

Galactic Observer

John J. McCarthy Observatory

Volume 5, No. 3

March 2012

Ring of Fire

In 186 A.D., Chinese astronomers recorded a mysterious "guest star" that lit up the night sky for eight months. The composite infrared image here shows the remains of X-86, a powerful supernova 8,000 light years away and 85 light years in diameter.

To find out how astronomers measure these extreme distances, come to JJMO's Second Saturday Stars program on March 10

Source: X-ray: NASA/CXC/SAO & ESA;
Infared: NASA/JPL-Caltech/B. Williams (NCSU)
[http://www.nasa.gov/multimedia/
imagegallery/image_feature_2173.html](http://www.nasa.gov/multimedia/imagegallery/image_feature_2173.html)



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	Allan Ostergren
Colin Campbell	Cecilia Page
Dennis Cartolano	Joe Privitera
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Bob Lambert	Bob Willaum
Dr. Parker Moreland	Paul Woodell
Amy Ziffer	

Galactic Observer Editorial Committee

Managing Editor

Bill Cloutier

Production & Design

Allan Ostergren

Website Development

John Gebauer

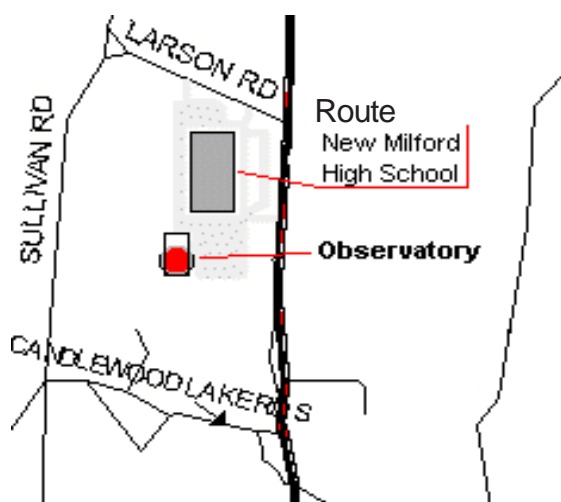
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Josh Reynolds

Technical Support

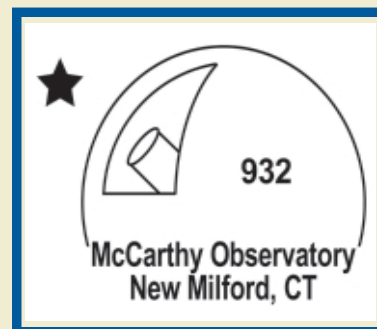
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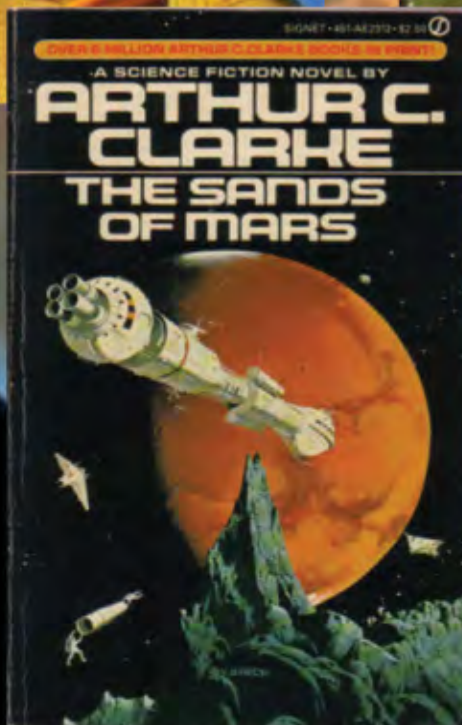
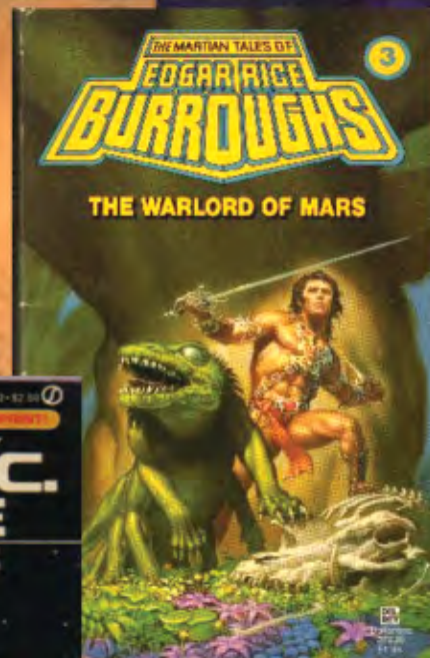


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March Astronomy Calendar and Space Exploration Almanac



National Reading Month

The Year of the Solar System

NASA announced on Oct. 7, 2010 that the upcoming year would be "The Year of the Solar System." The "Year," however, is a Martian year and, as such, 23 months in length. Some of the highlights of the "Year" of exploration are:

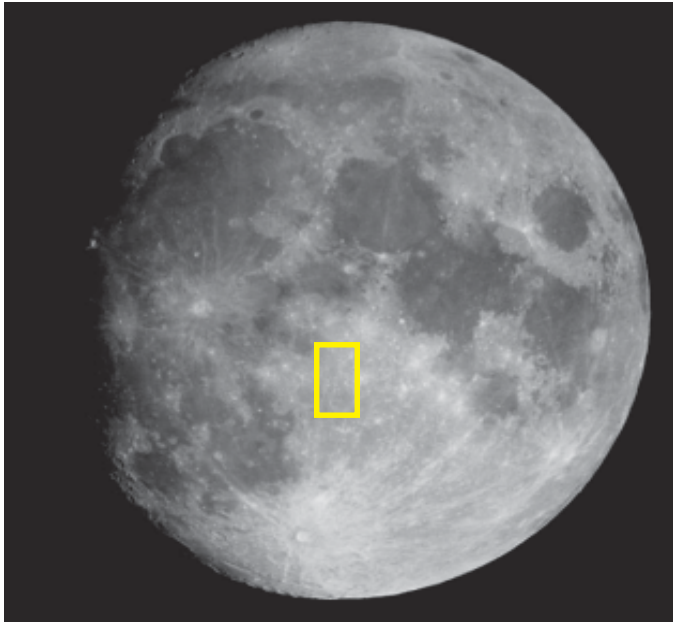
Date	Mission	Status
04 Nov 2010	Deep Impact encounters Comet Hartley 2	Successful rendezvous; see http://www.nasa.gov/mission_pages/epoxi/index.html
19 Nov 2010	Launch of O/OREOS, a shoebox-sized satellite designed to test the durability of life in space	Ground stations receiving data
19 Nov 2010	Launch of experimental solar sail (NanoSail-D)	Mission completed (successfully)
07 Dec 2010	Japan's Akatsuki (Venus Climate Orbiter) spacecraft	Spacecraft fails to enter orbit around Venus - now in orbit around the Sun
14 Feb 2011	Stardust NExT encounters Comet Tempel 1	Successful rendezvous; see http://stardustnext.jpl.nasa.gov/
17 Mar 2011	MESSENGER enters orbit around Mercury	First spacecraft to achieve orbit around Mercury; see http://messenger.jhuapl.edu/
18 Mar 2011	New Horizons spacecraft crosses the orbit of Uranus	4+ more years to Pluto; see http://pluto.jhuapl.edu/
16 Jul 2011	Dawn spacecraft arrives at the asteroid Vesta	Orbit achieved; see http://dawn.jpl.nasa.gov/
05 Aug 2011	Launch of the Juno spacecraft to Jupiter	Successful launch/deployment; see http://missionjuno.swri.edu/
10 Sept 2011	Launch of twin GRAIL spacecraft to map Moon's gravitational field	Successful launch/deployment; see http://solarsystem.nasa.gov/grail/
08 Nov 2011	Launch of the Phobos-Grunt sample-return mission	Successful launch/failure to leave low-Earth orbit/re-entered Earth's atmosphere on January 15 th
26 Nov 2011	Launch of Mars Science Laboratory (MSL)	Successful launch/deployment; see http://marsprogram.jpl.nasa.gov/msl/
05 Aug 2012	MSL lands on Mars	

Other notable events:

- | | |
|---|---|
| <ul style="list-style-type: none"> • August 9, 2011 • March 3, 2012 • May 20, 2012 • June 6, 2012 | <ul style="list-style-type: none"> Opportunity reached the rim of Endeavour crater Mars at Opposition Annular Solar Eclipse (visible in southwest U.S.) Venus Transit (visible before sunset on the east coast) |
|---|---|

"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



Lunar mare or "seas" are actually expansive low-lying plains formed by ancient lava flows

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 terminator (day/night divider) crosses a rugged portion of the lunar highlands just prior to the first quarter. The area is bordered by impact basins and still shows signs of the ancient cataclysmic events that eventually created the lunar mare.

The shadows cast by the rising Sun illuminate the stark features of two prominent craters near the lunar equator, Hipparchus and Albatagnius. The craters, shown on the following page, predate the Imbrium impact but had much different fates.

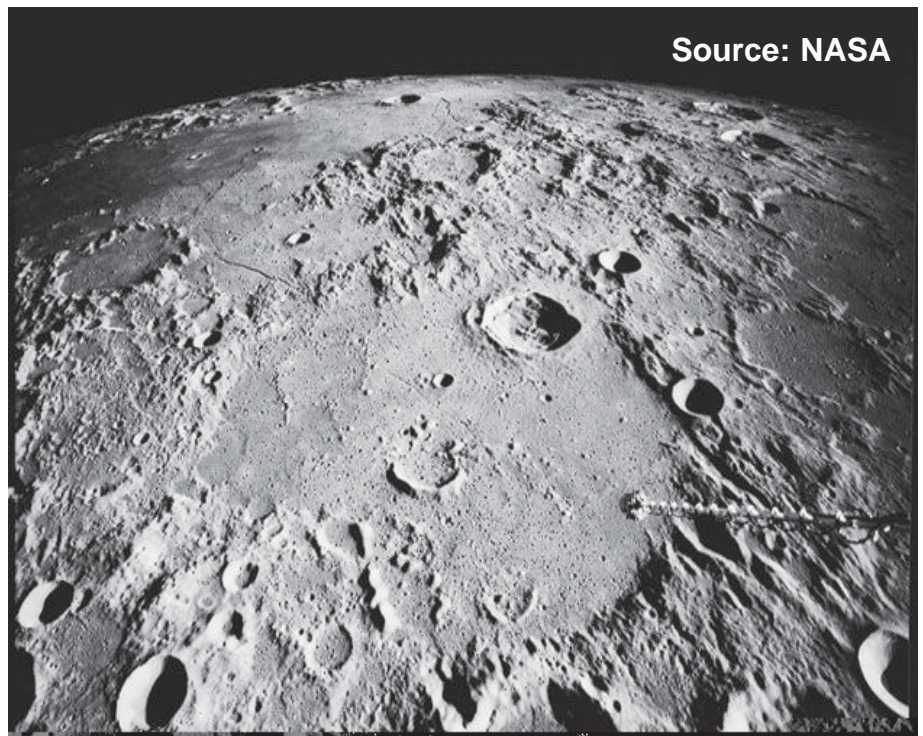
Named after the Arab astronomer and mathematician Muhammed Ben Geber Al-Battânî (ca. 858-929 AD), the crater Albatagnius is approximately 65 miles in

diameter. Saucer-like depressions and groves are visible on the crater's relatively flat floor and the off-centered central peak rises more than 4,000 feet above the plain. Shadows cast on the floor attest to the rugged, scalloped peaks that bound the eastern rim of the crater while the western rim has been breached by the crater Klein.

While larger than Albatagnius, the remnants of the crater Hipparchus are much less striking. Named after one of the greatest astronomers in the ancient world, Hipparchus (ca. 190-120 BC), the crater is surrounded by deep gouges and secondary crater chains that radiate from the Imbrium basin. The floor of Hipparchus is nearly filled with a light colored material, possibly fluidized ejecta from nearby impact(s). A faint rille (channel) that crosses the floor appears to be a continuation of the Réaumur Rille shown at the upper left.

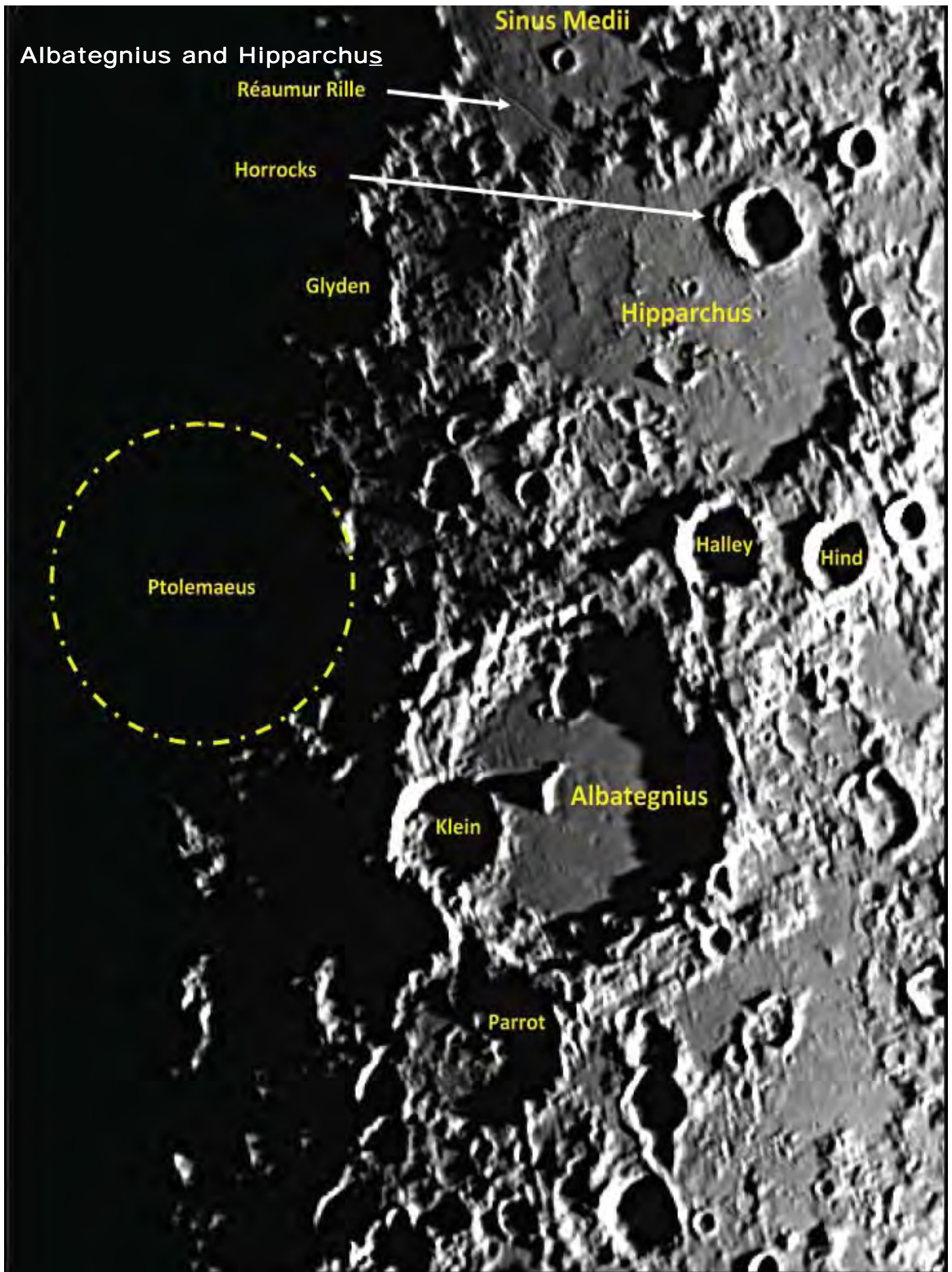
Under low illumination, ghosts of buried structures are visible on the floor of Hipparchus, as is the remnant of a wall from an older crater lying beneath the crater Horrocks. The once grand ramparts and terraces have been breached by impacts and impact projectiles. Gaps in the northwest rim spill out into Sinus Medii (Central Bay).

As the terminator advances to the west, sunlight will flood the crater Ptolemaeus, located just southwest of the crater Gylden, for another magnificent lunar sunrise.



Source: NASA

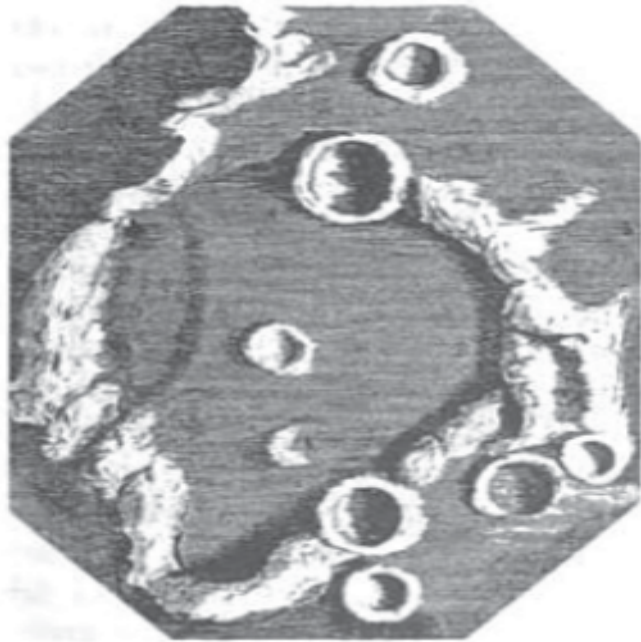
Oblique view of the 138 km Hipparchus crater (center), taken by Apollo 16 in 1972. The crater was formed in the Imbrium impact, more than 4 billion years ago, but its profile is worn down by subsequent impacts.



Hipparchus and Robert Hooke

Early Moon drawings were of the entire disc or lunar phase. Robert Hooke, a contemporary and rival of Isaac Newton, is credited with the first drawing of a single lunar feature. On the left is a drawing by Hooke of the crater Hipparchus. Oddly enough, it was included in Hooke's 1665 publication "Micrographia," a discourse on objects seen through a microscope.

Hooke was also the first to investigate the possible process(es) that created the "pits" on the Moon. He



Drawing by Robert Hooke - 1665



Photo by Bill Cloutier - 2011

first dropped musket balls into tubs of tobacco-pipe clay and water. While the collisions created features much like Hooke had observed on the Moon, he dismissed the impact theory because he could not imagine where the bodies (impactors) would come from and how the Moon's surface could be so soft. Hooke's was next able to reproduce similar features with a boiling pot of Alabaster. He noticed that bubbles rising to the surface, once the pot had been removed from the fire, formed pits similar to those he had seen on the Moon, particularly under the illumination of a candle in a darkened room. This led Hooke to conclude that the Moon's pits (craters) had a volcanic origin.

Hooke is credited with several major improvements to the telescope and mounts. He was a keen observer, recording Jupiter's rotation and surface features on Mars, and it is likely that his observational experiments were the basis for Newton's law of universal gravitation. His contributions to science were not limited to astronomy. Hooke is credited with the invention of the universal joint, iris camera diaphragm, and an early prototype of the respirator. Hooke was also a distinguished architect and surveyor for the City of London after the Great Fire of 1666.

Mars at Opposition

The term "Opposition" is used in astronomy to indicate an arrangement of celestial bodies. For a planet located beyond Earth's orbit, for example Mars, Opposition occurs when Mars is on the opposite side of the Earth from the Sun. At Opposition, Mars will rise in the east as the Sun sets in the west. It is also a time when Mars makes



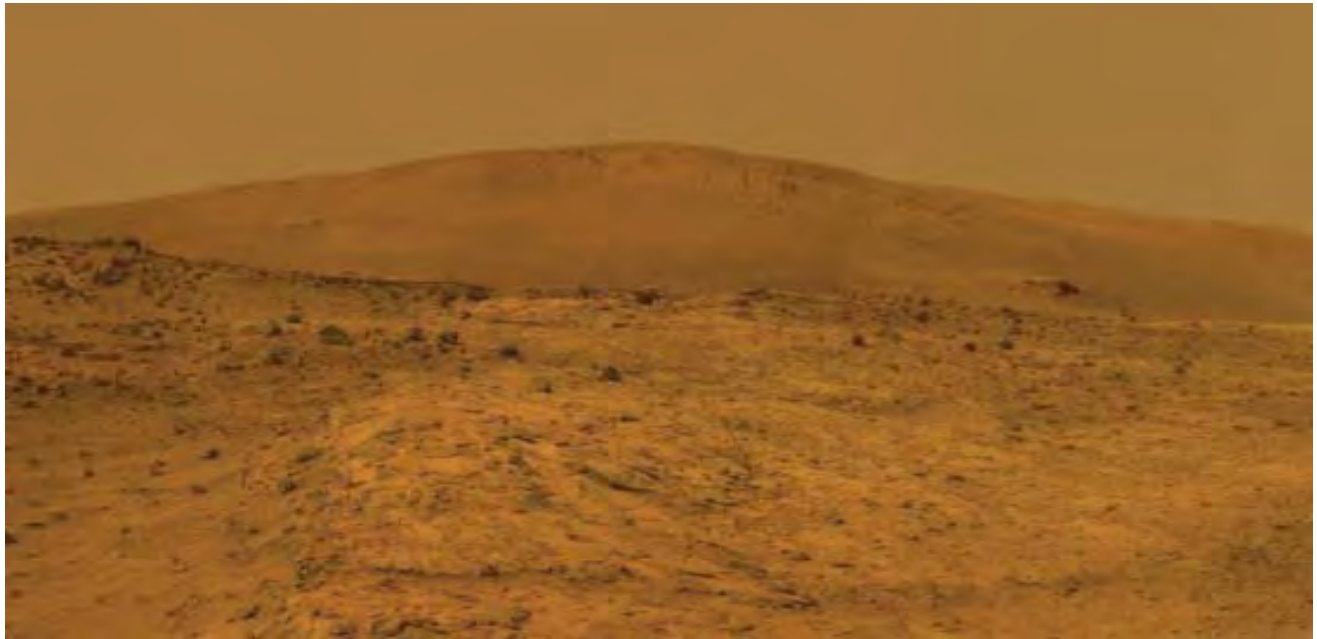
Planetary arrangement on March 3rd
Solar System Live by John Walker

its closest approach to Earth (which occurs approximately once every 25 to 26 months).

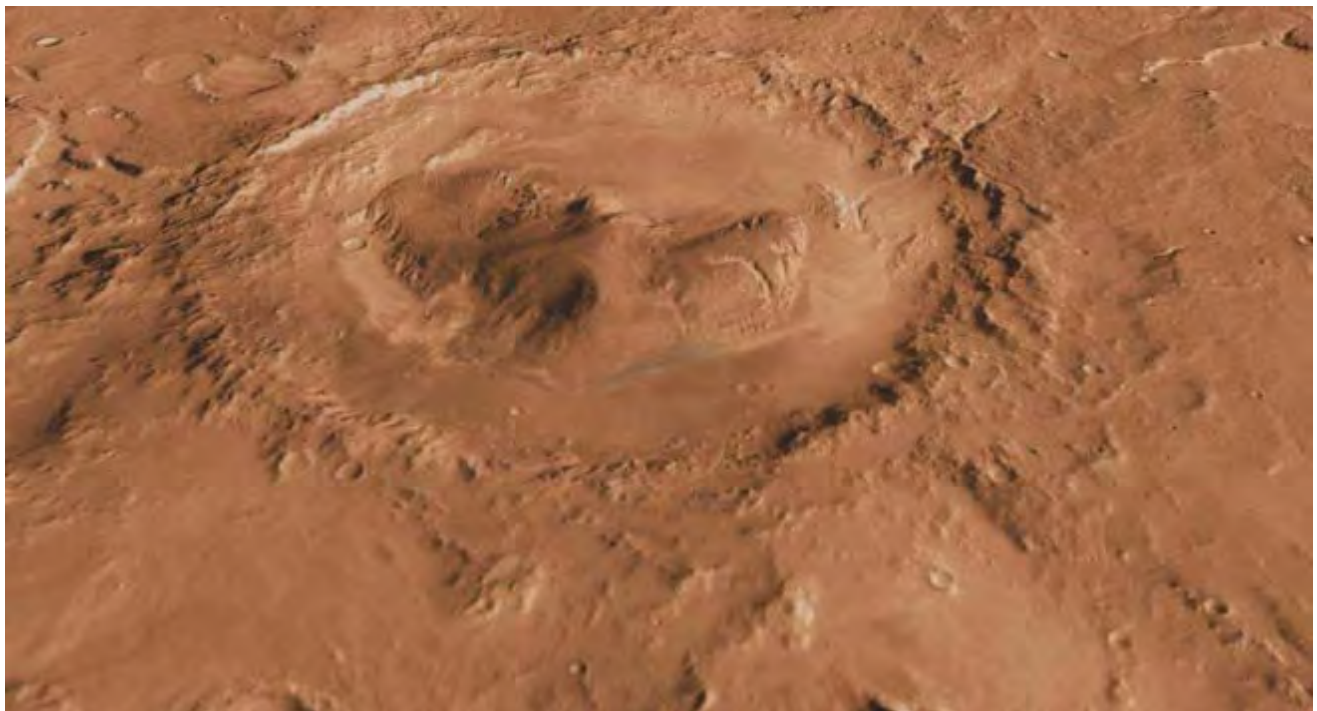
Due to Mars' highly elliptical orbit (as compared to the Earth), the distance between the two planets can vary considerably from one Opposition to the next. For example, in 2003, Mars made one of its closest approaches (34.6 million miles), while in 2012 the distance will be almost

double (62.6 million miles). As a result, for Earth-bound viewers, the planet will appear much smaller this time around than in the recent past.

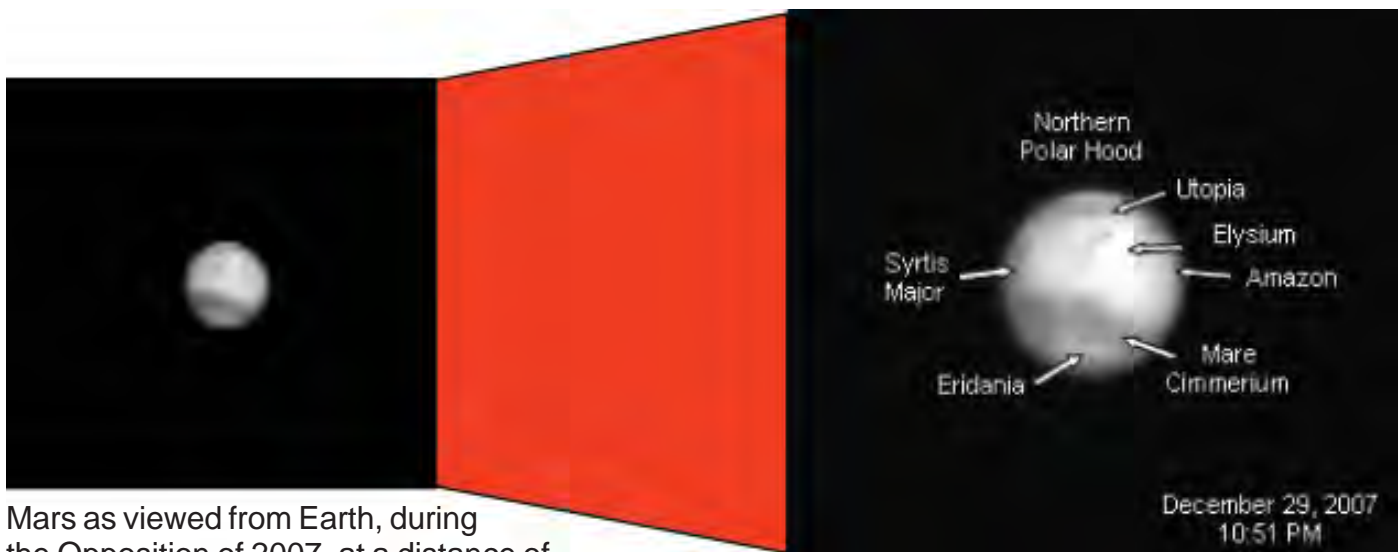
Mars can be found in the constellation Leo this year when it reaches Opposition on March 3rd. The following views of Mars start with a postcard vista and conclude with an image from an Earth-bound telescope.



Panorama from the winter haven (2008) of the Mars Exploration Rover Spirit Image credit: NASA/JPL/Cornell



Composite image of Gale Crater from observations by NASA's Mars Odyssey orbiter and the Mars Reconnaissance Orbiter. The crater is the target of the Mars Science Laboratory currently in route and scheduled to land near the foothills of the central peak in August of this year. Image Credit: NASA/JPL-Caltech/ASU/UA



Mars as viewed from Earth, during the Opposition of 2007, at a distance of approximately 54.8 million miles through an 11-inch Schmidt-Cassegrain telescope (Image: Bill Cloutier)



Decked in its Polar Hood of clouds, the Red Planet was captured by the Hubble Space Telescope in a particularly close Opposition
Image Credit: NASA and the Hubble Heritage Team (STScI/AURA)

New Moon Map

China's space agency has released a high-resolution map of the Moon generated from photos taken by its Chang'e-2 lunar orbiter. While the Lunar Reconnaissance Orbiter (U.S.) can produce images at higher

resolution, Chinese officials claim that their lunar map is the highest-resolution view of the entire Moon.

The Chinese map was produced from photos taken in October of 2010 and in May of 2011 at altitudes of 100 kilometers (60 miles) and 15 kilometers (9 miles). The map will be used in evaluating landing sites for future missions.

Sinus Iridium (Bay of Rainbows) is an area of particular interest for China's next stage of lunar exploration (a soft landing) and, as such, was the prime photographic target during the low altitude orbits. An unmanned, soft- lunar landing by Chang'e-3 is planned for some time in 2013. China's long term plans also include a manned mission to the lunar surface.

Images are available at <http://www.space.com/14536-china-moon-map-change-2-images.html>.

GRACE

As the two GRACE spacecraft commence their mapping of the Moon's gravity field, another set of spacecraft have been performing a similar mission in Earth orbit. For ten years the GRACE spacecraft have been measuring the loss of ice on the Earth's land surfaces and the resulting rise of the global sea level.

Much like GRAIL, the GRACE satellites fly in tandem and track changes in the gravity field that result from minute regional variations in mass. Over a seven year period (2003 to 2010), satellite measurements have shown that 1,000 cubic miles of ice (or 4.3 trillion tons) have been lost to the oceans from the glaciers in Greenland, Antarctica and other land forms.

ASTRONOMY—TELESCOPES

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120 **ASTRONOMY IS A SPACE AGE HOBBY**



Long before there was Celestron or Meade, there was Edmund Scientific. Norman Edmund started out (as Edmund Salvage Corporation) reselling war surplus optics out of his home. The company grew and expanded into a provider of commercial optics, scientific instruments, and educational and instructional apparatus, including telescopes. Norman Edmund passed away in January at the age of 95.

On the left is a page out of the Edmund Scientific catalog from 1969. On the right is a 40+ year old Palomar model, as advertised. The telescope, purchased in the late 1960s with earnings from a paper route, had been languishing in the basement for several decades. Parts had been scavenged for other projects and the steel base used to support a barn door star tracker. With news of Norman's passing, a day was spent going through boxes of telescope parts, eyepieces, and other fittings (the diagonal turned up in a box of old photos). Dust and grime were gently removed from the primary mirror, exposing a couple of spots where the aluminized coating has failed, but all in all, not too bad for its age. By day's end, the original Kellner eyepieces with the accompanying Barlow

lens had been located, missing screws and nuts replaced (with a trip to Taylor's Hardware), and the mirror returned to its proper place. Someday, it may yet again gaze upon the starry night sky as it did when man last stepped upon the Moon.

The Power of Reading

The National Education Association's *Read Across America* national reading celebration takes place each year on or around March 2nd, the birthday of Dr. Seuss. Theodor Seuss Geisel, the creator of such characters as The Cat in the Hat, understood the power of the imagination to entertain, inspire and educate.

Many of NASA's engineers and the Apollo astronauts grew up reading science fiction stories of space exploration and alien worlds. In many instances, the stories led them to pursue educations in science, technology, engineering and math.

The Apollo 15 astronauts went so far as to name several craters and other features around their landing site after references in various science fiction classics including *Dune* (Frank Herbert), *Dandelion* (Ray Bradbury),

Source: NASA



Crater Dune at the Apollo 15 landing site

docked with the Russian space station, Mir. She also served as the Science Director from 2004 to 2007 at the NASA Ames Research Center for the Kepler (planet finding) space telescope.

Dr. Voss became hooked on science fiction in sixth grade when she read Madeleine L'Engle's *A Wrinkle in Time*. It was after reading that story that she decided she wanted to become an astronaut. It was also the start of a life-long interest in reading and, in particular, science fiction which filled her book shelves at home.



NASA Photo

Dr. Janice Voss (1956 - 2012)

William Borucki, a principal investigator for the Kepler mission, recalls that "Whenever anyone mentioned a science fiction story, Janice would pull out a small notebook that she carried to see if she had already read the story. If she hadn't read the story, it would quickly be added to her list to read."

Janice Voss passed away on Feb. 6, 2012 at the age of 55 after losing a battle with cancer.

March History

Caroline Herschel was born in Hanover, Germany on March 16, 1750, the fifth of six children. Her four brothers were brought up to be musicians like their father, a talented musician and bandmaster. Caroline's mother saw no need for a girl to be educated and preferred that Caroline become a house servant to the rest of the family. Unfortunately, Caroline contracted typhus at age 10. It permanently stunted her growth (she was just over four feet tall as an adult), further convincing her mother that she wouldn't amount to much.



Caroline's brother William escaped to England during the French occupation of Hanover in 1757. Her father Isaac, who had left to fight the French, returned home in poor health. Caroline lived at home as a servant until his death in 1767. Against her mother's will, she then left Hanover to join her brother William in England.

William Herschel was an accomplished musician although he gained considerable fame with his hobby as an astronomer and telescope maker. His reputation as a craftsman allowed him to quit his job as a musician and concentrate on astronomy. Caroline became her brother's apprentice, helping him design and build larger and more powerful telescopes. She also assisted her brother in recording his observations, sitting in a window and writing by candlelight while her brother called out what he saw through the telescope's eyepiece.

Astronomy became a full-time occupation when William discovered the planet Uranus in 1781 and received an annual endowment from King George III. When her brother was away, Caroline would use her own telescope to sweep the sky looking for comets. On August 1, 1786, Caroline discovered her first comet, the first comet to be discovered by a woman. Between 1786 and 1797 she would discover eight comets, as well as a number of deep sky objects.

With the marriage of William to Mary Pitt in 1788 and the birth of their son John in 1792, Caroline became involved in the education of her nephew. Under his father's and aunt's tutelage, John would become the first astronomer to thoroughly survey the southern hemisphere. Following William's death in 1822, Caroline continued to assist John in his astronomical work.

Caroline catalogued every discovery she and William made. Two of her catalogues are still in use today. She lived to be 98 and was recognized by the King of England, the Royal Astronomical Society, the King of Prussia and the King of Denmark for her life-long scientific achievements. After her death, Caroline Herschel was honored by the astronomical community by the naming of a lunar crater after her (C. Herschel) and an asteroid (281) Lucretia (her middle name).

Winter Favorite

A favorite observing target in the winter sky is NGC 891, an edge-on spiral galaxy discovered by Caroline Herschel in August 1783. Located at a distance of 31



million light years, NGC 891 is also called the "Outer Limits" galaxy since its image was used in the closing credits of the classic 1960s science fiction television show of the same name. The galaxy can be found in the constellation Andromeda, in the direction of the constellation Perseus. NGC 891's size and mass are similar to our Milky Way Galaxy. In this nearly edge on view, the dust lanes in the spiral arms can be clearly seen. Still visible in March, look for the galaxy shortly after sunset in the western sky with a moderately-sized telescope.

More March History

On March 16, 1926, in Auburn, Massachusetts, Robert Goddard launched the first liquid fueled rocket. A graduate of Worcester Polytechnic Institute, despite discharging a

powder rocket from the basement of the physics building, the significance of Goddard's feat is compared by space flight historians to the first aircraft flight at Kitty Hawk. Among his achievements, Goddard was first to prove that rockets would work in a vacuum and to mathematically explore the practicality of using rocket propulsion to reach high altitudes and even the Moon (1912). While he was eventually banished from the fields of Auburn by the fire marshal, the site is commemorated by markers on what is now the Pakachoag Golf Course. The next time you're traveling on the Massachusetts Turnpike towards Boston and points north, look to your left as you pass Exit 10. Just beyond the large shopping mall is where history was made.

Zodiacal Light

The solar system is filled with tiny dust particles from the passing of comets and collisions of asteroids. The dust orbits in the same plane as the Earth and the other planets. Shortly before sunrise and just after sunset, sunlight can be seen reflecting off this disk of debris. Called the zodiacal light, it is best observed when the ecliptic (the apparent path of the Sun and planets) is nearly perpendicular to the horizon (on spring evenings and autumn mornings). The best time to glimpse the zodiacal light is when the Moon is absent from the evening sky (for example, between March 14th and 22nd).

Comet History

Sixteen years ago we were treated to the first of what would be two spectacular comets. Comet Hyakutake made its close approach to Earth in March of 1996. The comet was visible high overhead, throughout most of the night. Its tail could be traced halfway across a darkened sky.

The picture on the right was taken on March 27, 1996, at 2:30 a.m. as the coma of the comet passed Polaris, the



North Star. The comet was truly a ghostly apparition. Its eerie iridescence was reminiscent of the glow-in-the-dark stars that you stick to a child's bedroom ceiling. The night was so quiet, you wondered if the comet's appearance was somehow responsible. Who knew that Hyakutake was a portent of another bright comet that would appear the following year?

March Nights

March, the month named for the planet Mars, denotes the end of the long winter nights. The Sun crosses the celestial equator at 1:14 am on the 20th, marking the Vernal Equinox and the beginning of the spring season in the northern hemisphere. If you have the opportunity to be in the Yucatan on this day, take a trip out to Chichen Itza to watch the Sun cast the shadow of a plumed serpent on the pyramid of Kukulcan.

As the month begins, Mars climbs into the sky as darkness falls, reaching maximum brightness and apparent size on the 3rd. While not a favorable Opposition (due to the

large distance between the Earth and Mars), keen observers should be able to discern the bright northern polar ice cap as well as the more distinctive dark surface markings in a medium-sized telescope.

Saturn reaches Opposition in April, so it's not too early to catch a glimpse of the ringed world. This year, Earth-bound observers will have a good view of Saturn's rings. With a diameter of 150,000 miles, its rings are usually visible in even small telescopes. However, for the past several years, the rings as viewed from Earth were nearly edge-on and, at times, invisible. This year, the rings have opened up, providing views of major ring subdivisions, gaps and shadows cast by the planet on the rings and the rings on the planet. You can find Saturn in the constellation Virgo.

Sunrise and Sunset

<u>Sun</u>	<u>Sunrise</u>	<u>Sunset</u>
March 1 st (EST)	06:28	17:45
March 15 th (EDT)	07:05	19:01
March 31 st	06:38	19:18

Astronomical and Historical Events

- 1st History: Soviet spacecraft Venera 13 lands on Venus and records first color panoramic views of the surface (1982)
- 1st History: discovery of Saturn's moon *Helene* by Pierre Laques and Jean Lecacheux from the Pic du Midi Observatory in the French Pyrenees; named after Helen of Troy (1980)
- 1st History: Soviet spacecraft Venera 3 lands (crashes) on Venus, becoming first spacecraft to impact the surface of another planet (1966)
- 2nd History: launch of the Rosetta spacecraft; scheduled to rendezvous with (and land on) Comet 67 P/Churyumov-Gerasimenko in 2014 (2004)
- 2nd History: launch of Pioneer 10, a Jupiter flyby mission (1972)
- 3rd Mars at Opposition
- 3rd History: ESA's Mars Express spacecraft executes the closest flyby of Mars' largest moon *Phobos*, coming within 50 km (30 miles) of the moon's surface (2010)
- 3rd History: Chinese National Space Agency announces the Chang'e lunar exploration program (2003)
- 3rd History: launch of Apollo 9 with astronauts James McDivitt, David Scott and Russell Schweikart in the first manned flight test of the lunar module (1969)
- 5th Mercury at its Greatest Eastern Elongation (separation from the Sun) at 18° in the evening sky
- 5th Comet C/2009 P1 (Garradd) closest approach to Earth (1.266 AU)
- 5th History: launch of the Air Force's second robotic space plane (X-37B) from the Cape Canaveral Air Force Station (2011)
- 5th History: Soviet spacecraft Venera 14 lands on Venus and uses a screw drill to obtain a surface sample that was determined to be similar to oceanic basalts on Earth (1982)
- 5th History: flyby of Jupiter by the Voyager 1 spacecraft (1979)
- 6th Distant flyby of Saturn's large moon *Titan* by the Cassini spacecraft
- 6th History: launch of the Kepler telescope from Cape Canaveral Air Force Station aboard a Delta II rocket; designed to survey nearby stars for Earth-size and smaller planets; detected 1,235 possible extra-solar planets in its first four months of operation (2009)
- 6th History: flyby of Comet Halley by Vega 1, a Soviet spacecraft (1986)
- 7th History: John Herschel born, first astronomer to survey the southern hemisphere (1792)

Astronomical and Historical Events (continued)

- 8th Full Moon (Full Worm Moon)
- 8th Distant flyby of Saturn's moon *Hyperion* by the Cassini spacecraft
- 8th History: maiden voyage of Europe's first unmanned cargo ship to the International Space Station; the Jules Verne was launched from Kourou, French Guiana aboard an Ariane 5 rocket; in addition to delivering supplies to the ISS, the cargo ship contained a manuscript by the 19th century French author and science fiction pioneer with computations of distances from Earth to several astronomical destinations, as well as to the center of the planet (2008)
- 8th History: flyby of Comet Halley by Susei, a Japanese spacecraft (1986)
- 8th History: discovery of rings around Uranus by NASA's airborne observatory (1977)
- 9th Distant flyby of Saturn's moon *Titan*, *Helene* and *Enceladus* by the Cassini spacecraft
- 9th Scheduled launch of the European Space Agency's third Automated Transfer Vehicle, named Edoardo Amaldi, from Kourou, French Guiana to the ISS
- 9th History: flyby of Comet Halley by Vega 2, a Soviet spacecraft (1986)
- 9th History: launch of the Soviet spacecraft Sputnik 9, with dog Chernushka (1961)
- 9th History: Yuri Gagarin born; first person to orbit the Earth in 1961 (1934)
- 10th Moon at perigee (closest distance from Earth)
- 10th **Second Saturday Stars - Open House at McCarthy Observatory**
- 10th Distant flyby of Saturn's moons *Prometheus*, *Epimetheus*, *Calypso* and *Rhea* by the Cassini spacecraft
- 10th History: Mars Reconnaissance Orbiter arrives at Mars (2006)
- 10th History: flyby of Comet Halley by Sakigake, a Japanese spacecraft (1986)
- 11th Daylight Saving Time – set clocks ahead one hour (United States)
- 11th Asteroid 5 Astraea at Opposition (9.0 magnitude)
- 11th History: launch of Pioneer 5 into solar orbit between the Earth and Venus; confirmed the existence of interplanetary magnetic fields (1965)
- 11th History: Urbain Leverrier born, mathematician and astronomer, predicted existence of Neptune (1811)
- 13th History: flyby of Comet Halley by Giotto, a European Space Agency spacecraft (1986)
- 13th History: discovery of Saturn's moon *Calypso* by Dan Pascu, P.K. Seidelmann, William Baum and D. Currie (1980)
- 13th History: Percival Lowell born, established observatory in Flagstaff, AZ to observe Schiaparelli's Martian "canali" and look for other signs of life (1855)
- 13th History: William Herschel discovers the planet Uranus; originally named Georgium Sidus by Herschel in honor of his patron, King George III of England (1781)
- 14th Last Quarter Moon
- 14th History: Stardust passes within 181 km (112 miles) of the nucleus of Comet Tempel 1 (2011)
- 14th History: John J. McCarthy Observatory issued Observatory Code Number 932 by the Minor Planet Center of the International Astronomical Union (2001)
- 14th History: Albert Einstein born, developed theories of mass to energy conversion and the curvature of space and time in large gravitational fields (1879)
- 14th History: Giovanni Schiaparelli born, director of the Milan Observatory and first to describe faint features on Mars as "canali" (1835)
- 16th History: third and final flyby of Mercury by the Mariner 10 spacecraft (the last of the Mariner probes); Mariner 10 was also the first spacecraft to use solar radiation pressure on its solar panels and the antenna for attitude control during flight (1975)
- 16th History: launch of Gemini 8 with astronauts Neil Armstrong and David Scott; first docking with another space vehicle, an unmanned Agena stage (1966)
- 16th History: launch of the first Titan II Intercontinental Ballistic Missile, also used as the launch vehicle for the manned Gemini spacecraft in the early 1960's (1962)

Astronomical and Historical Events (continued)

- 16th History: Robert Goddard launches first liquid-fuel rocket in Auburn, MA (1926)
- 16th History: Caroline Herschel born; see article on Page 12 (1750)
- 17th Dwarf Planet 136472 Makemake at Opposition (51.386 AU)
- 17th History: launch of the Gravity Recovery And Climate Experiment (GRACE) spacecraft (2002)
- 17th History: launch of Vanguard 1, 4th artificial satellite and oldest still orbiting Earth (1958)
- 17th History: Galileo Galilei publishes “Sidereus Nuncius” (Starry Messenger), the first scientific treatise based on observations made through a telescope; it described Galileo’s early observations of the Moon, the stars, and the moons of Jupiter (1610)
- 18th History: MESSENGER enters orbit around Mercury (2011)
- 18th History: New Horizons spacecraft (on its way to Pluto) crosses the orbit of Uranus (2011)
- 18th History: explosion during launch of a Vostok rocket carrying a military spy satellite kills 48 members of the Soviet Missile Troop; likely cause of explosion was an oxygen peroxide leak caused by the poor quality of the rocket’s fuel filters (1980)
- 18th History: Alexei Leonov performs first spacewalk from Soviet Voskhod spacecraft (1965)
- 19th History: Moon flyby by the Hiten spacecraft; Japan’s first lunar flyby, orbiter and surface impactor (1990)
- 20th Vernal Equinox, 1:14 am EDT
- 21st History: launch of Ranger 9, Moon impact mission; transmitted the highest resolution imagery obtained to that date before impacting the floor of Alphonsus crater on the 24th (1965)
- 22nd New Moon
- 22nd History: launch of space shuttle Atlantis (STS-76), third mission to Russian space station Mir and transfer of the first American woman, Shannon Lucid, to the station (1996)
- 23rd History: launch of Gemini 3 with astronauts Virgil Grissom and John Young, first manned Gemini flight (1965)
- 23rd History: Wernher von Braun born, German rocket scientist and leader of the U.S. moon program (1912)
- 23rd History: first photograph of the Moon taken by American astronomer J.W. Draper (1840)
- 25th History: launch of the IMAGE spacecraft, first mission dedicated to mapping the Earth’s magnetosphere (2000)
- 25th History: close approach of Comet Hyakutake (0.10 AU) to Earth (1996)
- 25th History: launch of Soviet spacecraft Sputnik 10 with dog Zvezdochka (1961)
- 25th History: Christiaan Huygens discovers *Titan*, Saturn’s largest moon (1655)
- 26th Moon at apogee (furthest distance from Earth)
- 27th Flyby of Saturn’s moon *Enceladus* by the Cassini spacecraft
- 27th Distant flyby of Saturn’s moons *Polydeuces*, *Prometheus* and *Janus* by the Cassini spacecraft
- 27th Venus at its Greatest Eastern Elongation (separation from the Sun) at 46° in the evening sky
- 27th History: launch of the Soviet atmospheric probe and lander Venera 8 to Venus (1972)
- 27th History: launch of Mariner 7, Mars flyby mission (1969)
- 27th History: President Eisenhower approves the military lunar program to be managed by the Advanced Research Projects Agency (1958)
- 28th Distant flyby of Saturn’s moon *Dione* by the Cassini spacecraft
- 28th History: flyby of Comet Halley by the ICE spacecraft (1986)
- 28th History: Heinrich Olbers discovers the Asteroid 2 Pallas (1802)
- 29th History: First flyby of Mercury by the Mariner 10 spacecraft (1974)
- 29th History: Heinrich Olbers discovers the Asteroid 4 Vesta (1807)
- 30th First Quarter Moon
- 31st History: launch of Soviet spacecraft Luna 10, first man-made object to go into orbit around another planetary body; detected evidence of mass concentrations on the Moon called “mascons” (1966)

References on Distances

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

International Space Station/Space Shuttle/Iridium Satellites

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

Solar Activity

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

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Page 3: Science fiction stories with a Mars theme superimposed on a photo of Mars taken by the NASA and the Hubble Heritage Team (STScI/AURA) Photo by Bill Cloutier

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

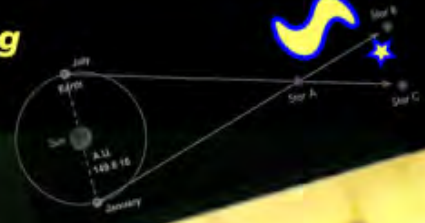
Second Saturday Stars

FREE EVENT

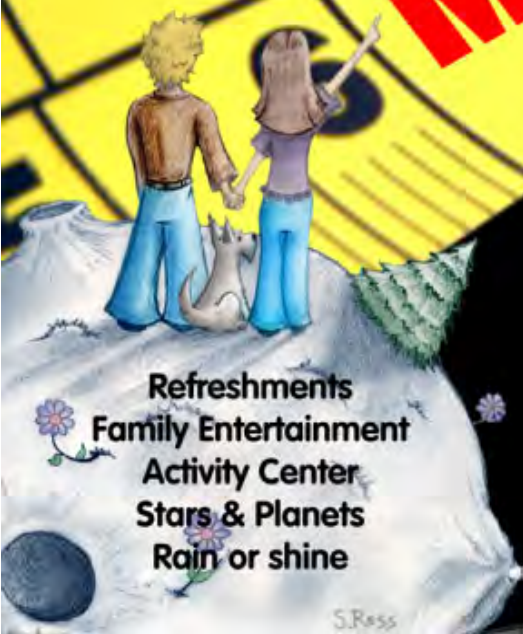
Every Month at the
John J. McCarthy Observatory
Behind the New Milford High School
860.946.0312

www.mccarthyobservatory.org

March 10th
7:00 - 9:00 pm



**MEASURING THE DISTANCE
IN THE UNIVERSE**



Refreshments
Family Entertainment
Activity Center
Stars & Planets
Rain or shine



March 2012

Celestial Calendar

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Phases of the Moon  Mar 1 Mar 8 Mar 14 Mar 22				1  Soviet spacecraft Venera 3 crashes on Venus. 1966 Venera 13 makes successful landing 1982 Saturn's moon Helene discovered by Pierre Laques and Jean Lecheux 1980	2  Launch of Pioneer 10 Jupiter flyby mission 1972 Launch of Rosetta spacecraft to comet 67 P/Churyumov-Gerasimenko 2004	3  Launch of Apollo 9; first test of lunar module 1969 ESA's Mars Express spacecraft close flyby of Martian moon Phobos 2010
4  Scheduled launch of Air Force's 2nd robotic space plane (X-37B) from Cape Canaveral Giovanni Schiaparelli, born 1835, first to describe Martian "canali"	5  Soviet spacecraft Venera 14 lands on Venus 1982  Voyager 1 flyby of Jupiter 1979	6  Flyby of comet Halley by Soviet Vega 1 spacecraft 1986  Launch of Kepler telescope, to search for exoplanets - 2009	7  John Herschel born, first astronomer to survey southern hemisphere 1792	8  Flyby of comet Halley by Japanese Suissei spacecraft 1986 Discovery of Uranus' rings by NASA Airborne Observatory 1977  Maiden voyage of the Jules Verne, Europe's first unmanned cargo ship to Int. Space station (2008)	9  Flyby of comet Halley by Soviet spacecraft 1986  Sputnik 9, with dog Chernushka 1961  Yuri Gagarin born (first to orbit Earth) 1934	10  Flyby of Comet Halley by Japanese Sakiyake spacecraft 1986  Mars Reconnaissance Orbiter arrives at Mars 2006  2nd Saturday Stars Open House McCarthy Observatory
11  Daylight Saving Time  Urban Leverrier born - Predicted existence of Neptune 1811  Launch of Pioneer 5 into solar orbit to study interplanetary magnetic fields 1965	12  Simon Newcomb born - Canadian-American astronomer, studied planetary motion 1855	13  Percival Lowell born 1855  Discovery of Uranus by William Herschel 1781  Flyby of Comet Halley by ESA spacecraft, Giotto 1986	14  Giovanni Schiaparelli born, first to observe Martian "canali" 1835  Albert Einstein born 1879  JMO earns Observatory Code 932 from IAU's Minor Planet Center for tracking of asteroid Geographos (2001)	15  Abbé Nicolas Louis de Lacaille born, French astronomer, catalogued southern hemisphere stars and constellations 1713	16  Robert Goddard first liquid fuel rocket 1926  First Titan 2 ICBM 1962  Caroline Hershel born, first woman astronomer 1750	17  Vanguard 1 artificial satellite 1958  Publication of <i>Siderews Nuncius</i> on Galileo's astronomical observations (later taken on 2008 Hubble repair mission) 1610
18  Alexei Leonov First Spacewalk 1965  Soviet Vostok rocket explodes during launch, killing 48 1980	19  Moon flyby by Japan's Hiten orbiter and impactor 1990	20  Vernal Equinox	21  Launch of Ranger 9 Moon impact mission 1965	22  Shannon Lucid, first American woman on Russian Space Station 1996	23  Launch of Gemini 3 (Grissom, Young) - 1965  Wernher von Braun born 1912  First photo of Moon by J.W. Draper 1840	24  Planet Pluto (now dwarf planet) officially named by Lowell Observatory, on suggestion of Oxford schoolgirl, Venetia Burney (1930)
25  Comet Hyakutake 1996  Christiaan Huygens, discoverer of Titan born 1655  Launch of IMAGE spacecraft, first to study Earth's magnetosphere (2000)	26  French mathematician and discoverer of Neptune, Urban Jean Joseph Le Verrier, proposes existence of a new planet Vulcan within orbit of Mercury (1859)	27  Eisenhower approves military lunar program - 1958  Launch of Mariner 7 Mars flyby mission - 1969	28  Flyby of Halley's Comet by ICE spacecraft 1986	29  First flyby of Mercury by the Mariner 10 spacecraft 1974	30  Launch of Soyuz TMA-21 from Baikonur Cosmodrome, Kazakhstan, carrying three members of the Expedition 27 crew to the ISS	31  Launch of Soviet spacecraft Luna 10, first to orbit Moon - 1966