Galactic Observer

John J. McCarthy Observatory

Volume 5, No. 11 November 2012

Fading Embers

The Veil Nebula forms the silken remnants of a supernova in the constellation Cygnus that exploded 5-8000 years ago, and has since expanded to 6 times the diameter of our Moon in the night sky. First documented in 1784 by the astronomer William Herschel, the superheated cloud of gas and dust has become so dispersed that only scattered filaments remain along its periphery - identified under separate entries in the catalogue of deep space objects.

The image here is of the Eastern Veil (NGC 6992), taken by Marc Polansky at JJMO. At bottom left is a composite image of the nebula *(Source credits on page 14)*

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 Barone
Colin Campbell
Dennis Cartolano
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Jeff Chodak
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Managing Editor
Bill Cloutier

Production & Design
Allan Ostergren

Website Development
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Josh Reynolds

Technical Support
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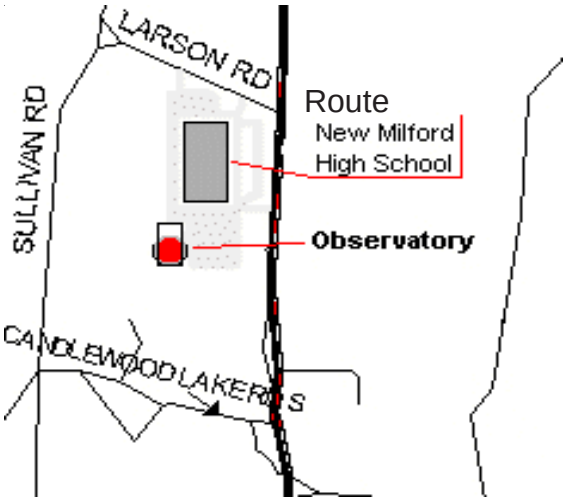
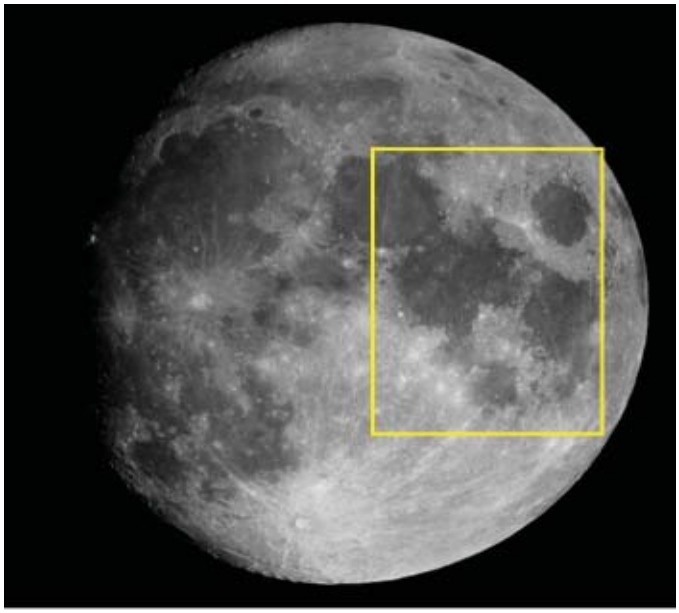


In This Issue

November Calendar and Space Exploration Almanac

"Out the Window on Your Left"

IT'S BEEN 40 YEARS since we left the last foot print on the dusty lunar surface. Sadly, as a nation founded on exploration and the conquest of new



frontiers, we appear to have lost our will to lead as a space-faring nation. But, what if the average citizen had the means to visit our only natural satellite; what would they see out the window of their spacecraft as they entered orbit around the Moon? This column may provide some thoughts to ponder when planning your visit (if only in your imagination).

The view this month is of a six day old Moon and the lunar seas on the Moon's eastern hemisphere. The photo on the following page (taken on September 21, 2012), includes two Apollo landing sites, several impact basins, and some of the most interesting craters on the Moon.

1. Posidonius is a magnificent, fractured floor crater situated on the eastern rim of the Serenitatis basin. Telescopic views show a broad, shallow floor with concentric ridges and radial channels or rilles created as magma exerted pressure from below.

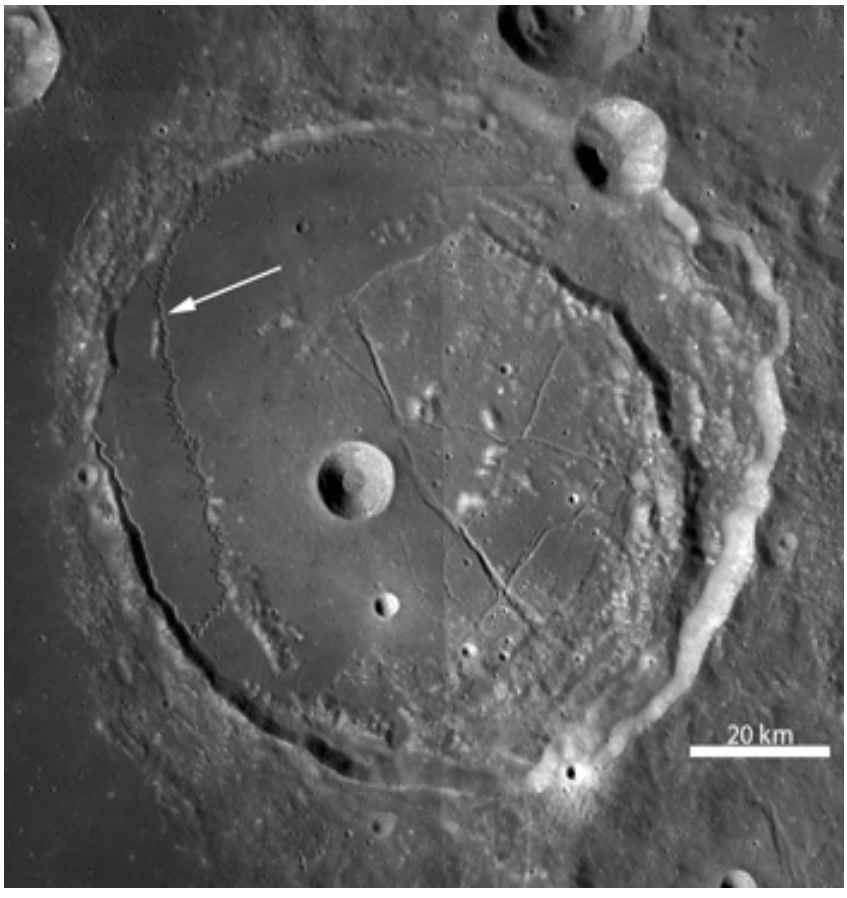
2. The final Apollo mission, Apollo 17, landed among the massifs in a valley named after the nearby Taurus Mountains to the east and the Littrow crater to the north of the landing site.

3. Tranquility Base, the landing site of Apollo 11, lies over six hundred kilometers to the southwest of the Taurus-Littrow valley. The site, chosen by NASA for its relatively featureless terrain from afar, was actually quite challenging when Armstrong was looking for level ground upon which to set down the lunar lander with its fields of smaller craters.

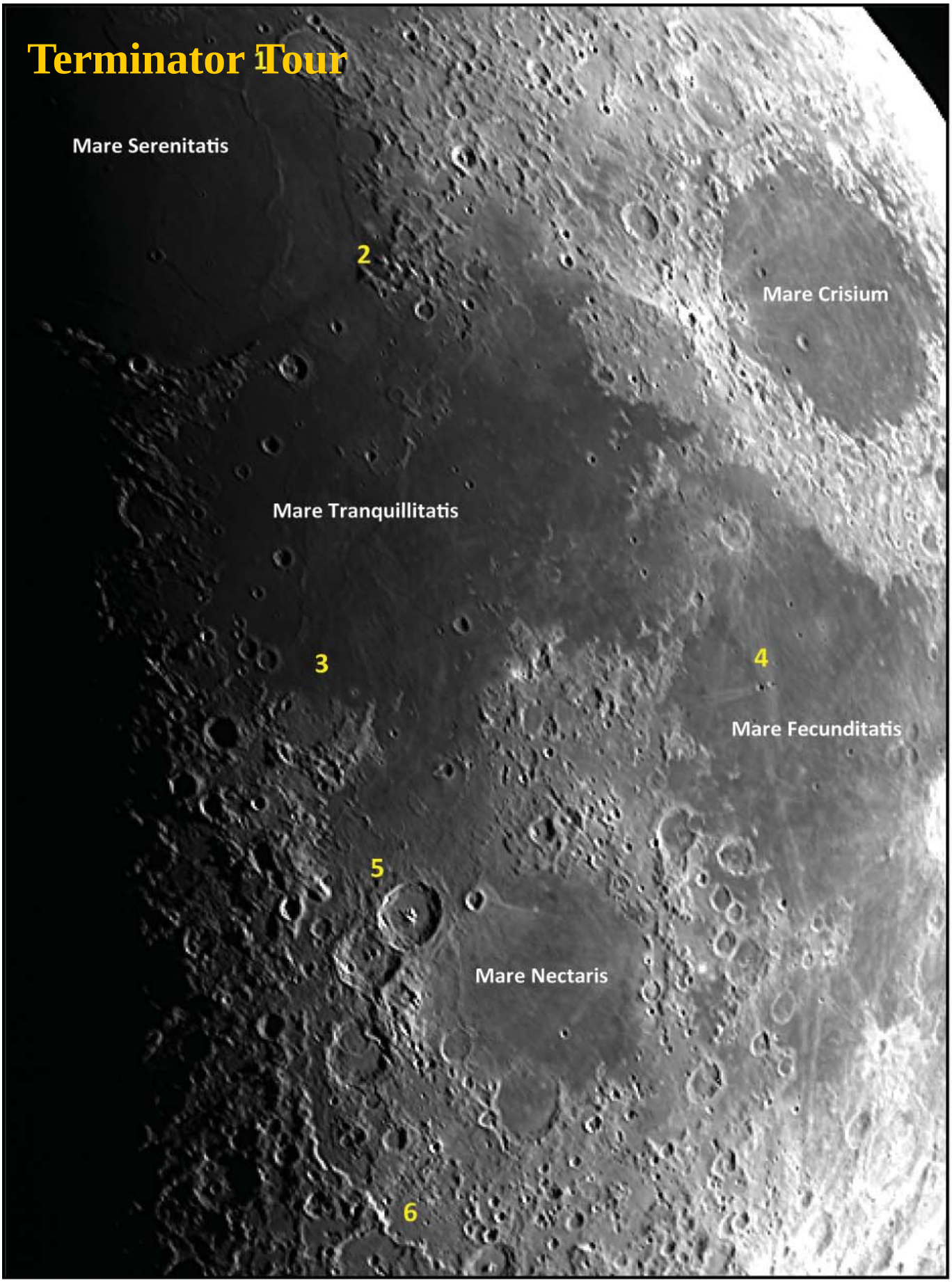
4. A pair of comet-like rays denotes the location of two craters, Messier and Messier A, named after the 19th century French astronomer and famed comet hunter. The craters were formed by an oblique impact that cast ejecta across the lava plains.

5. The ramparts of the crater Theophilus extend into one of the oldest impact basins on the Moon: Nectaris. The impact that created the 103 km diameter crater also annihilated the northeastern wall of the adjacent and older crater Cyrillus.

6. The Altai Scarp runs nearly 500 km along the western border of the Nectaris impact basin. The wall is actually a segment of the multiple, concentrate impact rings created by a cataclysmic impact. Unlike the Orientale impact basin, where the rings are essentially intact, only remnants of the Nectaris rings endure, the remainder having been erased by subsequent impacts and ejecta from the formation of nearby basins.

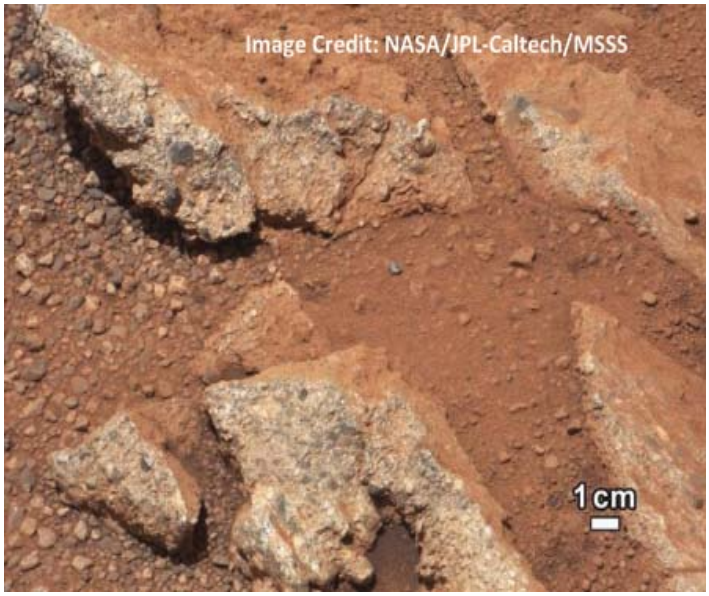


Rimae Posidonius is a sinuous rille winding across the floor of Posidonius crater. Source: NASA/GSFC/Arizona State University.


Terminator Tour
1
Mare Serenitatis
2
Mare Crisium
Mare Tranquillitatis
3
4
Mare Fecunditatis
5
Mare Nectaris
6

Mars Science Laboratory

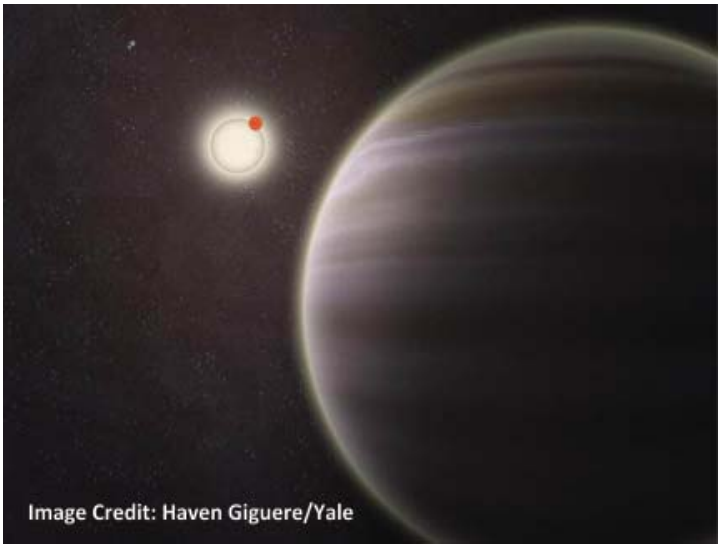
NASA's Curiosity rover has found the first direct evidence of fast moving surface water on Mars. On Martian day 27, Curiosity imaged an eroded outcrop near the base of Mount Sharp in Gale Crater.



Curiosity's image shows gravel-sized rocks, many with worn and rounded edges. The rock shapes indicate that they were transported across the surface. The rocks are large enough that they would have to have been transported by water, being too large to be carried by Mars' feeble winds. Rock size also gives investigators clues to the required speed of the stream; estimated at 3 feet per second.

Shades of Nightfall

In 1941, Isaac Asimov wrote a science fiction short story about a planet, illuminated by six suns, beset by an episodic event every 2,000 years where an eclipse would plunge the world into total darkness. "Nightfall" was a tale of the ensuing panic brought on by the darkness and, more importantly, a sky full of stars never seen in a perpetual day.

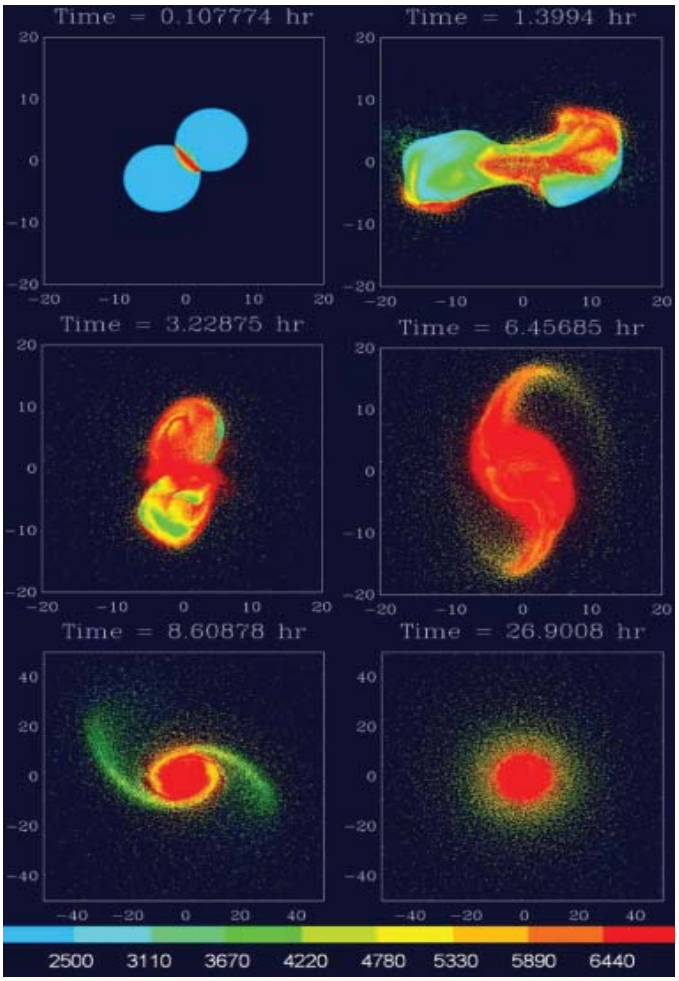


In a case of truth being stranger than fiction, a joint effort by amateur astronomers and scientists has found the first planet in a four star system. Using the Planethunter.org website, the planet was found in data collected by the Kepler space observatory that has been searching a small patch of the sky near the constellation Cygnus for transiting exoplanets. The planet, christened PH1, is slightly larger than Neptune and thought to be a gas giant. It orbits two of the stars once every 137 days. The second pair of distant stars orbits the planetary system.

Updated Model for Moon Formation

Theories on our Moon's formation and evolution continue to be tested as we learn more about our only natural satellite. Prior to the Apollo astronauts landing on the Moon and returning samples to Earth for analysis, there were ample theories on how and when the Moon formed. Notions included co-formation with the Earth, creation elsewhere in the solar system and eventual capture by the Earth, fission of the embryonic Earth into two bodies, and formation as a byproduct of an impact of the Earth by a smaller planetoid. Initial analysis of the lunar samples showed a world much like the Earth in elemental geology, yet different enough to discount co-formation, capture or fission. Out of the analysis, the impact scenario gained widespread acceptance. In 2001, computer models were able to simulate the formation processes, revealed in the analysis of lunar samples, with an oblique collision of a Mars-sized protoplanet, shortly after the Earth had coalesced. In the model, most of the impactor merged with the Earth, with some fraction forming a cloud of debris encircling the Earth. It was from this cloud that the Moon was formed through collision and accretion of the debris fragments.

With the ongoing search for water and other volatiles on the Moon, researchers have re-examined the Apollo samples, in many instances with technology not available 40 years ago. Comparing oxygen and titanium isotopes (isotopes are variants of the same element with different numbers of neutrons) found on both the Earth and Moon, the results of the analyses have challenged the basic premise of the impact theory. Instead of differences that would have been expected from remnants of two different bodies, the isotopes were essentially identical; suggesting only one parent.



Updated Collision Model
Courtesy Southwest Research Institute

In an attempt to reconcile the new findings with their 2001 impact computer model, Southwest Research Institute (SwRI) increased the size of the impactor and changed the angle of impact from a glancing blow to one just off-center, while maintaining the appropriate resulting masses for the Earth and Moon. SwRI was able to produce a scenario whereby the composition of the debris cloud (and future Moon) would be comparable to that found in the Earth's mantle. The new model is based on an impactor 4 to 5 times the mass of Mars, or about the same mass as the embryonic Earth.

The collision created a rapidly spinning Earth-mass planet and a cloud of debris equivalent to three lunar masses from which the Moon would form. The collision also homogenized the material from the two protoplanets, explaining the similarity in the elemental composition of the two bodies.

Leonid Meteor Shower

Almost everyone has seen a "\'shooting star;' but not everyone knows what they are, where they come from and how best to view them. For those of you that remember that chilly November night in 2001 when the stars fell like rain, a meteor shower or meteor storm is truly unforgettable. As with that night, all you need are a comfortable chair and a warm blanket to enjoy the show.

Meteor showers occur when the Earth passes through a cloud of debris left behind by a comet. As a comet nears the Sun, the volatile gases warm and erupt along with trapped particles of rock and dust. Pushed away from the comet by the solar wind, this material forms the comet's tail. Each time a comet crosses the Earth's orbit it leaves behind a small cloud of debris. When the Earth passes through these clouds, the debris quickly heats up in the atmosphere, creating streaks of light across the night sky. The point in the sky where the meteors appear to originate is called the radiant. Meteor showers are identified by the constellation in which the radiant appears. As such, if you trace the path of the meteors in the early morning of November 17, you will notice that most seem to originate from a point in the constellation Leo, hence the name Leonids.

Why does the same meteor shower excite one year and disappoint the next? While comets are responsible for seeding Earth's orbit with the makings of a meteor shower, most comets are not frequent visitors to the inner solar system. Comet Tempel-Tuttle (the source of the Leonid meteors) crosses Earth's orbit once every 33 years. The resulting cloud is about 10 Earth diameters across and continues to drift along the comet's path. Most years the Earth misses these clouds altogether. In those years the meteor shower is sparse. Other years, as in 2001, the Earth can interact with several debris clouds from Comet Tempel-Tuttle. If the debris cloud is dense (containing a lot of rock and dust) the show can be spectacular. However, as debris clouds age they stretch out and become less dense. The resulting encounter produces fewer and fewer meteors.

What can we expect this year? With a crescent Moon setting early on the previous evening, expect to see an average of 15-20 meteors per hour during the peak period from a dark site.

Space Debris

More than a ton of meteoroids bombards the Earth and moon every day. Most disintegrate in the Earth's atmosphere. The moon is not so fortunate; the lunar surface is continually modified by the bombardment, as shown by the samples brought back from there by the Apollo astronauts. NASA is

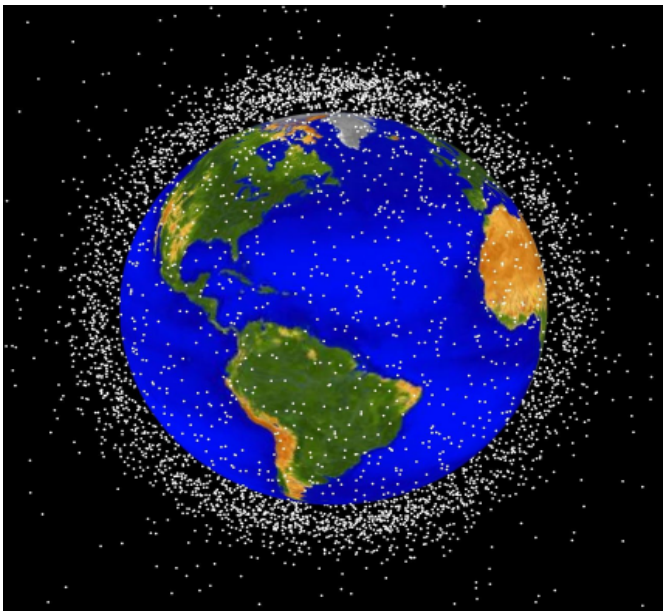
supporting projects that monitor the frequency of lunar impacts, anticipating that the information will be useful in designing more robust lunar structures and contingency plans for astronauts venturing out on the lunar surface.

NASA launched the Chandra X-ray Observatory in July 1999, placing it in an elliptical orbit that extends almost one-third the distance to the moon. In November 2003, the telescope's operators placed the telescope in a safe configuration during its passage through four meteor shower streams. Despite an extremely low probability (one in a million) that the telescope would be hit by a meteoroid, that's what apparently happened early on the morning of November 15th. Fortunately, there was no apparent damage to the more sensitive parts of the telescope.

In 2006, the right-hand payload bay door radiator of the space shuttle Atlantis was hit by space debris. The object blasted its way through the metal skin and aluminum honeycomb material inside before exiting the other side. The resulting hole missed the Freon coolant lines inside the panel and did not endanger the crew. (The radiators are only deployed once the shuttle is in space and are stored in the cargo bay during reentry.) However, the impact illustrates the danger presented by space debris to spacecraft and their human occupants.

The Hubble Space Telescope's Wide Field Planetary Camera 2 was returned to Earth as part of the telescope's servicing mission in 2009 (STS-125). Attached to the camera was a large radiator (2.2 m by 0.8 m). The radiator had been in space since the camera was installed in 1993, and its large flat surface provided an excellent measure for determining impact rates for orbital debris at the telescope's altitude (between 560 and 620 km). Initial analysis of the radiator, completed last September, found a total of 685 micrometeoroid and orbital debris impact features (larger than about 0.3 mm).

It is estimated that tens of millions of man-made objects orbit the Earth, the vast majority smaller than 1 centimeter in size. The objects come from derelict spacecraft, exploding rocket boosters, discarded motors, deterioration of man-made structures including thermal blankets and solar panels, as well as from accidental and deliberate collisions. The objects orbit the Earth in many



Orbital debris in low Earth orbit - within 200 kilometers of the surface. (Source: NASA Orbital Debris Program Office

different directions, altitudes, and velocities, traveling up to 30,000 miles an hour or 20 times faster than a rifle bullet. At these speeds, it doesn't take a very large object to inflict considerable damage to another object, including the International Space Station. The space shuttle windows were hit by small pieces of debris 32 times during an average mission. Micrometeorites are involved in approximately one-third of the collisions. The grains of sand are generally less dense than man-made debris, and therefore, relatively harmless. The remaining two-thirds do have some penetrating power and are primarily bits of aluminum, followed by paint, steel, and copper.

NASA currently tracks more than 16,400 objects; most are larger than 10 centimeters (4 inches). This is double the number of objects tracked ten years ago. (There may be 500,000 debris fragments greater than one centimeter in size and over a 100 million fragments smaller than a centimeter). While the United States and Russia are the largest contributors to the swarm of man-made objects, newer space faring nations, in particular China, have added to the problem (particularly after its intentional destruction of its Fengyun 1C spacecraft). While debris in low-Earth orbit will eventually fall back to the surface, objects higher than 800 kilometers (480 miles) can continue to circle the planet for decades and even centuries.

Until a solution can be found to cleaning up the debris (that is both technically feasible and economical), NASA has developed guidelines it hopes other nations will adopt to minimize the creation of even more debris. In the meantime, surveillance of the ex-

isting debris (only practical for the larger objects) will allow spacecraft that can maneuver to avoid future collisions, and more importantly, the loss of life. For additional information, NASA publishes the "Orbital Debris Quarterly News," complete with a "satellite box score." The newsletter (past and present) is available at http://www.orbitaldebris.jsc.nasa.gov/newsletter/newsletter.html.

Jupiter and its Moons

Jupiter reaches Opposition (and closest approach to Earth) on the evening of December 2nd (EST); so the gas giant is well placed for viewing in the November evening sky. It rises two hours after sunset at the beginning of the month and just around sunset at month's end. As one of the brightest star-like objects in the night sky, Jupiter can be found in the constellation Taurus.

One of the more interesting and easier events to observe through a telescope is the projection of a shadow from one of Jupiter's moons on the Jovian disk as the moon passes in front of (or transits) the planet. The photo on the right shows the shadow of Ganymede on the Jovian disk. On nights of good visibility the following events should be visible through a moderately-sized telescope (between approximately 6 pm and midnight).

Date	Moon	Transit Begins	Transit Ends
7th	Io	10:11 pm	12:21 am (8th)
11th	Europa	8:21 pm	10:45 pm
16th	Io	6:34 pm	8:44 pm
18th	Europa	10:57 pm	1:21 am (19th)
23rd	Io	8:28 pm	10:38 pm
28th	Ganymede	5:38 pm	7:44 pm

Transit of Jupiter's Red Spot

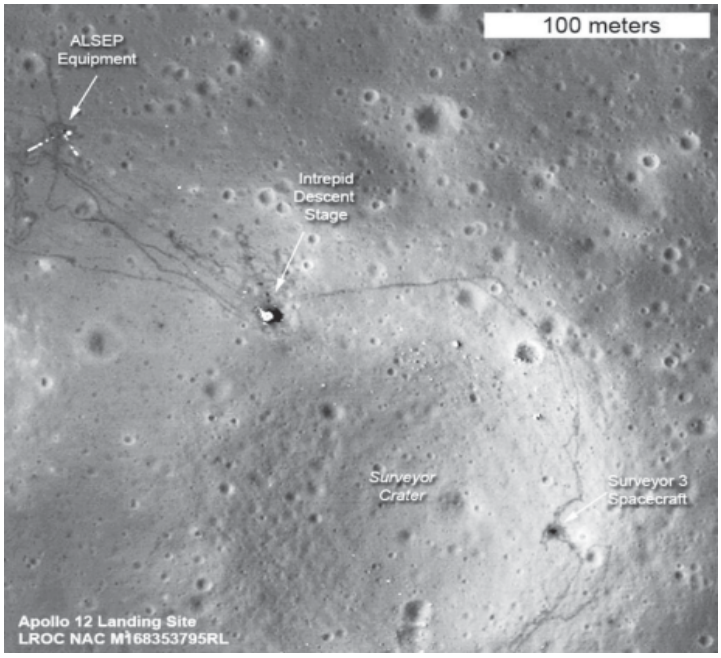
The Red Spot is a large cyclone in the upper Jovian atmosphere. The rapid rotation of this gas giant (10 hours) may be responsible for the longevity of this storm, which has been observed for over 300 years. The Red Spot will cross the center line of the planetary disk on the following evenings during the hours of approximately 8 pm to midnight local time (EDT through 11/3; EST thereafter):

Date	Transit Time	Date	Transit Time
1st	9:01 pm	17th	11:09 pm
3rd	10:39 pm	20th	8:38 pm
5th	11:17 pm	22nd	10:16 pm
8th	8:46 pm	24th	11:53 pm
10th	10:24 pm	27th	9:23 pm
15th	9:31 pm	29th	11:00 pm

November History: Apollo 12

The second manned mission to the lunar surface was launched on November 14, 1969. The mission was almost lost before it started. The Saturn V rocket booster was hit by lighting as it rose from the launch pad. Fortunately, a young flight controller in mission control (John Aaron) remembered seeing the same dizzying display of warning lights and alarms in a practice run and was able to provide the crew directions on re-establishing power and control to the spacecraft.

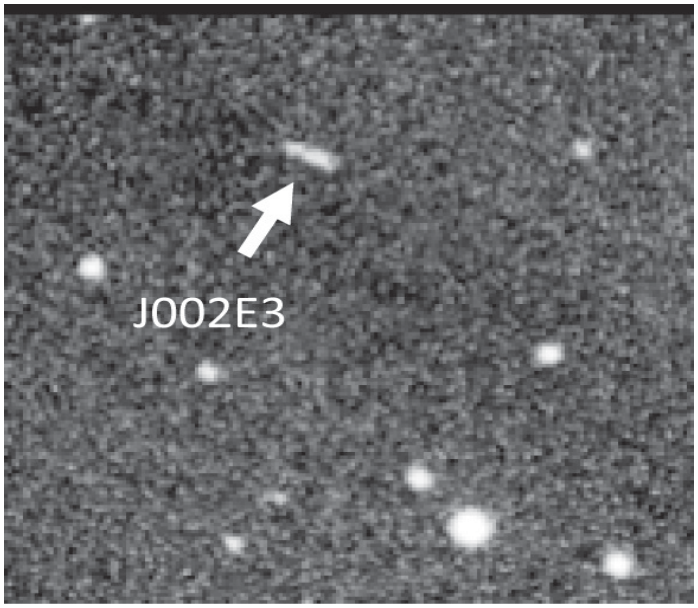
After leaving Earth orbit, the command module extracts the lunar excursion module from the third stage. The trajectory (or path) of the third stage is then modified, so as not to interfere with the lunar landing (either by placing it into orbit around the Sun or deliberately crashing it into the Moon). In what would become of interest 33 years later, the engine on the third stage burned 300 seconds too long, sending the rocket booster into a semi-stable orbit around the Earth. Two years later, it finally entered into an orbit around the Sun (by passing through a region of space controlled by the Earth and Sun).



Credit: NASA/Goddard Space Flight Center/Arizona State

The Ocean of Storms was the designated landing site for Apollo 12, southeast of the large crater Lansberg. Mission Commander Pete Conrad made a pinpoint landing 600 feet from the Surveyor 3 spacecraft which had landed two years earlier. The diminutive Conrad joked as he stepped out onto the lunar surface for the first time, "Whoopee! Man, that may have been one small one for Neil, but that's a long one for me."

In 2002, amateur astronomer Bill Yeung discovered a new object orbiting the Earth. Designated J002E3, the object was later determined to be artificial (from the analysis of reflected sunlight). After considerable study, it was concluded that J002E3 was most likely the third stage of Apollo 12. The object made six elongated orbits of the Earth before disappearing, presumably returning to its previous orbit around the Sun.



J002E3 was imaged from the McCarthy Observatory during three of its close approaches to Earth. Although the images are just snapshots, the tumbling motion of the booster is clearly seen as the sunlight alternately reflects off the white painted sides of the rocket and then the darkened ends.

November Nights

The late Harvard University astronomer Harlow Shapley was born in November 1885. One of his many accomplishments was accurately measuring the distance to globular star clusters and their position around the Milky Way Galaxy. While warm summer nights are usually reserved for hunting globulars, the autumnal sky contains several impressive clusters including M15 in Pegasus and M2 in Aquarius. M30 in Capricorn is also visible in the southwest sky in the evening.

On the eastern side of the Great Square of Pegasus is the constellation Andromeda. Within this constellation and visible to the unaided eye on a dark night is the Andromeda Galaxy (M31), a massive pinwheel of 500 billion suns. Larger than the Milky Way, the Andromeda Galaxy is currently rushing towards us at 75 miles per second. Fortunately, it is approximately 2½ million light years (14.7 million trillion miles) distant, so it will be some time before the two galaxies merge. Visible through a telescope are Andromeda's two companion galaxies, M32 and M110. While M32 can be mistaken for a bright star due to its close proximity to the core of the Andromeda Galaxy, M110 is a bit easier, being further away and larger than M32.

Located not far from M31 is the Triangulum or Pinwheel Galaxy (M33). Smaller and less massive than the Milky Way, this galaxy can be a challenge to see on less than ideal nights, due to its low surface brightness. However, through a large telescope on a dark, steady night, the view looking face-on at this giant pinwheel can be spectacular. The large spiral arms of M33 are filled with star-forming regions that almost appear to be gliding through space.

Sunrise and Sunset

Sun	Sunrise	Sunset
November 1st (EDT)	07:26	17:48
November 15th (EST)	06:43	16:33
November 30th	07:00	16:25

Astronomical and Historical Events

1st Moon at apogee (furthest distance from Earth)
1st History: launch of the Wind spacecraft, designed to monitor the solar wind (1994)
2nd History: flyby of Asteroid 5535 Annefrank by the Stardust spacecraft (2002)
2nd History: first light at the 100-inch telescope on Mount Wilson (1917)
3rd Taurids Meteor Shower peak
3rd History: launch of Mariner 10 to Venus and Mercury; first mission to use the gravitational pull of one planet (Venus) to reach another (Mercury) (1973)

Astronomical and Historical Events for October (continued)

3rd History: launch of Sputnik 2 and a dog named Laika (1957)
4th End of Daylight Savings Time - set clocks back one hour at 2 a.m.
4th History: Deep Impact's closest approach to the nucleus of Comet 103P/Hartley 2 (2010)
4th History: launch of the Soviet Venus lander Venera 14 (1981)
5th History: Chinese spacecraft Chang'e 1 enters orbit around Moon (2007)
6th Last Quarter Moon
7th History: launch of Mars Global Surveyor (1996)
7th History: launch of Surveyor 6 moon lander (landed two days later). On November 17th, the lander's small vernier engines were fired for 2½ seconds, lifting the lander off the lunar surface 10 to 12 feet and almost 8 feet sideways. This lunar "hop" was the first powered takeoff from the lunar surface. It also provided NASA a view of the original landing site and a baseline for acquiring stereoscopic images of its surroundings. (1967)
7th History: launch of Lunar Orbiter 2, Apollo landing site survey mission (1966)
8th History: launch of the ill-fated Phobos-Grunt spacecraft from the Baikonur Cosmodrome in Kazakhstan. Destined for the Martian moon Phobos, the spacecraft never left Earth orbit and eventually re-entered the atmosphere.
8th History: meteorite hits a house in Wethersfield, Connecticut (1982)
8th History: launch of Pioneer 9 into solar orbit (1968)
8th History: launch of Little Joe rocket, qualifying flight for the Mercury spacecraft (1960)
8th History: Edmund Halley born, English astronomer who calculated the orbit and predicted the return of the comet now called Comet Halley (1656)
9th History: launch of the Venus Express spacecraft; ESA Venus orbiter (2005)
9th History: launch of the first Saturn V rocket, Apollo 4 (1967)
10th Second Saturday Stars - Open House at the McCarthy Observatory (7:00 pm)
10th History: launch of Luna 17, Soviet Moon rover mission (1970)
10th History: launch of USSR spacecraft Zond 6; Moon orbit and return (1968)
10th History: Waseda Meteorite Fall; hits house in Japan (1823)
11th History: launch of Gemini 12 with astronauts James Lovell and Edwin Aldrin (1966)
11th History: Tycho Brahe discovers a new star in the constellation Cassiopeia shining as bright as Jupiter; later determined to be a supernova - SN1572 (1572)
12th History: launch of STS-2, second flight of the Space Shuttle Columbia (1981)
12th History: flyby of Saturn by the Voyager 1 spacecraft (1980)
12th History: Seth Nicholson born, American astronomer who discovered four of Jupiter's moons, a Trojan asteroid, and computed orbits of several comets and of Pluto (1891)
13th New Moon
13th Flyby of Saturn's largest moon Titan by the Cassini spacecraft
13th History: launch of HEAO-2, the second of NASA's three High Energy Astrophysical Observatories; renamed Einstein after launch, it was the first fully imaging X-ray space telescope (1978)
14th Moon at perigee (closest approach to Earth)
14th History: dedication of the New Milford Solar System Scale Model (2009)
14th History: Mariner 9 arrives at Mars; first spacecraft to orbit another planet (1971)
14th History: launch of Apollo 12, with astronauts Pete Conrad, Richard Gordon and Alan Bean to the moon's Ocean of Storms and near the robotic explorer Surveyor 3 (1969)
15th Kuiper Belt Object 90377 Sedna at Opposition (85.759 AU)
15th History: ESA's spacecraft SMART-1 enters lunar orbit; first ESA Small Mission for Advanced Research in Technology; travelled to the Moon using solar-electric propulsion and carrying a battery of miniaturized instruments (2004)
15th History: the only orbital launch of the Russian space shuttle Buran; the unmanned shuttle orbited the Earth twice before landing (1988)

Astronomical and Historical Events for August (continued)

16th History: launch of the third (and last) Skylab crew with astronauts Gerald Carr, William Pogue and Edward Gibson (1973)
16th History: launch of Venera 3, Soviet Venus lander (1965)
17th Leonids Meteor Shower peak
17th History: Soviet lunar lander Luna 17 deploys first rover - Lunokhod 1 (built by the Kharkov state bicycle plant); operated for 11 months, photographing and mapping the lunar surface and analyzing the regolith (1970)
18th History: Leonids Meteor Storm (2001)
18th History: launch of the COBE spacecraft; observed diffuse cosmic background radiation (1989)
20th First Quarter Moon
20th History: launch of the Swift spacecraft; first-of-its-kind multi-wavelength observatory dedicated to the study of gamma-ray bursts (2004)
23rd History: launch of the European Space Agency's first satellite, Meteosat 1 (1977)
23rd History: launch of Tiros II weather satellite (1960)
26th History: launch of the Mars Science Laboratory (MSL) aboard an Atlas 5 rocket from the Cape Canaveral Air Force Station (2011)
26th History: discovery of Mars meteorites SAU 005 and SAU 008 (1999)
26th History: launch of France's first satellite, Asterix 1 (1965)
26th History: launch of Explorer 18; studied charged particles and magnetic fields in and around the Earth – Moon (1963)
27th Kuiper Belt Object 278361 (2007 JJ43) at Opposition (42.405 AU); a trans-Neptunian object orbiting the Sun near the outer edge of the Kuiper belt; likely a dwarf planet based upon initial estimates of its size
27th History: Soviet spacecraft Mars 2 arrives at Mars; lander crashes, becoming first human artifact to impact the surface of Mars (1971)
28th Full Moon (Full Beaver Moon)
28th Moon at apogee (furthest distance from Earth)
28th History: launch of Algeria's first satellite, Alsat 1 (2002)
28th History: launch of Mariner 4; first spacecraft to obtain and transmit close range images of Mars (1964)
29th Flyby of Saturn's largest moon Titan by the Cassini spacecraft
29th History: discovery of Y000593 Mars meteorite in Antarctica (2000)
29th History: launch of Australia's first satellite, Wresat 1 (1967)
29th History: launch of Mercury 5 with Enos the chimpanzee (1961)
30th History: Sylacauga Meteorite Fall; hits women (1954)

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

Page 1 "The Eastern Veil Nebula" Narrowband- Hydrogen Alpha, Sulfur II, Oxygen III composite through the Takahashi FSQ-106 + ST10-XE CCD. Around half an hour in each filter over one night of imaging on 9/15/12. Image by Marc Polansky.

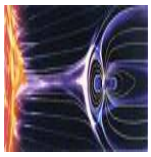
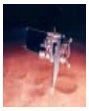
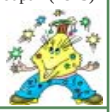
Insert: A wide-field image of the Veil Nebula, made as a color composite from individual exposures from the Digitized Sky Survey 2. The field of view is 4.2 x 4.4 degrees. Credit: NASA, ESA, the Hubble Heritage (STScI/AURA)-ESA/Hubble Collaboration, and the Digitized Sky Survey 2. Acknowledgment: J. Hester (Arizona State University) and Davide De Martin (ESA/Hubble).

Page 3 Photo: Celebrating International Observe the Moon Night 2012, Conor points out the First Quarter Moon to his younger brother Brandon from their Florida home. Photo by Bill Cloutier III

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

November 2012

Celestial Calendar

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Phases of the Moon  Nov 6 Nov 13  Nov 20 Nov 28				1 Moon at apogee (farthest from Earth)   Launch of Wind spacecraft to study solar wind (1994)	2 Flyby of asteroid 5535 Anne Frank by Stardust spacecraft (2002)   First light of Mt. Wilson 100-inch telescope - (1917) Harlow Shapley born, American astronomer, measured distances within our galaxy (1885) 	3 Taurids meteor showers peak   Launch of Mariner 10 to Venus and Mercury (1973) Launch of Sputnik 2, with dog Laika (1957) 
4 End of Daylight Savings Time   Deep Impact closest approach to the nucleus of Comet 103/ P Hartley 2 (2010)	5  Fred Lawrence Whipple born, American astronomer; first to theorize of comets as "dirty snowballs" (1906)	6 Charles Owen Hobaugh, NASA astronaught born (1961) Lunar Orbiter 2 launch (1966) Galileo's third flyby of Europa (also known as the Europa 11 flyby because it took place during Galileo's eleventh orbit around Jupiter), the smallest of Jupiter's Galilean satellites, occured on 06 November 1997 at 20:32 UTC	7  Launch of Mars Global Surveyor (1996) Launch of Surveyor 6 Moon Lander, dry-run for later manned mission (1967) 	Moon at apogee (furthest from the Earth) 8   Launch of Little Joe rocket (1960) Meteorite hits house in Wethersfield CT (1982)   Edmund Halley born (1656)	9  Launch of Venus Express spacecraft; ESA Venus orbiter (2005)  Launch of 1st Saturn V rocket - Apollo 4 (1967)	10 Launch of Soviet spacecraft Zond 6 to Moon (1968)  Launch of Luna 17, Soviet Moon Rover mission (1970)   Waseda meteor hits house in Japan (1823) 2nd Saturday Stars Open House McCarthy Observatory 
11  Tycho Brahe discovers supernova SN1572 (bright as Jupiter) (1572) Launch of Gemini 12, with astronauts Lovell and Aldrin (1966) 	12  Seth Nicholson born, American astronomer (1891) Space Shuttle Columbia safe re-launch, with commander Joe Engle and pilot Richard Truly (1981) 	13  Launch of HEAO-2 (Einstein), 1st fully-imaging x-ray telescope in space - 1978 Dawn spacecraft enters Asteroid Belt on way to Vesta and Ceres (2009) 	Moon at perigee (closest to Earth) 14   Launch of Apollo 12 - Conrad, Gordon, Bean, 1969 Mariner 9 arrives at Mars, 1st spacecraft to orbit another planet, 1971   Dedication of the New Milford solar system scale model (2009)	Astronomer William Herschel born 1738 15   ESA Smart-1 enters lunar orbit, using solar-electric propulsion 2004 Only orbital launch of Russian Buran space shuttle in unmanned mission (1988) 	16  Launch of Venera 3, Soviet Venus lander (1965)  Launch of 3rd and last Skylab crew - Carr, Pogue, Gibson (1973)	17 Soviet lunar lander, Luna 17 with 1st rover, Lunakhod 1 (1970) Leonids meteor shower peak
18 Leonids Meteor Storm (2001) Alan Shepard born, 1st American in space and 5th to walk on Moon - 1923 Launch of the COBE spacecraft; observed diffuse cosmic background radiation (1989)	19 Apollo 12 astronauts Charles Conrad and Alan Bean made man's second landing on the moon (1969)	20 Launch of the Swift spacecraft, multi-wavelength observatory to study gamma wave bursts (2004)	21 India's space program begins with the launch of a Nike-Apache sounding rocket from coconut groves in Thumba, a small fishing village in Kerala state (1963)	22 Scheduled return to Earth of Soyuz 27 from the International Space Station	23 Launch of European Space Agency's 1st satellite, Meteosat (1977)	24 Space-walking astronauts from shuttle Columbia catch a 1 1/2 -ton satellite, and the cockpit crew used the shuttle's robot arm to return it to the cargo bay (1997)
25 Radio signals exchanged between Viking 1 Mars Lander and Earth are slowed by sun's gravity, confirming Einstein's general theory of relativity (1976)	26 Launch of France's first satellite, Asterix 1 (1965) Launch of Explorer 18; studied charged particles and magnetic fields in and around the Earth - Moon (1963) Discovery of Mars meteorites AU 005 and SAU 008 (1999)	27 Soviet spacecraft Mars 2, first human artifact to impact Martian surface (1971)	28 Launch of Algeria's 1st satellite, Alsat 1 2002 Launch of Mariner 4, first spacecraft to send close range images of Mars (1964)	29 Launch of Australia's 1st satellite, Wresat 1 1967 Launch of Mercury 5, with Enos the chimp 1961 Discovery of Y000593 Mars meteorite in Antarctica (2000)	30 Sylicauga meteorite fall strikes Alabama woman (1954)	

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

November 10th

7:00 - 9:00 pm

Gravity & Astronomy

Refreshments
Family Entertainment
Activity Center
Stars & Planets
Rain or shine

Map

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