

# **G**alactic Observer

John J. McCarthy Observatory

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March 2013

## *The Whirlpool Galaxy*

*Distinguished by their long, swirling tentacles, spiral galaxies make up almost two-thirds of our local universe. The Whirlpool Galaxy (NGC 5194) is considered an "interacting grand design" spiral - its extended arms thought to be held in place by powerful density waves and tugged outward by gravitational forces from a neighboring galaxy, NGC 5195 (see inset).*

*About thirty million light years from Earth and 60 thousand light years across, the Whirlpool is easily viewed with binoculars in the northern hemisphere within the constellation Canes Venatici.*

*Image Source: NASA/Hubble*



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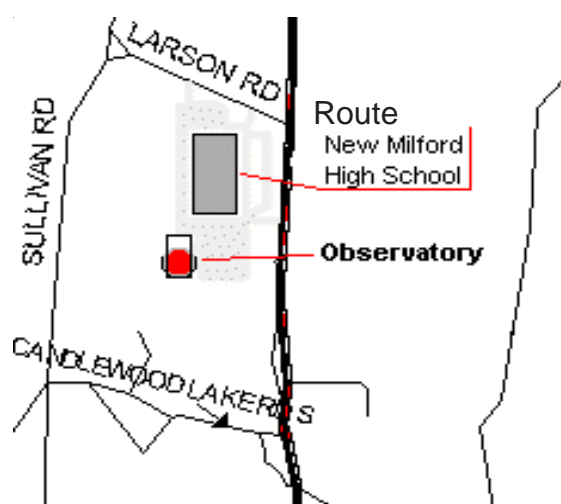
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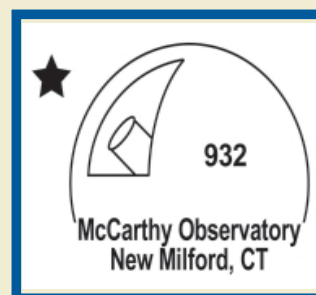
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## In This Issue

OUT THE WINDOW ON YOUR LEFT .....	3	SUNRISE AND SUNSET .....	11
CASSINI AT SUNRISE .....	4	ASTRONOMICAL AND HISTORICAL EVENTS .....	11
HEAVEN AND EARTH .....	5	REFERENCES ON DISTANCES .....	14
ICE IN THE MOST UNLIKELY PLACE .....	5	INTERNATIONAL SPACE STATION AND IRIIDIUM SATELLITES .....	14
COMET PANSTARRS UPDATE .....	6	SOLAR ACTIVITY .....	14
ASTROPHOTOGRAPHY .....	7	COVER CREDITS .....	14
TWIST OF FATE .....	7	MARCH GRAPHIC CALENDAR .....	17
COMET HISTORY .....	8	SECOND SATURDAY STARS .....	18
MARCH HISTORY .....	8		
THE POWER OF READING .....	9		
MORE MARCH HISTORY .....	10		
WINTER FAVORITE .....	11		
ZODIACAL LIGHT .....	11		
MARCH NIGHTS .....	11		
EASTER AND THE FULL MOON .....	11		

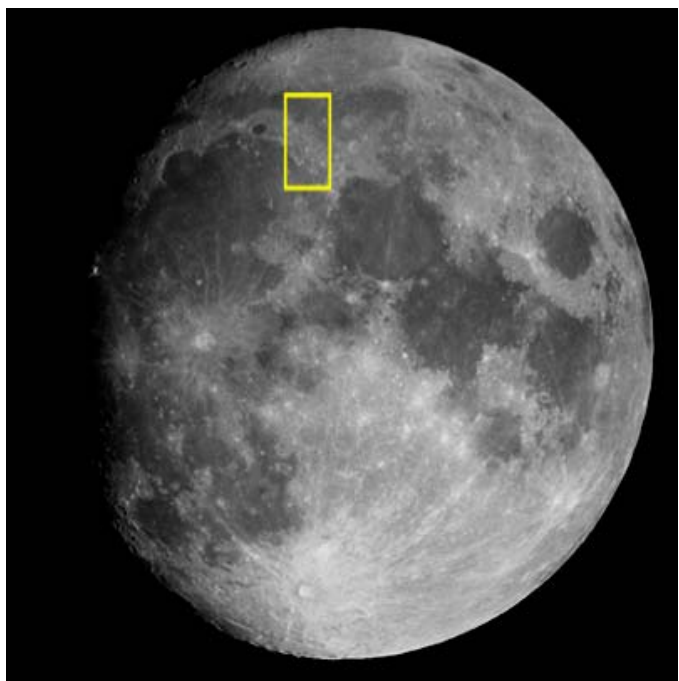


## March Astronomy Calendar and Space Exploration Almanac



## "Out the Window on Your Left"

It's been more than 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 pro-



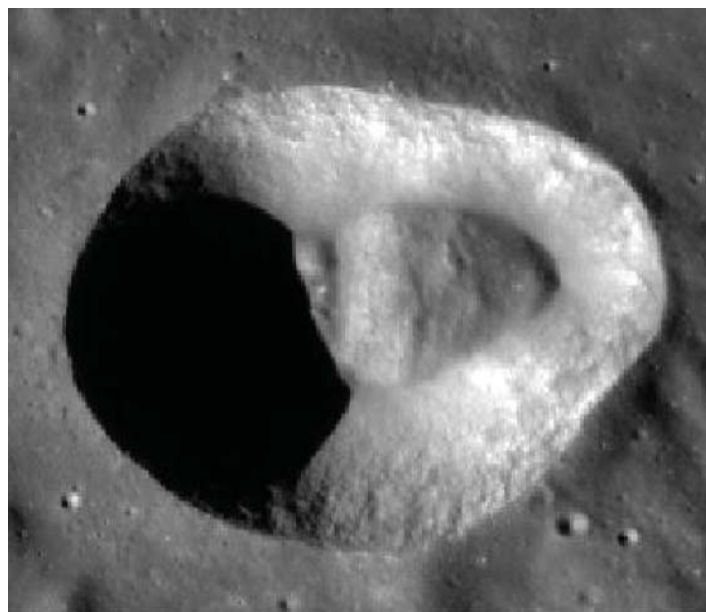
Lunar mare or "seas" are actually expansive low-lying plains formed by ancient lava flows

vide some thoughts to ponder when planning your visit (if only in your imagination).

The Sun's first rays, after a two week long absence, illuminate the rim of the crater Cassini, as well as that of the smaller Cassini A, located within the confines of the larger crater. Cassini is located on the shore of Mare Imbrium (the Sea of Showers), at the conjunction of the lunar Alps and Caucasus mountains that form the northeastern arc of the Imbrium impact basin's rim. The 36 mile (57 km) diameter Cassini was created after the Imbrium basin but is less than a mile in depth, having been flooded by later Imbrium lava flows.

Formation of the 9 mile (15 km) diameter Cassini A crater is more enigmatic. An oblique impact or closely-spaced multiple impacts are among the theories offered for its oblong shape shown in the Lunar Reconnaissance Orbiter image.

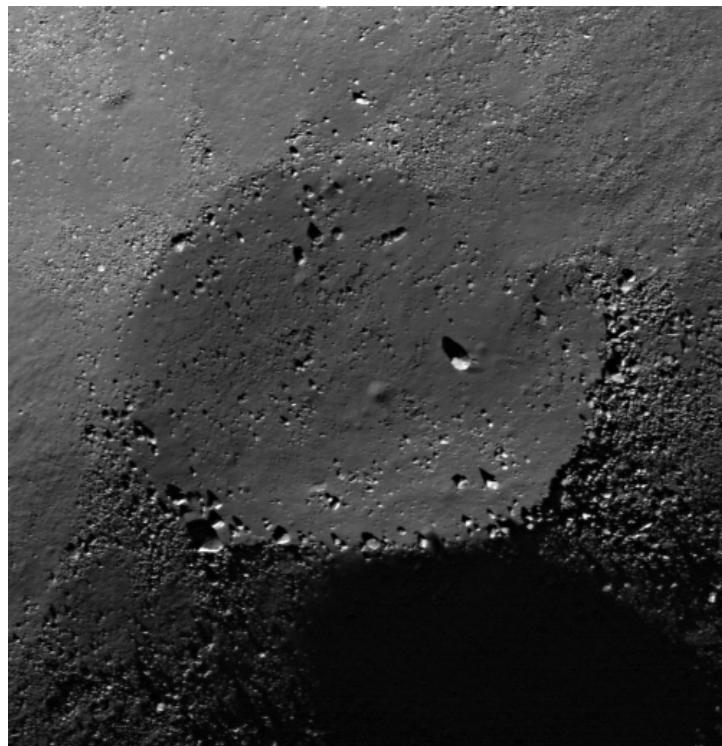
The low Sun angle in the image on the following page accentuates the gash that bisects the Alps northwest of Cassini. The rift valley, Vallis Alpes or the



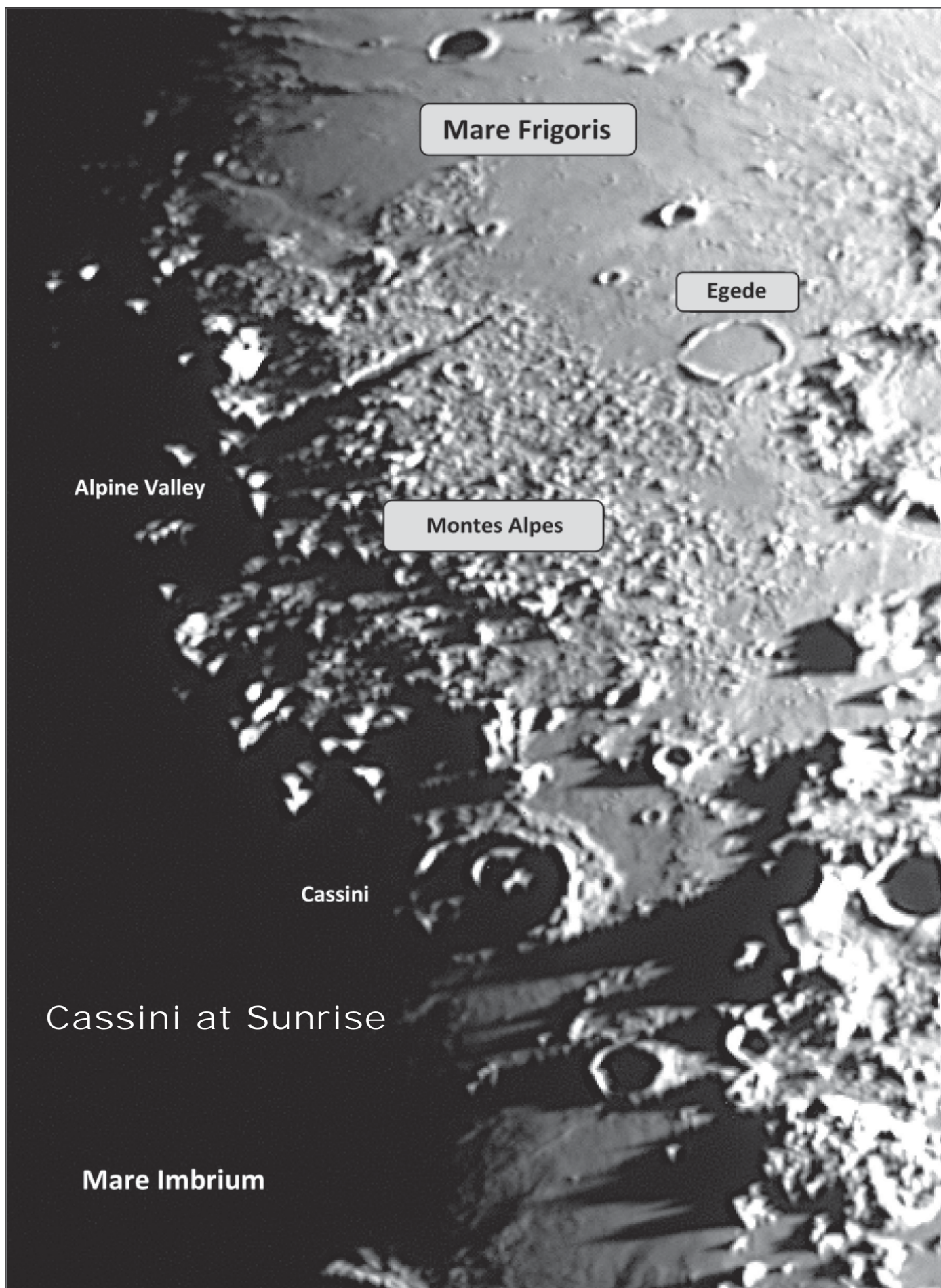
Lunar Reconnaissance Orbiter image of Cassini A  
Credit: NASA/GSFC/Arizona State University

Alpine Valley, likely formed when the ground was thrust downward between parallel faults running from Mare Imbrium to Mare Frigoris (Sea of Cold). Under a high Sun, a central rille can be seen running the length of the valley.

Mare Frigoris is an elongated mare running from Mare Serenitatis (Sea of Serenity) to Oceanus Procellarum (Ocean of Storms). It is believed to be associated with the formation of Procellarum basin.



The floor of a 1.2-km diameter crater in the Mare Frigoris Constellation region. Credit: NASA/GSFC/Arizona State University



Cassini at Sunrise

## Heaven and Earth

Friday, February 15<sup>th</sup> was a busy day for space traffic. While the eyes of the world were focused on the passage of asteroid 2012 DA14 only 17,200 miles above the Earth's surface, the residents of Chelyabinsk, Russia, spent the morning picking up pieces of broken windows and collapsed walls from a smaller asteroid or meteoroid (smaller piece of an asteroid) that came much closer. The Chelyabinsk asteroid entered the Earth's atmosphere from a direction opposite that of asteroid 2012 DA14 and is therefore believed to be unrelated to the larger asteroid. Before hitting the Earth's atmosphere, the Chelyabinsk asteroid is estimated to have been approximately 55 feet (17 meters) across with a mass of 10,000 tons. During its brief passage through the atmosphere, the term "meteor" is used to describe the object.

The meteor broke apart 12 to 15 miles (20 to 25 km) above Earth's surface, unleashing a 500 kiloton blast. Flying shrapnel (mostly broken glass) from buildings damaged by the shock wave resulted in more than 1,000 injuries.

The trail of the Chelyabinsk meteor through the atmosphere was captured by several cameras on the ground,

and by a weather satellite. Small fragments of the meteor (meteorites) were possibly recovered by scientists with the Urals Federal University on a nearby, frozen lake. Initial indications are that the meteorites are chondrites, or stony meteorites. While one Russian lawmaker blamed the United States for the "attack," the meteor is believed to have originated from the outer asteroid belt.

Fireballs were also reported in the skies above Cuba and San Francisco. While likely unrelated, it is a reminder that 37,000 to 78,000 tons of cosmic debris (mostly dust-sized particles) are estimated to rain down upon the Earth every year.

## Ice in the Most Unlikely Place

Twenty-nine million miles from the Sun, at its closest approach, and with surface temperatures that can reach 800°F, Mercury is the last place you would expect to find ice. While the Arecibo radio telescope had detected highly reflective areas near the poles in 1991, confirmation that it might be due to ice deposits had to wait for the MESSENGER spacecraft to arrive on orbit in March 2011.

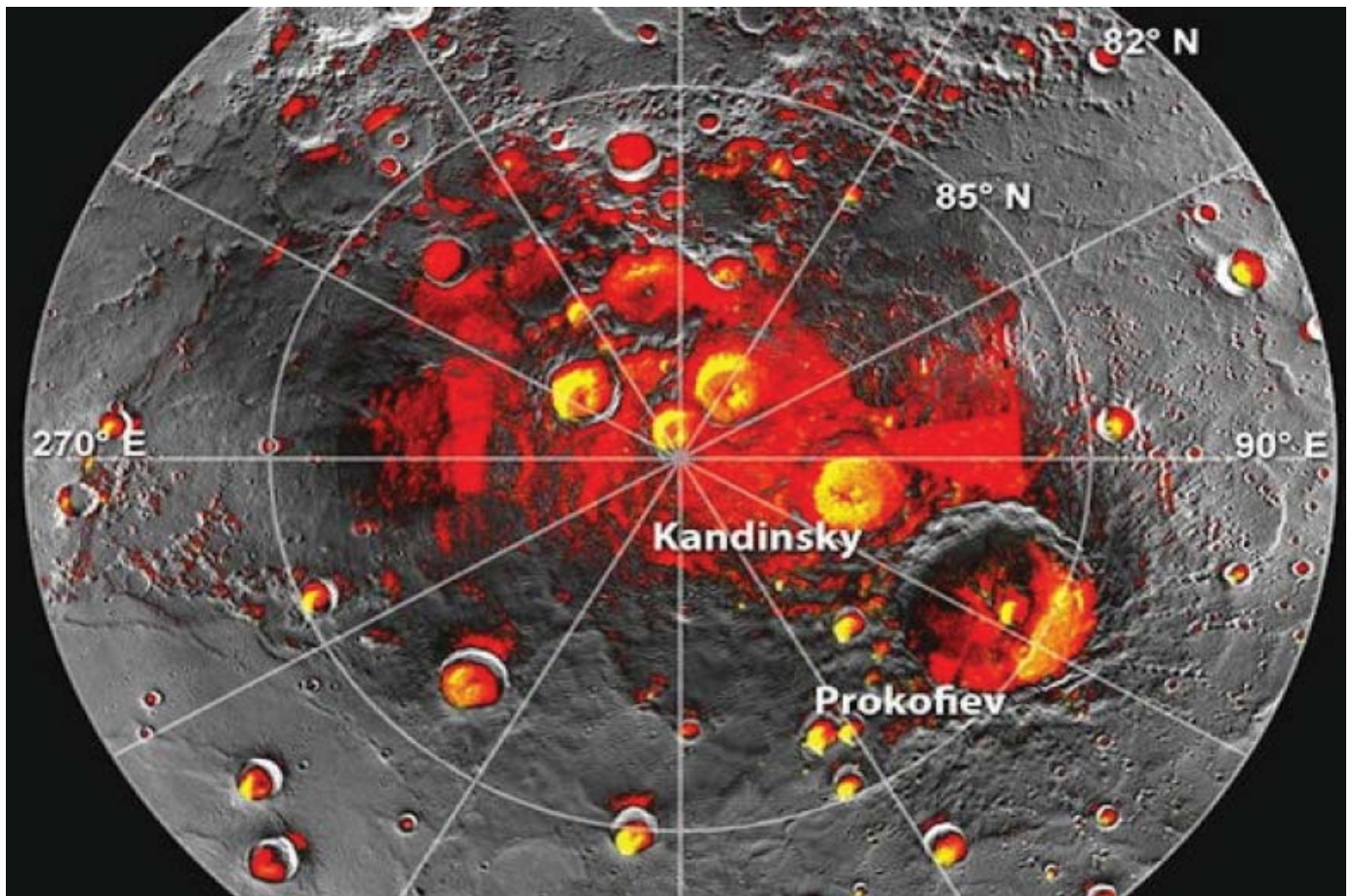


Image Credit: NASA/Johns Hopkins University Applied Physics Laboratory/Carnegie Institution of Washington/National Astronomy and Ionosphere Center, Arecibo Observatory

The image of Mercury's north pole shows areas (in red) that appear to be in permanent shadow from the images taken by MESSENGER to date. The yellow represents the highly reflective areas detected by Arecibo and other radio telescopes and correspond to crater floors or north facing crater walls in the MESSENGER images. The spacecraft, using neutron spectroscopy, has confirmed high levels of hydrogen (which can be correlated to water-ice) within these same areas, making it likely that ice exists just below Mercury's surface layer.

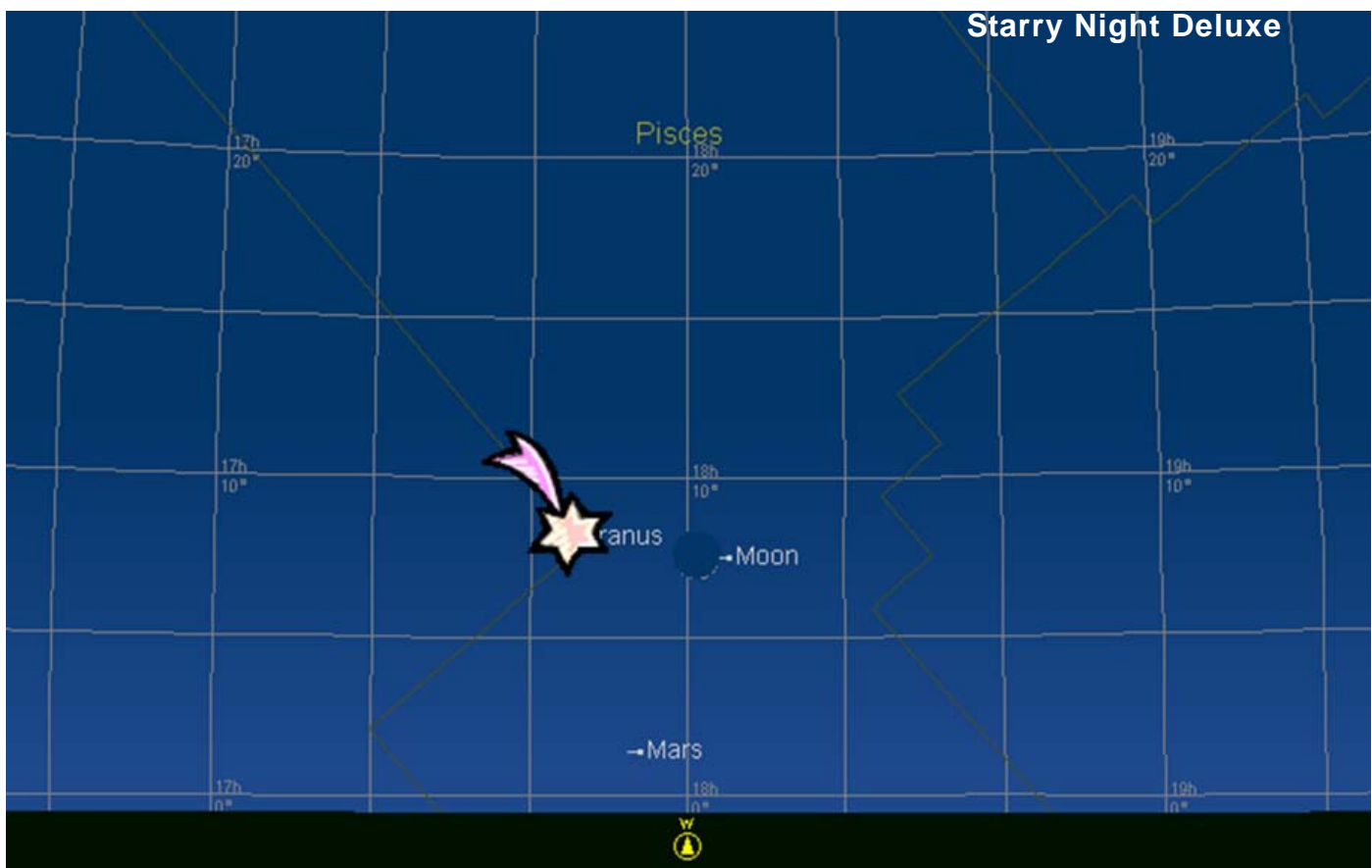
### Comet PanSTARRS Update

Currently enjoyed by observers in the southern hemisphere, comet PanSTARRS (C/2011 L4) will move into the evening sky for northern observers in early March.

While initial predictions were promising, the brightening of the comet as it nears the Sun has slowed. Current predictions are that the comet will only reach 3<sup>rd</sup> magnitude, at best, at perihelion (closest approach to the Sun) on the 10<sup>th</sup>.

The middle two weeks of March will offer your best opportunity to catch a glimpse of the comet. At its brightest, it will be very low on western horizon (less than 10°), just after sunset. Although it will climb higher each day as it moves to the northwest, it is expected to fade to below naked-eye visibility by the end of the month.

The comet has developed a broad dust tail and a small, but growing, ion tail. The dust tail fans out along the path of the comet, while the ion tail points directly away from the Sun.

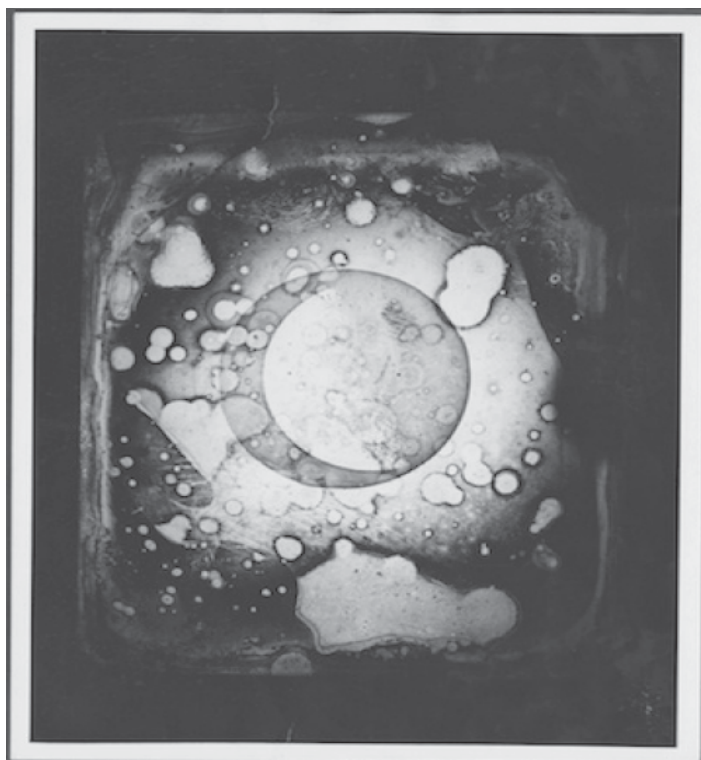


### Astrophotography

With the invention of a commercially available photographic process in 1837 by Louis-Jacques-Mandé Daguerre came the first attempts at astrophotography. The daguerreotype process, named after its inventor, produced a fragile image on a silvered copper plate. Exposure times were long, initially limiting its application to landscapes and still lifes. Advances in chemistry increased plate sensi-

tivity and permitted shorter exposures, but lighting remained an issue.

In addition to the challenges of the infant technology, astrophotographers had to contend with the motion of the Earth, tracking errors, and relatively faint celestial targets. Consequently, early attempts were on brighter objects like the Moon and Sun. Even so, many initial attempts produced results so unsatisfactory that many astro-photographers aban-



Lunar daguerreotype mirror-reversed image of the last quarter Moon by J.W. Draper

doned efforts until more sensitive emulsions became available.



John W. Draper

John W. Draper is credited with the first successful image of a celestial object (the Moon). After earlier, unsuccessful attempts, Draper imaged the Moon from his rooftop observatory at New York University on March 23<sup>rd</sup> and again on March 26, 1840. The 20+ minute exposure was taken with a 5-inch reflector.

### Twist of Fate

On March 3, 1969, a Saturn V rocket carried the crew of Apollo 9 into Earth orbit for the first manned flight test of the lunar module. The ten day mission was the most complex mission that had been conducted with two manned spacecraft, including the evaluation and testing of the first spacecraft designed to operate solely outside the Earth's atmosphere, a spacewalk, rendezvous and docking exercises, and the test firing of the lunar module's descent engine. The successes of Apollo 9 paved the way for the lunar landing missions that followed.

A year earlier, the crew of Apollo 9 (astronauts James McDivitt, David Scott and Russell Schweikart) had been assigned to Apollo 8, with the same mission objectives. However, by mid-year 1968, it was clear that the lunar lander, due to numerous manufacturing and technical concerns, would not be ready for a year-end flight. With a growing concern that the Soviets were ready to begin flying their new Soyuz spacecraft again (after a fatal accident on its first flight), NASA decided to send Apollo 8 on a flight around the Moon without the lunar lander. McDivitt considered the mission no more than a publicity stunt and turned it down, opting to switch with the Apollo 9 crew in anticipation that the lunar lander would then be available for that flight. McDivitt's decision would ultimately determine who would be the first to walk on the Moon, as the backup crew for Apollo 8 would become the prime crew for Apollo 11. With the crew switch, Pete Conrad went from the commander of Apollo 11 to the commander of Apollo 12 and from the first to the third person to walk on the Moon.

### Comet History

Seventeen 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 following page 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 (Hale-Bopp) that would appear the following year?

### 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.

### The Power of Reading

The National Education Association's *Read Across America* national reading celebration takes place each year on or around March 2<sup>nd</sup>, 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.



Crater Dune at the Apollo 15 landing site: NASA Photo

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), *Earthlight* (Arthur Clarke), *St. George* (Jules Verne), *Durins Bridge* (Tolkien) and *Rhysling* after a Robert Heinlein character in *The Green Hills of Earth*.

Joe Allen, Mission Scientist and EVA

CapCom on Apollo 15, quoted Heinlein's fictional blind poet Rhysling as David Scott and Jim Irwin wrapped up their final lunar excursion and prepared the lunar module Falcon for their return to orbit. In the transcripts, Allen tells the astronauts that "we're ready for you to come back again to the homes of men on the cool green hills of Earth."



Dr. Janice Voss (1956 - 2012)  
NASA Photo

Prior to the launch of STS-125 in May 2009, I had the opportunity to interview one of several astronauts made available to the press. I requested time with Dr. Janice Voss because we had something in common: we both grew up reading science fiction.

Dr. Voss worked for Orbital Sciences Corporation before being selected as an astronaut in 1990. She was a veteran of five shuttle missions, logging over 49 days in space and traveling 18.8 million miles in 779 Earth orbits. One of her more memorable moments as an astronaut was on STS-63, in February 1995, when the shuttle 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.

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.

### More 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.

### 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 4<sup>th</sup> and 11<sup>nd</sup>).

### 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 7:02 am on the 20<sup>th</sup>, 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.

Saturn reaches Opposition in late 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, approximately every 15 years (twice during Saturn's 29½ year orbit around the Sun), the Earth crosses the plane of Saturn's rings. During a ring crossing, the rings are seen edge-on

(appearing to disappear). Since 2009 (the last ring crossing), the rings have continued to "open 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, not far from the bright star Spica.

### Easter and the Full Moon

Although the Christian celebration of Easter is always on a Sunday, the date can vary by more than a month. Unlike many religious observances which are associated with a particular calendar date, Christian churches use a method developed by Pope Gregory XIII to establish the annual date of Easter. As a general rule, Easter falls on the first Sunday that follows the first full moon that occurs on or after the vernal equinox. It is important to note that the church has its own method of determining when the moon is full and the church has also fixed the date of the vernal equinox as March 21<sup>st</sup>. Consequently, the church's date of Easter may be different than if determined using more precise astronomical data.

This year (2013), the vernal equinox occurs on the morning of March 20<sup>th</sup>. The next full moon occurs on March 27<sup>th</sup>. Easter, therefore, falls on the following Sunday (31<sup>st</sup>).

According to the Church's ecclesiastical rules for determining the date, Easter can occur no earlier than March 22<sup>nd</sup> or later than April 25<sup>th</sup>.

### Sunrise and Sunset

<u>Sun</u>	<u>Sunrise</u>	<u>Sunset</u>
March 1 <sup>st</sup> (EST)	06:28	17:44
March 15 <sup>th</sup> (EDT)	07:05	19:01
March 31 <sup>st</sup>	06:38	19:18

## Astronomical and Historical Events

- 1<sup>st</sup> Scheduled launch of Space X's cargo-carrying spacecraft (Dragon) to the International Space Station
- 1<sup>st</sup> History: Soviet spacecraft Venera 13 lands on Venus and records first color panoramic views of the surface (1982)
- 1<sup>st</sup> 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)
- 1<sup>st</sup> History: Soviet spacecraft Venera 3 lands (crashes) on Venus, becoming first spacecraft to impact the surface of another planet (1966)
- 2<sup>nd</sup> History: launch of the Rosetta spacecraft; scheduled to rendezvous with (and land on) Comet 67 P/Churyumov-Gerasimenko in 2014 (2004)
- 2<sup>nd</sup> History: launch of Pioneer 10, a Jupiter flyby mission (1972)
- 3<sup>rd</sup> 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)

### Astronomical and Historical Events (continued)

- 3<sup>rd</sup> History: Chinese National Space Agency announces the Chang'e lunar exploration program (2003)
- 3<sup>rd</sup> 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)
- 4<sup>th</sup> Last Quarter Moon
- 5<sup>th</sup> Moon at perigee (closest distance from Earth)
- 5<sup>th</sup> Comet C/2011 L4 (PANSTARRS) closest approach to Earth (1.097 AU)
- 5<sup>th</sup> History: launch of the Air Force's second robotic space plane (X-37B) from the Cape Canaveral Air Force Station (2011)
- 5<sup>th</sup> 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)
- 5<sup>th</sup> History: flyby of Jupiter by the Voyager 1 spacecraft (1979)
- 6<sup>th</sup> History: launch of the Kepler telescope from Cape Canaveral Air Force Station aboard a Delta II rocket (2009); designed to survey nearby stars for Earth-size and smaller planets; 105 confirmed planets and 2,740 candidates (2013)
- 6<sup>th</sup> History: flyby of Comet Halley by Vega 1, a Soviet spacecraft (1986)
- 7<sup>th</sup> History: John Herschel born, first astronomer to survey the southern hemisphere (1792)
- 8<sup>th</sup> 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 19<sup>th</sup> 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)
- 8<sup>th</sup> History: flyby of Comet Halley by Susei, a Japanese spacecraft (1986)
- 8<sup>th</sup> History: discovery of rings around Uranus by NASA's airborne observatory (1977)
- 9<sup>th</sup> **Second Saturday Stars - Open House at McCarthy Observatory**
- 9<sup>th</sup> Flyby of Saturn's moon *Rhea* by the Cassini spacecraft
- 9<sup>th</sup> History: flyby of Comet Halley by Vega 2, a Soviet spacecraft (1986)
- 9<sup>th</sup> History: launch of the Soviet spacecraft Sputnik 9, with dog Chernushka (1961)
- 9<sup>th</sup> History: Yuri Gagarin born; first person to orbit the Earth in 1961 (1934)
- 10<sup>th</sup> Daylight Saving Time - set clocks ahead one hour (United States)
- 10<sup>th</sup> Comet C/2011 L4 (PanSTARRS) reaches perihelion – closest approach to the Sun (0.302 AU)
- 10<sup>th</sup> History: Mars Reconnaissance Orbiter arrives at Mars (2006)
- 10<sup>th</sup> History: flyby of Comet Halley by Sakigake, a Japanese spacecraft (1986)
- 11<sup>th</sup> New Moon
- 11<sup>th</sup> History: launch of Pioneer 5 into solar orbit between the Earth and Venus; confirmed the existence of interplanetary magnetic fields (1965)
- 11<sup>th</sup> History: Urbain Leverrier born, mathematician and astronomer, predicted existence of Neptune (1811)
- 12<sup>th</sup> Asteroid 29 Amphitrite at Opposition
- 13<sup>th</sup> History: flyby of Comet Halley by Giotto, a European Space Agency spacecraft (1986)
- 13<sup>th</sup> History: discovery of Saturn's moon *Calypso* by Dan Pascu, P.K. Seidelmann, William Baum and D. Currie (1980)
- 13<sup>th</sup> History: Percival Lowell born, established observatory in Flagstaff, AZ to observe Schiaparelli's Martian "canali" and look for other signs of life (1855)
- 13<sup>th</sup> History: William Herschel discovers the planet Uranus; originally named Georgium Sidus by Herschel in honor of his patron, King George III of England (1781)
- 14<sup>th</sup> History: Stardust passes within 181 km (112 miles) of the nucleus of Comet Tempel 1 (2011)
- 14<sup>th</sup> History: John J. McCarthy Observatory issued Observatory Code Number 932 by the Minor Planet Center of the International Astronomical Union (2001)
- 14<sup>th</sup> History: Albert Einstein born, developed theories of mass to energy conversion and the curvature of space and time in large gravitational fields (1879)

## Astronomical and Historical Events (continued)

- 14<sup>th</sup> History: Giovanni Schiaparelli born, director of the Milan Observatory and first to describe faint features on Mars as “canali” (1835)
- 15<sup>th</sup> History: San Juan Capistrano Meteorite Fall; the largest piece (50.5 g) penetrated the aluminum roof of a carport in a mobile-home park (1973)
- 16<sup>th</sup> 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)
- 16<sup>th</sup> History: launch of Gemini 8 with astronauts Neil Armstrong and David Scott; first docking with another space vehicle, an unmanned Agena stage (1966)
- 16<sup>th</sup> 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)
- 16<sup>th</sup> History: Robert Goddard launches first liquid-fuel rocket in Auburn, MA (1926)
- 16<sup>th</sup> History: Caroline Herschel born (1750)
- 17<sup>th</sup> History: launch of the Gravity Recovery And Climate Experiment (GRACE) spacecraft (2002)
- 17<sup>th</sup> History: launch of Vanguard 1, 4<sup>th</sup> artificial satellite and oldest still orbiting Earth (1958)
- 17<sup>th</sup> 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)
- 18<sup>th</sup> Moon at apogee (furthest distance from Earth)
- 18<sup>th</sup> History: MESSENGER enters orbit around Mercury (2011)
- 18<sup>th</sup> History: New Horizons spacecraft (on its way to Pluto) crosses the orbit of Uranus (2011)
- 18<sup>th</sup> 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)
- 18<sup>th</sup> History: Alexei Leonov performs first spacewalk from Soviet Voskhod spacecraft (1965)
- 19<sup>th</sup> First Quarter Moon
- 19<sup>th</sup> Asteroid 14 Irene at Opposition (8.3 Magnitude)
- 19<sup>th</sup> Dwarf Planet 136472 Makemake at Opposition (51.435 AU)
- 19<sup>th</sup> History: Moon flyby by the Hiten spacecraft; Japan’s first lunar flyby, orbiter and surface impactor (1990)
- 20<sup>th</sup> Vernal Equinox (beginning of the Spring season in northern hemisphere) at 7:02 am EDT
- 21<sup>st</sup> 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 24<sup>th</sup> (1965)
- 22<sup>nd</sup> 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)
- 23<sup>rd</sup> History: launch of Gemini 3 with astronauts Virgil Grissom and John Young, first manned Gemini flight (1965)
- 23<sup>rd</sup> History: Wernher von Braun born, German rocket scientist and leader of the U.S. moon program (1912)
- 23<sup>rd</sup> History: first photograph of the Moon taken by American astronomer J.W. Draper (1840)
- 25<sup>th</sup> History: launch of the IMAGE spacecraft, first mission dedicated to mapping the Earth’s magnetosphere (2000)
- 25<sup>th</sup> History: close approach of Comet Hyakutake (0.10 AU) to Earth (1996)
- 25<sup>th</sup> History: launch of Soviet spacecraft Sputnik 10 with dog Zvezdochka (1961)
- 25<sup>th</sup> History: Christiaan Huygens discovers *Titan*, Saturn’s largest moon (1655)
- 27<sup>th</sup> Full Moon (Full Worm Moon)
- 27<sup>th</sup> History: launch of the Soviet atmospheric probe and lander Venera 8 to Venus (1972)
- 27<sup>th</sup> History: launch of Mariner 7, Mars flyby mission (1969)
- 27<sup>th</sup> History: President Eisenhower approves the military lunar program to be managed by the Advanced Research Projects Agency (1958)

### Astronomical and Historical Events (continued)

- 28<sup>th</sup> Scheduled launch of a Soyuz spacecraft from the Baikonur Cosmodrome in Kazakhstan to the International Space Station with members of the next expedition crew
- 28<sup>th</sup> History: flyby of Comet Halley by the ICE spacecraft (1986)
- 28<sup>th</sup> History: Heinrich Olbers discovers the Asteroid 2 Pallas (1802)
- 29<sup>th</sup> History: First flyby of Mercury by the Mariner 10 spacecraft (1974)
- 29<sup>th</sup> History: Heinrich Olbers discovers the Asteroid 4 Vesta (1807)
- 30<sup>th</sup> Moon at perigee (closest distance from Earth)
- 31<sup>st</sup> Easter Sunday
- 31<sup>st</sup> Mercury at its Greatest Western Elongation (separation from the Sun) at 28° in the morning sky
- 31<sup>st</sup> 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 ( $1^\circ$ ); three fingers span approximately five degrees ( $5^\circ$ )
- One astronomical unit (AU) is the distance from the Sun to the Earth or approximately 93 million miles

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

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

### Solar Activity

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

### Image Credits

**Front page design and graphic calendars:** Allan Ostergren

**Page 1:** The Whirlpool Galaxy: a digital combination of a ground-based image from the 0.9-meter telescope at Kitt Peak National Observatory and a space-based image from the Hubble Space Telescope highlighting sharp features normally too red to be seen. Image Credit: NASA/Hubble.

**Page 3:** The McMath-Pierce Solar Telescope at the Kitt Peak National Observatory outside of Tucson, Arizona. A heliostat on top of the 100 foot tall vertical tower tracks the Sun, sending the image down the two hundred foot long slanted shaft to an underground viewing chamber. Photo by Bill Cloutier

**Second Saturday Stars poster:** Sean Ross, Ross Designs

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

# March 2013

## Celestial Calendar

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

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

Betelgeuse

**March 9th**  
**7:00 - 9:00 pm**

Belatrix

# ORION

Mintaka

Alnilam

Alniltak

Barnard Loop

## The Constellation That Has It All

M42

M43

Rigel

Salph

Map



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