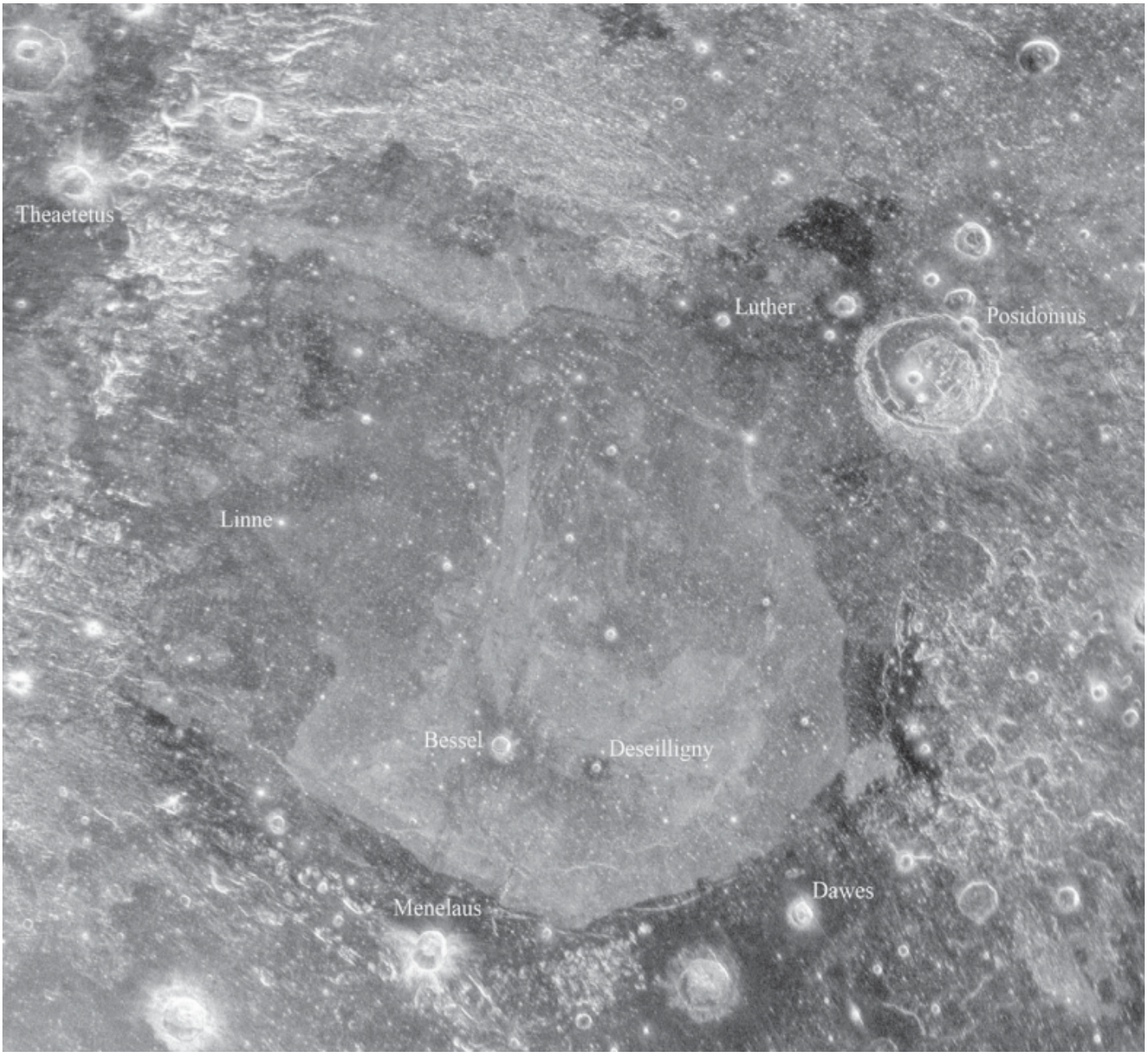
Striving to find new ways of delivering ever larger payloads onto the Martian surface, NASA is testing two new technologies in a June experimental flight. The rocket powered, saucer-shaped vehicle will climb to an altitude of 180,000 feet (to simulate the rare air conditions of the Martian atmosphere). Dropping quickly, the vehicle will deploy an inflatable Kevlar tube around itself, called the Supersonic Inflatable Aerodynamic Decelerator. The inflatable tube is designed to increase the spacecraft's drag, slowing the spacecraft down and saving fuel. After the tube is inflated, the spacecraft will deploy a massive parachute called the Supersonic Disk Sail Parachute. If successful, these technologies may offer the means of delivering the equipment, supplies and crews for extended exploration of the Red Planet.



Test Vehicle
Image Credit: NASA/JPL-Caltech

Penetrating View

Radar Image of Mare Serenitatis

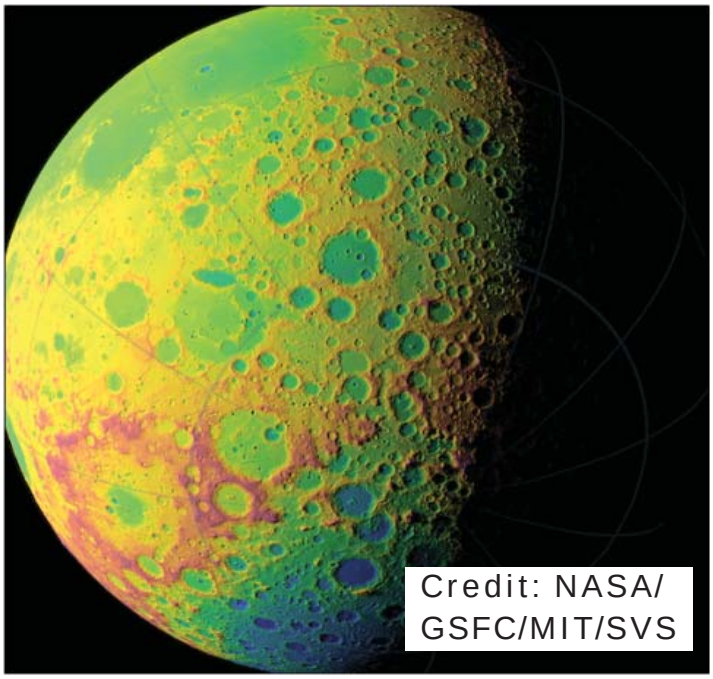


This unusual view of the Mare Serenitatis (Sea of Serenity) was captured by two radio telescopes, the 1,000 foot (305 m) Arecibo telescope in Puerto Rico and the 328 foot (100 m) Green Bank telescope in West Virginia. Unlike optical telescopes, this image reveals a view 33 to 50 feet (10 to 15 m) below the surface. Pulses of radio waves were sent from Arecibo, where they hit the surface and penetrated it, before bouncing back to be collected by the Green Bank antennae. Image Credit: Bruce Campbell (Smithsonian Institution, National Air and Space Museum); Arecibo/NAIC; NRAO/AUI/NSF

Lunar Reconnaissance Orbiter

On the evening of June 18, 2009, an Atlas V 401 rocket lifted off from Cape Canaveral carrying NASA's Lunar Reconnaissance Orbiter (LRO). In the five years since entering polar orbit, the spacecraft has been mapping the Moon from as close as 14 miles (22 km) above the lunar surface.

Although the images from the spacecraft's wide and narrow field cameras provide dramatic vistas of the lunar landscape, a compact instrument package weighing just 21 pounds, and bouncing a laser pulse



off the Moon's surface, is revolutionizing the way we see the Moon. The Lunar Orbiter Laser Altimeter (LOLA) is constructing topographical maps of the rugged visible surface as well as those areas hidden by perpetual shadow. The data gathered by the altimeter is providing an unprecedented depiction of the lunar landscape - information invaluable in assessing future landing sites, identifying means of access to resources (for example, polar ice), and for general lunar navigation and exploration.

The topographic map of the moon's southern hemisphere is presented in false colors to indicate elevation, with blue representing the lowest elevations and red the highest. This particular image shows one of the largest impact basins in the solar system, the South Pole-Aitken, at the lower left of the globe (in deep blue). The western limb shows features on the far side while the terminator (day/night dividing line) shows the southern highlands on the near side.

Summer Solstice

On the morning of June 21st the Sun will rise over a prehistoric structure on the Salisbury Plain in southern England as it has for the last 4,000 years. For those individuals standing within the 100 foot diameter circle of 30 sandstone or sarsen-stones (weighing up to 50 tons each), the Sun will appear over a large naturally shaped stone (Heel Stone) located outside and to the northeast of the circle. The alignment signals the start of the longest day, midsummer, or the summer solstice.

The photo (below) shows the current state of the stone circle. Many of the original stones are missing or damaged. Over time, they were taken to build houses and roads, chipped away by visitors and taken as souvenirs. What remains represents the last in a progressive sequence of monuments erected at the site between 3,000 and 1,600 B.C. The Heel Stone (photo previous page) is adjacent to the access road to the site. The ancient people who constructed this monument left no written record of their accomplishments or the intended use of the stone circle. Its purpose has been widely debated and many groups have attempted to claim

ownership. However, archeologists have clearly shown that the construction of Stonehenge predates the appearance of most modern cultures in Britain.

In the 1960s, Gerald Hawkins, an astronomer at the Smithsonian Astrophysical Observatory, found that each significant stone aligns with at least one other to point to an extreme position of the sun or moon ("Stonehenge Decoded," Doubleday & Company). That Stonehenge is an astronomical observatory or celestial calendar is intriguing, as the precision and architectural refinement by which it was constructed certainly suggests a significant purpose for this megalithic monument.

June History

Women in Space

On June 16, 1963, Valentina Tereshkova became the first woman in space. Shortly after Yuri Gagarin's flight, the Soviets began a search for suitable female candidates for spaceflight. With few female pilots, the majority of the candidates were women parachutists (Valentina had joined an amateur parachuting club at the age of 18). Control of the Vostok spacecraft was completely automatic, so piloting experience was not required. However, since the Vostok was not designed to return its occupant safely to Earth, the cosmonaut was required to eject from the spacecraft after re-entry and parachute to the landing site.

The selection of Valentina Tereshkova for the flight was made by Premier Khrushchev. In addition to experience and fitness, qualifications included being an ideal Soviet citizen and model Communist Party member. On June 16th, Valentina rode Vostok 6 into orbit with the call sign "Chaika" (Seagull). The mission was not without incident and included space-sickness, leg cramps and other discomforts from being strapped into the capsule for three days. More importantly, the capsule ended up in the wrong orientation and, had it not been corrected, would not have allowed her to return to Earth.

Valentina's three days in space was more flight time than all the American astronauts combined (at that time). After fulfilling her duties to her country, Tereshkova retired to a small house on the outskirts of Star City. The house was topped with a seagull weathervane, the call sign of her flight.

Twenty years later on June 18th, Sally Ride became the first American woman in space. Launched aboard the space shuttle Challenger, Sally served as the mission specialist on the five person crew.

An Extraordinary Feat

If you have ever seen a Gemini space capsule (there is one on display at the Air and Space Museum in Washington, D.C.) it is difficult to comprehend how two people could have spent any length of time inside its cramped interior (Frank Borman and Jim Lovell spent 14 days orbiting the Earth in Gemini 7). The reentry module, where the two astronauts sat, is approximately 11 feet long with a maximum diameter of 7½ feet and filled with instrumentation and controls.

James A. McDivitt (foreground) and Edward H. White II inside their Gemini-4 spacecraft

On June 3, 1965, Gemini 4 lifted off on a four day mission. The highlight of the mission was to be a spacewalk by Ed White. NASA was very concerned with "putting guys in vacuums with nothing between them but that little old lady from Worcester, Massachusetts [the seamstress at the David Clark Company], and her glue pot and that suit." However, the Soviets had challenged the United States with a spacewalk by Cosmonaut Alexei Leonov in March during a Voskhod II mission, and the United States did not want to appear to be falling behind its adversary.

After struggling with a faulty hatch, Ed White finally exited the spacecraft as it passed over the Pacific Ocean. Using a gun powered by compressed oxygen, he was able to maneuver

outside the capsule, just avoiding the flaming thrusters of the Gemini capsule. After a 23 minute spacewalk, Jim McDivitt struggled to get the six foot tall Ed White back inside the capsule and close the balky door.

Unfortunately, after making history as the first American to walk in space, Ed White died during a test of the Apollo 1 spacecraft when the pure oxygen atmosphere exploded, killing all three astronauts.

Sunrise and Sunset

Sun	Sunrise	Sunset
June 1st (EDT)	05:22	20:21
June 15th	05:19	20:30
June 30th	05:23	20:32

Summer Nights

For the more adventurous and sleep deprived individuals, the summer sky sparkles as twilight deepens and the summer Milky Way rises. The Milky Way is heralded by the three stars of the summer triangle Vega, Deneb and Altair. Appearing like a gossamer stream of stars, it flows across the night sky, emptying into the constellation Sagittarius. In our light-polluted skies, it may be easier to see on nights when the Moon is absent (in the weeks preceding and following the New Moon on the 8th).

High in the June sky is the constellation Hercules. Shaped like a keystone or trapezoid, Hercules is home to one of the finest globular star clusters in the northern hemisphere. The Great Hercules Cluster (M13) is a collection of several hundred thousand suns located near the galactic core of the Milky Way Galaxy at a distance of approximately 25,000 light years. Hercules rises in the evening after the constellation Boötes with its bright star Arcturus and before the constellation Lyra with its bright star Vega. The cluster can be found on the side of the keystone asterism facing Boötes.

Astronomical and Historical Events

1st Asteroid 15 Eunomia at Opposition (9.5 Magnitude)
1st History: launch of the ROSAT (Röntgen) X-ray observatory; cooperative program between Germany, the United States, and United Kingdom; among its many discoveries was the detection of X-ray emissions from Comet Hyakutake (1990)
2nd History: launch of the Mars Express spacecraft and ill-fated Beagle 2 lander (2003)
2nd History: launch of the Space Shuttle Discovery (STS-91); ninth and final Mir docking (1998)
2nd History: launch of Soviet Venus orbiter Venera 15; side-looking radar provided high resolution mapping of surface in tandem with Venera 16 (1983)
2nd History: discovery of Comet Donati by Italian astronomer Giovanni Battista Donati; brightest comet of the 19th century and first comet to be photographed (1858)
3rd Moon at apogee (furthest distance from Earth)
3rd History: launch of Gemini 4; Ed White becomes first American to walk in space (1965)
3rd History: launch of Gemini 9 with astronauts Thomas Stafford and Eugene Cernan (1966)
3rd Trans-Neptunian Object and potential dwarf planet *2010 KZ39* at Opposition (45.222 AU)
3rd History: dedication of the 200-inch Hale Telescope at Palomar Mountain (1948)
4th History: maiden flight of Space X's Falcon 9 rocket; launched from Cape Canaveral, Florida (2010)
5th First Quarter Moon
6th Trans-Neptunian Object 174567 Varda at Opposition (46.262 AU)
6th History: launch of Soviet Venus orbiter Venera 16; side-looking radar provided high resolution mapping of surface in tandem with Venera 15 (1983)
8th History: New Horizons spacecraft, on its way to Pluto, crosses the orbit of Saturn (2008)
8th History: launch of Soviet Venus orbiter/lander Venera 9; transmitted the first black and white images of the surface of Venus (1975)
8th History: Giovanni Cassini born, observer of Mars, Jupiter and Saturn (1625)
9th History: dedication of the Kathleen Fischer Sundial at the McCarthy Observatory (2012)
10th History: launch of Mars Exploration Rover A (Spirit) in 2003
10th History: launch of Explorer 49, Moon orbiter and radio astronomy explorer (1973)
11th History: flyby of Venus by Soviet spacecraft Vega 1 on its way to Comet Halley; dropped off lander and a balloon to study middle cloud layers (1985)
12th Kuiper Belt Object and Plutino *28978 Ixion* at Opposition (39.414 AU)
12th History: launch of Venera 4, Soviet Venus lander; first to enter atmosphere of another planet (1967)

Astronomical and Historical Events (continued)

13rd Full Moon (Strawberry Moon)
13th History: return of the sample capsule from the Hayabusa (MUSES-C) spacecraft (2010)
14th **Second Saturday Stars/Open House at the McCarthy Observatory 8:00 to 10:00 pm**
14th Moon at perigee (closest distance from Earth)
14th History: launch of Mariner 5; Venus flyby mission (1967)
14th History: launch of Venera 10; Soviet Venus orbiter/lander (1975)
15th History: flyby of Venus by Soviet spacecraft Vega 2 on its way to Comet Halley; dropped off lander and a balloon to study middle cloud layers (1985)
16th History: Liu Yang becomes the first Chinese woman in space aboard a Shenzhou-9 spacecraft, joining two other crew members on a thirteen day mission to the orbiting Tiangong 1 laboratory module (2012)
16th History: Valentina Tereshkova; first woman in space aboard Soviet Vostok 6 (1963)
17th Kuiper Belt Object 50000 *Quaoar* at Opposition (42.013 AU)
17th History: discovery of the Dhofar 378 Mars Meteorite (2000)
18th Flyby of Saturn's largest moon *Titan* by the Cassini spacecraft
18th History: launch of the Lunar Reconnaissance Orbiter (LRO) and Lunar CRater Observation and Sensing Satellite (LCROSS) to the Moon (2009)
18th History: Sally Ride becomes the first American woman in space aboard the Space Shuttle Challenger (1983)
19th Last Quarter Moon
19th History: flyby of Earth by the ill-fated Nozomi spacecraft on it way to Mars (2003)
20th History: discovery of Nova 1670 in Vulpeculae (1670)
21st Summer Solstice at 10:51 UT (6:51 am EDT)
21st **Summer Solstice Celebration at the McCarthy Observatory**
22nd History: launch of Soviet space station Salyut 5 (1976)
22nd History: founding of the Royal Greenwich Observatory (1675)
22nd History: discovery of Pluto's largest moon *Charon* by Jim Christy (1978)
24th Asteroid 29 Amphitrite at Opposition (9.5 Magnitude)
24th History: launch of the Salyut 3 Soviet space station (1974)
24th History: Fred Hoyle born; British astronomer and proponent of nucleosynthesis (1915)
24th History: Sir William Huggins makes first photographic spectrum of a comet (1881)
25th History: Rupert Wildt born, German-American astronomer and first to hypothesize that the CO_2 in the Venusian atmosphere was responsible for the trapped heat (1905)
25th History: Hermann Oberth born, father of modern rocketry and space travel (1894)
26th History: Charles Messier born, famed comet hunter (1730)
27th New Moon
27th History: discovery of the Mars meteorite SAU 060, a small 42.28 g partially crusted grey-greenish stone found near Sayh al Uhaymir in Oman (2001)
27th History: flyby of the asteroid *Mathilde* by the NEAR spacecraft (1997)
27th History: launch of SEASAT, the first Earth-orbiting satellite designed for remote sensing of the Earth's oceans (1978)
27th History: Alexis Bouvard born, French astronomer, director of Paris Observatory, postulated existence of eighth planet from discrepancies in his astronomical tables for Saturn and Uranus. Neptune was subsequently discovered by John Couch Adams and Urbain Le Verrier after his death where he had predicted (1767)
28th Kuiper Belt Object 307261 (2002 MS_4) at Opposition; a Trans-Neptunian object discovered in 2002 by Chad Trujillo and Michael E. Brown (45.956 AU)
28th History: Nakhla meteorite fall in Egypt (Mars meteorite), a piece of which was claimed to have vaporized a dog; first direct evidence of aqueous processes on Mars; (1911)
29th History: George Ellery Hale born, founding father of the Mt. Wilson Observatory (1868)
30th Asteroid *39 Laetitia* at Opposition (9.8 Magnitude)
30th History: death of 3 cosmonauts in Soyuz 11 when capsule depressurizes on reentry – capsule was too cramped for cosmonauts to wear spacesuits (1971)
30th History: Tunguska Explosion Event (1908)

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 calendar: Allan Ostergren
For more information on Venus Express, go to *http://www.esa.int/Our_Activities/Space_Science/Venus_Express.*

Page 3: P The sundial is located at the center of McKeldin Mall on the campus of the University of Maryland. Raised hour markers are positioned along the perimeter of a 25 foot diameter concrete disk. A bronze gnomon, casting the shadow, stands 6½ feet high at its tip. Markers for date throughout the year are located on a northern extension of the base. The sundial honors Dutch astronomer Uco van Wijk, a founder of the university's astronomy program.

Photo: Bill Cloutier

Second Saturday Stars poster: Sean Ross, Ross Designs

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

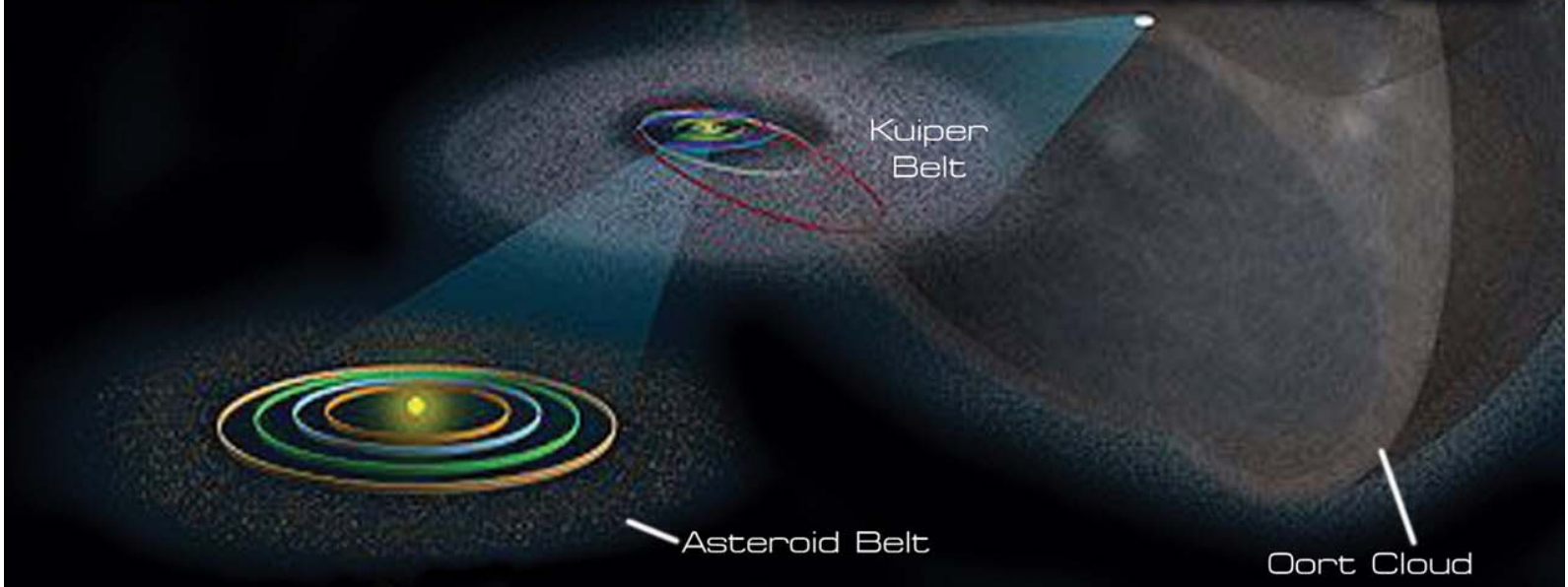
Second Saturday Stars

FREE EVENT

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

June 14th
8:00 - 10:00 pm

SOLAR SYSTEM SECRETS



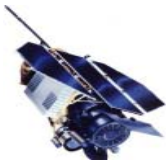
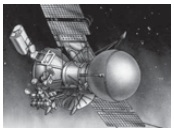
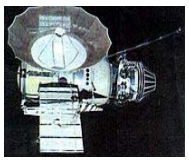
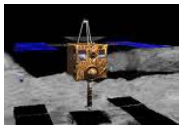
OORT CLOUD COMETS

Map

art & design · sean ross · rossgrafix13@yahoo.com

June 2014

Celestial Calendar

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1  Launch of ROSAT (Röntgen) X-ray observatory (1990)	**2** Full Moon at Apogee (farthest from earth)  Launch of Soviet Venus Orbiter, Venera 15 to map surface of Venus, in tandem with Venera 16 (1983)   Launch of Mars Express spacecraft and ill-fated Beagle 2 lander. (2003)	**3** 200-inch Hale Telescope dedication (1948)   Gemini 9 launch, Thomas Stafford, Eugene Cernan. (1966) Launch of Gemini 4; Ed White 1st American to walk in space (1965) 	**4**  Maiden flight of Space X Falcon 9 rocket (2010)	**5**  Scheduled launch of the European Space Agency's fourth cargo-carrying Automated Transfer Vehicle (named Albert Einstein) aboard an Ariane 5 ES rocket from Kourou, French Guiana to the International Space Station	**6**  Venera 16 - last of Soviet Venus orbiter/ lander missions to map Venusian landscape (1983)	**7**  “Three flames ate the sun, and big stars were seen.” - etching on Chinese oracle bones indicating ancient solar eclipse, with three coronal streamers and stars visible in the darkened sky. (1302 BC)
8  Giovanni Cassini born, observer of Mars, Jupiter and Saturn (1625)  Launch of Venera 9, - 1st black/white images of surface of Venus (1975)	**9** Dedicationof the Kathleen Fischer Sundial at the McCarthy Observatory (2012)  Johann Gottfried Galle, German astronomer, born - first to view planet Neptune, using calculations of Urbain Le Verrier 1846. (1812) 	**10**  Launch of Explorer 49 - moon orbiter and radio astronomy explorer (1973) Launch of Mars Exploration Rover A Spirit (2003) 	**11**  Flyby of Venus by Soviet spacecraft Vega 1 on its way to Comet Halley - dropped off lander and a balloon to study middle cloud layers (1985)	**12**  Launch of Venera 4, Soviet Venus lander, first to enter orbit of another planet (1967)	**13**  Return of sample capsule from the Hayabusa (MUSES-C) spacecraft, taken from near-Earth asteroid Itokawa (2010)	**14**  Moon at Perigee (closest to earth)  Launch of Mariner 5, Venus flyby mission (1967) Launch of Venera 10, Soviet Venus orbiter/ lander (1975)  2nd Saturday Stars Open House McCarthy Observatory
15  flyby of Venus by Soviet spacecraft Vega 2 on its way to Comet Halley; dropped off lander and a balloon to study middle cloud layers (1985)	**16**  Liu Yang becomes the first Chinese woman in space (2012) Valentina Tereshkova, 1st woman in space (1963) 	**17**  Discovery of the Dhofar 378 Mars meteorite (2000)	**18**  Sally Ride, 1st U.S. woman in space (1983) Launch of Lunar Reconnais-sance Orbiter and LCROSS satellite to Moon (2009) 	**19**  Flyby of Earth by the ill-fated Nozomi spacecraft on its way to Mars (2003)	**20**  Discovery of Nova 1670 in Vulpeculae by Pere Dom Voiture Anthelme, a Carthusian monk in Dijon, France (1670)	**21** Summer Solstice 05:04 UT (1:04 AM EDT)   Yáng Lìwei, a Chinese major general, military pilot and a CNSA astronaut; was first man sent into space by the Chinese space program and his mission, Shenzhou 5, made China the third country to independently send people into space (1965)
22  Royal Greenwich Observatory founded (1675) Discovery of Pluto's largest moon Charon by Jim Christy (1978)   Launch of Soviet space station Salyut 5 (1976)	**23**  Full strawberry Moon at perigee (closest to earth and largest of year)  Martin John Rees born, British cosmologist and astrophysicist, has contributed to knowlege of the cosmic background radiation, galaxy clustering and formation, and on the final disproof of Steady State theory. (1942)	**24** Fred Hoyle born, British astronomer and proponent of nucleosynthesis (1915)   Sir William Huggins makes 1st photographic spectrum of a comet (1881)	**25** Rupert Wildt born, German astronomer (1905) Hermann Oberth born, father of modern rocketry and space travel (1894)	**26** Charles Messier born, famed comet hunter (1730) German astronomer Walter Baade discovers near-earth asteroid 1566 Icarus inside orbit of Mercury, which became the subject of asteroid-busting "project Icarus." (1949) 	**27** Alexis Bouvard born,postulated existence of 8th planet, later identified as Neptune (1767) launch of SEASAT 1, first Earth-orbiting satellite designed for remote sensing of oceans (1978) Flyby of the asteroid Mathilde by the NEAR spacecraft (1997) 	**28** Nakhla meteor fall in Egypt - A piece of Mars object fabled to have hit dog (1911)
29 George Ellery Hale born, founding father of Mt. Wilson Observatory (1868) Shuttle Atlantis docks with Russian space station Mir to form the largest man-made satellite ever to orbit the Earth - the second time ships from two countries had linked up in space (1995). 	**30** Death of 3 cosmonauts in Soyuz 11 when capsule depressurizes in reentry (1971) Tunguska explosion event (1908) 					

Phases of the Moon

June 5 — June 13 — June 19 — June 27