Galactic Observer John J. McCarthy Observatory

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Belly of the Beast

At the center of the Milky Way galaxy, a gas cloud is on a perilous journey into a supermassive black hole. As the cloud stretches and accelerates, it gives away the location of its silent predator. For more information, see page 9 inside, or go to http://www.nasa.gov/ centers/goddard/news/topstory/2008/ blackhole_slumber.html.

Credit: NASA/CXC/MIT/Frederick K. Baganoff et al.

SGR A*

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It is through their efforts that the McCarthy Observatory has established itself as a significant educational and recreational resource within the western Connecticut community.

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January Astronomy Calendar and Space Exploration Almanac

Scale Model of the New Horizons Spacecraft by Don Ross





http://www.mccarthyobservatory.org

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 <u>http://www.nasa.gov/mission_pages/</u> 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 <u>http://stardustnext.jpl.nasa.gov/</u>		
17 Mar 2011	MESSENGER enters orbit around Mercury		First spacecraft to achieve orbit around Mercury; see <u>http://messenger.jhuapl.edu/</u>		
18 Mar 2011	New Horizons spacecraft crosses the orbit of Uranus		4+ more years to Pluto; see <u>http://pluto.jhuapl.edu/</u>		
16 Jul 2011	Dawn spacecraft arrives at the asteroid Vesta		Orbit achieved; see <u>http://dawn.jpl.nasa.gov/</u>		
05 Aug 2011	Launch of the Juno spacecraft to Jupiter		Successful launch/deployment; see <u>http://missionjuno.swri.edu/</u>		
10 Sept 2011	Launch of twin GRAIL spacecraft to map Moon's gravitational field		Successful launch/deployment; see <u>http://solarsystem.nasa.gov/grail/</u>		
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 <u>http://marsprogram.jpl.nasa.gov/msl/</u>		
05 Aug 2012	MSL lands on Mars				

Other notable events:

- August 9, 2011 Opportunity reached the rim of Endeavour crater
- March 3, 2012 Mars at Opposition
- April 15, 2012 Saturn at Opposition
- May 20, 2012 Annular Solar Eclipse (visible in southwest U.S.)
- June 6, 2012 Venus Transit (visible before sunset on the east coast)
- July 2012 Dawn spacecraft leaves Vesta for Ceres

"Out the Window on Your Left"

It's been 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 spacefaring 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 Fra Mauro region comes into view this month, just south of the crater Copernicus. Blanketed with ejecta from the impact that created the Imbrium basin to the north, the area was targeted for study and sampling by the Apollo 13 crew. NASA subsequently retargeted Apollo 14 after the Apollo 13 mission was aborted. The area was also visited by Apollo 12 to the west and the Ranger 7 spacecraft to the south (Mare Cognitum).

Apollo 14 astronauts Alan Shepard and Edgar Mitchell landed just to the north of the partially lava-flooded Fra Mauro crater. During two lunar excursions, 42 kilograms (93 pounds) of rock was collected. This last "walking" mission (before an electric powered rover was brought along) included an attempted traversal to the rim of Cone crater, while dragging a tool cart. The young crater was large enough to penetrate the surrounding regolith and expose a more ancient geology. While the astronauts were not able to reach the rim (Lunar Reconnaissance Orbiter photos show that they were only 30 meters from the rim when they turned back), they did manage to collect rock samples that provided a definite age for the Imbrium impact (3.85 billion years ago).

The landing site shown on the following page is covered with furrowed material deposited by the Imbrium impact. Rilles (grooves or channels) and ridges traverse the craters Fra Mauro, Parry and Bonpland to the south. Commander Alan Shepard was the oldest astronaut, and the only one of the original Mercury Seven astronauts, to walk on the Moon. He persevered, despite being grounded for four years with a medical issue. His crew was originally scheduled to fly Apollo 13, but was replaced in 1969 with the more experienced crew led by Jim Lovell, in the likelihood that Apollo 11 and 12 failed in their landing attempts.

Shepard is famous for stowing away a makeshift six iron golf club and two golf balls. He took several one-handed swings, claiming that he hit the second ball "miles and miles and miles."



LRO Spectacular

AUNCHED IN JUNE 2009, the Lunar Reconnaissance Orbiter (LRO) has provided the most detailed view of the Moon's surface since astronaut Gene Cernan stowed his camera and climbed aboard the Apollo 17 lunar module for the last time. With the ability to resolve individual instrument packages left behind by the Apollo astronauts, LRO's seven instruments have acquired almost 200 terabytes of data. The information gathered by LRO has produced detailed maps of lunar topography, created temperature profiles, shown the distribution of potential ice deposits, as well as geologic details of impact features. In November of 2011, LRO flew over the Aristarchus plateau only 26 km (16.2 miles) above the surface. This recently released image of the western wall of the Aristarchus crater shows amazing detail on the 3,000 meter (9800 feet) high wall of terraced pre-impact crust, including dark streaks of impact melt and the bright crustal rocks.



Revisiting a Family Album

Anyone who has looked through an old family photo album can appreciate the intrinsic beauty of film, as well as its limitations, long before instant cameras and picture previews provided immediate gratification. The Johnson Space Center and Arizona State University's School of Earth and Space Exploration have teamed to digitize the images taken by the Mercury and Gemini astronauts with their Hasselblad medium format cameras. High resolution scans of the film negatives from the missions are available at *http://tothemoon.ser. asu.edu/gallery/gemini*. Browsing through the photos is reminiscent of those old family pictures, including images that are blurry, overexposed, haphazard, as well as those photos with only a part of the subject (leg or arm) in the field of view. A couple of my favorites from the Gemini XII mission that was launched in November of 1966 are shown below and on the following page.

The first image shows the Agena Target Vehicle (ATV), an unmanned and modified upper rocket stage. It was used during the Gemini program to develop proficiencies in rendezvous and docking in preparation of the Apollo program. The interest in this particular photo is that the crew of Gemini XII met up with the ATV in Earth orbit without its rendezvous radar (see next photo).



The second image shows Captain Edwin "Buzz" Aldrin sitting inside the Gemini XII spacecraft, illuminated by lights from the control panel and sunlight from the small window in the hatch. Gemini XII was the 10th and final manned Gemini flight and one of the more successful. The crew rendezvoused and docked with the ATV and demonstrated that astronauts could work and perform simple tasks while outside the spacecraft without the challenges experienced by previous crews (for example, overheating and exhaustion).

Note the floating pipe and the slide rule by Aldrin's right hand. When the spacecraft's rendezvous radar failed, Aldrin successfully calculated the proper coordinates and course corrections with a sextant, charts, **slide rule** and a pencil. Aldrin's ability to locate and rendezvous with the ATV alleviated concerns NASA had should a similar failure occur in lunar orbit.



Feeding Time for Our Black Hole

At the center of the Milky Way galaxy is a black hole estimated at four million times the mass of our Sun (fortunately Earth is located 26,000 light years from the galactic center). While astronomers cannot directly see the black hole, they do see the effects of the black hole's mass/gravity on nearby stars, as well as a stream of radiation around the black hole produced by in-falling material. Unlike many galaxies with active black holes spewing high energy jets of radiation, the Milky Way's black hole is relatively quiet. That may soon change as astronomers have detected



A Simulation of gas cloud after close approach to the black hole at the center of the Milky Way galaxy. For more information, go to *http://www.eso.org/public/news/eso1151/* Source: European Southern Observatory (ESO).

a large cloud of gas on a collision course with the black hole. The cloud, three times the mass of the Earth, is accelerating and breaking up as it approaches the black hole. The cloud is projected to reach the black hole's event horizon (the point of no return) sometime in 2013. It is estimated that it will take ten years for the black hole to completely devour the cloud. In the meantime, astronomers will have a ringside seat on the feeding frenzy.

Course Correction for the Red Planet

On January 11th, the Mars Science Laboratory successfully executed a course correction that places it on schedule for an August 6th encounter. The three hour series of engine burns also lined up the spacecraft with its landing site on Mars (Gale crater). When launched, the spacecraft and its rocket booster, traveling along with the spacecraft, were intentionally placed on a course so as to miss Mars. This was done so that the booster, which was not sterilized to the same degree as the spacecraft, would not impact and contaminate the Red Planet. The course correction puts the two vehicles on separate trajectories, with the booster safely passing by Mars.

New Horizons

The New Horizons spacecraft still has a way to go before it reaches Pluto in 2015, but it's getting closer (750,000 miles closer each day). The spacecraft crossed the orbit of Uranus in March 2011, and will cross Neptune's orbit in August 2014 before arriving at Pluto and its four moons. The four moon include a newly discovered moon temporarily designated P4 that resides between the orbits of Nix and Hydra.

The spacecraft left Earth on January 19, 2006. Traveling at ten times faster than a speeding bullet, it only took nine hours for the spacecraft to pass the Moon's orbit (a three day trip for the Apollo astronauts in 1969) and another year to Jupiter. Still, with the vastness of the outer solar system, it still had another 8½ years to go after passing Jupiter before it will reach the dwarf planet.

The New Horizons spacecraft is expected to reach Pluto on July 14, 2015 before heading out into the Kuiper Belt, a broad disk of icy worlds left over from the formation of the solar system. The 1,000 pound spacecraft is about the size of a grand piano, and it is equipped with seven instruments that will photograph and analyze Pluto and its large moon Charon. Two of the cameras on the spacecraft are named Ralph and Alice after a bickering couple on a classic television show called the "Honeymooners." Being so far away from the Sun, the spacecraft is powered by the heat from a nuclear generator; solar panels are inadequate.



Source: Johns Hopkins University APL New Horizons Mission

An Advocate for "Planet" Pluto

Planetary Scientist Alan Stern has been fighting to reinstate Pluto as a planet since it was demoted by a small minority of the members of the International Astronomical Union (IAU) in 2006. Stern is also the principal investigator with NASA's New Horizons mission to Pluto.

His argument targets one of the three new criteria for an object to be classified as a planet (and the one criterion that Pluto doesn't meet): "A 'planet' is a celestial body that ... (c) has cleared the neighbourhood around its orbit."

Stern contends that none of the remaining planets within the solar system have fully cleared their orbital zones, with many sharing their orbits with asteroids (including the Earth, Mars, Jupiter, and Neptune). He also has a problem with the implication of the IAU's criteria. The further the distance a planet is from the Sun, the larger it needs to be to clear its orbital zone (since the zone becomes larger with distance). The implication is that small planets, such as Mercury, Mars or even Earth, couldn't clear their orbital zone, if placed at Pluto's distance from the Sun. Conversely, would Pluto be considered a planet if it orbited close enough to the Sun to clear its orbital zone?

Stern believes that an object shouldn't be classified based upon its size, location or an unscientific need to limit planetary membership. He likes to use the "Star Trek" test for planethood: as you approach a celestial body in your spacecraft and it looks like a planet (and not a rock, moon, comet, another spacecraft, or star), it's a planet.

In July 2015, as the New Horizons spacecraft makes its closest approach to Pluto. I expect that many of us will apply that same test.

February History

Eighty-two years ago on February 18th, a young American astronomer named Clyde Tombaugh discovered the solar system's ninth planet while working at the Lowell Observatory in Flagstaff, Arizona.

Clyde Tombaugh was born on an Illinois farm in February 1906, the eldest of six children. His family moved to a wheat farm in Kansas in 1922. At age 22, with only a high school diploma, Clyde spent most of his time working the family farm. In his spare time he would grind and test telescope mirrors in the farm's underground cellar. In 1928, Clyde sent several of his drawings that he had made of Mars and Jupiter through his homemade telescope to the Lowell Observatory. By chance, the observatory had just acquired a 13-inch telescope and was looking for a dedicated amateur to conduct photographic surveys of the night sky. With only enough money for a one-way ticket, Clyde left Kansas for Arizona in January of 1929. Thirteen months later, and after photographing millions of stars, he would discover Planet X (its designation before being officially named).

Clyde Tombaugh died in 1997. His wife and his family attended the launch of New Horizons. Making the journey to Pluto along with the spacecraft are the ashes of the astronomer.

Venetia Phair, an 11 year old girl from England, suggested the name Pluto for the newly discovered planet. Her grandfather, who was the head librarian at Oxford University, passed the suggestion along to the American astronomers. Venetia, a retired school teacher, passed away in 2009 at the age of 90, but remains the only woman in the world to have named a planet (even if it's only a Dwarf Planet today). Venetia wasn't the only family member to have named a celestial object; her great uncle named the moons of Mars (Phobos and Deimos).

Compared to the size of the parent planet, Pluto has the largest moon in the solar system (the pair is sometimes referred to as a "double planet"). Charon was discovered in 1978 by the American astronomer James Christy and named for the boatman who ferried dead souls across the river Styx to Hades (Pluto's domain). Charon is more than half the size of Pluto. It is also only 12,000 miles from Pluto (compared to 238,000 miles for Earth's moon). As such, in the dark and frozen sky at the edge of our solar system, Charon would appear more than 7½ times larger in Pluto's sky than our moon appears in the Earth's sky.

Supernovas

A supernova is an explosion produced when a massive star exhausts its fuel and collapses. These collapsing stars are typically red supergiants at least 8 times more massive than our Sun. If the original star is less than 20 solar masses, the supernova leaves behind a neutron star,

approximately 10 to 17 kilometers (6-10 miles) across, a teaspoon of which weighs 200-400 million tons. (More massive stars can collapse into black holes.) One of the more famous remnants of a supernova is the Crab Nebula, visible with a moderate telescope in the winter sky in the constellation Taurus.

Many of the supernovas that occur in the



Hubble Heritage Team (NASA/STScI/AURA) Milky Way Galaxy are obscured from our view by gas and dust. On average, one supernova is detected in our galaxy every century (undetected supernovas may occur every 25 to 50 years, based upon our observations of other galaxies). Supernovas can become so bright that they overwhelm their host galaxies for weeks. In the last thousand years, there were four supernovas in the Milky Way that were well documented: a star in the constellation Lupus in the year 1006, one in the constellation Taurus in 1054 (described by Chinese astronomers), one in Cassiopeia in 1572 (observed by Tycho Brahe), and another in Ophiuchus in 1604 (studied by Johannes Kepler).

One of the most scrutinized supernovas occurred within the Large Magellanic Cloud, a satellite galaxy to the Milky Way. In February 1987, a star exploded near the Tarantula nebula some 169,000 light years away. It was the first time that astronomers had detailed observations, not only of the supernova, but of the star before it exploded. The most unusual feature of Supernova 1987A is the circumstellar rings of material seen expanding from the dying star. Since the rings are only moving at a speed of 70,000 to 100,000 miles per hour (much slower than the material ejected in the supernova explosion), scientists theorize that the material was expelled before the supernova when the star was still a red giant.

As Dr. Carl Sagan reminded us: "We are star-stuff." Almost all of the elements in our universe were created inside stellar factories (nucleosynthesis). However, elements heavier than iron are only created in the final moments of the collapse of a massive star and detonation of the core. So the next time that you admire your gold jewelry, remember that though it may have come from your favorite jeweler, those gold atoms were created by a nearby supernova.

A Star Cluster for Trekkies

The constellation Orion dominates the winter sky and provides many rich observing targets for even the smallest telescope. It also contains some lesser known (and viewed) celestial gems. Just northwest of Orion's bow or shield is a small open star cluster (NGC 1662). With only a few stars (less than 20) it is often overlooked in favor of the more spectacular clusters in nearby Auriga.

This 6th magnitude cluster was discovered and cataloged by William Herschel in 1794. What Sir William couldn't have imagined was that some observer, hundreds of years later, would associate this seemingly random pattern of stars as the running lights on a Klingon battlecruiser as it decloaked (see at right). It really



Image of the NGC 1662 taken at the McCarthy Observatory



Overlay of Klingon battlecruiser

doesn't matter how you connect the dots, just that you enjoy the wonders of the night sky, however small or trivial.Using your imagination can make that experience even more rewarding.

Soviet Moon Program

February marks the beginning of the end of the Soviet Moon program. While publicly denying its intentions to send cosmonauts to the Moon during the 1960s, Russia was secretly constructing rockets of mammoth proportions (rivaling the Saturn V). On February 21, 1969, the first N1 Moon rocket exploded during its test flight.

The launch of three more N1 rockets would fail before the Soviet government would abandon their manned-Moon program.



The historic photo above shows two N1 rockets on the pad at the Soviet Union's launch site at the Baikonur Cosmodrome (also known as Tyuratam) in Kazakhstan. The five stage rockets stood approximately 340 feet high with a first stage powered by 30 individual engines.

February Nights

The days grow longer in February, although the cold seems to linger. With the longer days comes a setting



sun that can now be appreciated by that portion of the working population that has spent the last two months driving back and forth to work in the dark.

With the setting Sun comes an opportunity to see an interesting atmospheric phenomenon: Sun pillars. As the Sun sets (or rises) hexagonal shaped ice crystals falling through the cold air can reflect the sunlight and produce dramatic and colorful columns of light. The photo on the right was taken at sunset in February 2002 from a ridge in Bridgewater, CT.

Sunrise and Sunset

<u>Sun</u>	<u>Sunrise</u>	<u>Sunset</u>
February 1 st (EST)	07:06	17:09
February 15 th	06:50	17:27
February 29th	06:29	17:44

Astronomical and Historical Events

- 1st History: launch of Explorer 1; first artificial satellite by the United States (1958)
- 2nd History: Soviet space station Salyut 4 reenters the Earth's atmosphere (1977)
- 3rd History: Apollo 14 lands in the Moon's Fra Mauro region; 3rd manned Moon landing with astronauts Alan Shepard, Stuart Roosa and Edgar Mitchell (1971)
- 3rd History: Soviet spacecraft Luna 9 becomes first spacecraft to soft land on the Moon (1966)
- 4th History: launch of Lunar Orbiter 3; photographed potential Apollo landing sites (1967)
- 4th History: Clyde Tombaugh born; discovered the dwarf planet Pluto (1906)



NASA/Goddard Space Flight Center/Arizona State University

Astronomical and Historical Events (continued)

- 5th History: flyby of Venus by the Mariner 10 spacecraft on its way to Mercury; first U.S. spacecraft to photograph Venus, first to use gravity of one planet to propel itself to another, and the first spacecraft to visit Mercury (1974)
- 6th History: Soviet space station Salyut 7 reenters Earth's atmosphere (1991)
- 7th Full Moon (Full Snow Moon)
- 7th History: launch of the Stardust spacecraft for a rendezvous with Comet Wild 2 (1999)
- 7th History: Astronomical Society of the Pacific founded (1889)
- 7th History: William Huggins born, pioneered work in astronomical spectroscopy and first to differentiate nebular and galactic spectra (1824)
- 8th History: discovery of the SAU 094 Mars meteorite in Sayh al Uhaymir, Oman; one of the largest Mars meteorites recovered and the only one with a documented strewn field (2001)
- 8th History: discovery of GRV 99027 Martian Meteorite on the ice sheet near the Grove Mountain region of Antarctica; the 9.97 gram meteorite was later characterized as a shergottite (2000)
- 8th History: flyby of Jupiter by the Ulysses spacecraft on its way to study the polar regions of the Sun (1992)
- 8th History: return of Skylab III crew (astronauts Gerald Carr, William Pogue and Edward Gibson) to Earth after a 3 month stay on the space station, (1974)
- 8th History: Jules Verne born, author and futurist (1828)
- 10th History: flyby of Venus by the Galileo spacecraft (for a gravity assist) on its way to Jupiter; the encounter provided the first views of mid-level clouds on Venus and confirmed the presence of lightning on the planet (1990)
- 10th History: flyby of Mars by the Soviet Mars 4 spacecraft; failed to enter orbit but did detect night-side ionosphere (1974)
- 11th Second Saturday Stars Open House at the McCarthy Observatory
- 11th Moon at perigee (closest distance from Earth)
- 11th History: launch of NASA's Solar Dynamics Observatory from Cape Canaveral, Florida; the first mission in the space agency's "Living with a Star" program; five-year mission to study the sun's energy and its influence on space weather (2010)
- 11th History: launch of the space shuttle Discovery (STS-82), second Hubble Space Telescope servicing mission; shuttle tire on display at the Observatory is from this mission (1997)
- 11th History: launch of first Japanese satellite; Oshumi (1970)
- 12th Kuiper Belt Object 55565 (2002 AW197) at Opposition; trans-Neptunian object (TNO) discovered in 2002 by Michael Brown et al., classified as a cubewano (45.228 AU)
- 12th History: landing of the Near Earth Asteroid Rendezvous (NEAR) spacecraft on the asteroid Eros (2001)
- 12th History: Soviet spacecraft Mars 5 enters orbit around Mars, providing information on surface temperatures, CO₂ concentrations, and detecting a thin ozone layer and water vapor concentrations near the Tharsis region (1974)
- 12th History: Sikhote Alin meteorite fall in Russia, one of the largest modern falls at 28 tons (1947)
- 14th Last Quarter Moon
- 14th History: flyby of Comet Tempel 1 by the Stardust spacecraft (2011)
- 14th History: NEAR spacecraft enters orbit around the Asteroid Eros; NEAR would observe and analyze the asteroid before landing on its surface a year later (2000)
- 14th History: Voyager 1 points its camera back towards the Sun and takes a family portrait, capturing six planets (Venus, Earth, Jupiter, Saturn, Uranus and Neptune) from a distance of approximately 4 billion miles; Mercury was too close to the Sun to be seen and Mars was lost in the scattered sunlight (1990)
- 14th History: launch of the Solar Maximum Mission to study the Sun during the peak of the solar cycle; a malfunction less than a year later cut the mission short. However, the satellite was recovered and repaired by the Space Shuttle Challenger in April 1984; operated successfully until burning up in the Earth's atmosphere in December 1989 (1980)
- 14th History: launch of Luna 20, Soviet Moon sample return (1972)
- 14th History: launch of Syncom 1, the first geosynchronous satellite (1963)
- 15th History: flyby of the Moon by the Hiten spacecraft; Earth orbiting satellite designed by the Japanese Space Agency to test technologies for lunar and planetary missions (1992)

Astronomical and Historical Events (continued)

- 15th History: Galileo Galilei born (1564)
- 16th History: Gerard Kuiper discovers Uranus' moon Miranda (1948)
- 16th History: August Kopff discovers asteroid 585 Bilkis (1906)
- 16th History: Joel Metcalf discovers asteroids 602 Marianna, 603 Timandra and 604 Tekmessa (1906)
- 17th History: launch of Ranger 8; Moon impact mission (1965)
- 17th History: launch of NEAR spacecraft, asteroid orbiter/lander; first of NASA's Discovery missions and the first mission to go into orbit around an asteroid (1996)
- 17th History: launch of Vanguard 2; designed to measure cloud-cover distribution over Earth (1959)
- 18th History: American astronomer Clyde Tombaugh discovers Pluto (1930)
- 19th Flyby of Saturn's largest moon Titan by the Cassini spacecraft
- 19th History: Nicolas Copernicus born (1473)
- 20th Distant flyby of Saturn's moon Polydeuces by the Cassini spacecraft
- 20th History: Clementine spacecraft enters lunar orbit and starts photographic survey; joint project between the Strategic Defense Initiative Organization and NASA, first of a new class of small spacecraft to enable long-duration deep space missions at low cost using lightweight satellite technology (1994)
- 20th History: launch of the core module of the Soviet space station Mir (1986)
- 20th History: launch of Mercury-Atlas 6 and Friendship 7 with astronaut John Glenn; first American in orbit (1962)
- 21st New Moon
- 21st Distant flyby of Saturn's moons Telesto, Enceladus, Pallene, Dione and Rhea by the Cassini spacecraft
- 21st Kuiper Belt Object 90482 Orcus at Opposition (47.023 AU)
- 21st History: Soviet moon rocket (N-1) explodes during first test flight (1969)
- 21st History: Max Wolf discovers asteroid 586 Thekla (1906)
- 21st History: August Kopff discovers asteroid 596 Scheila (1906)
- 22nd History: launch of Soviet spacecraft Kosmos 110, with dogs Veterok and Ugolyok (1966)
- 22nd History: Max Wolf discovers asteroids 587 Hypsipyle and 588 Achilles (1906)
- 23rd History: Supernova 1987A detected in the Large Magellanic Cloud (1987)
- 24th History: final mission of the Space Shuttle Discovery (STS-133). The shuttle delivered space parts and critical components to the ISS during its thirteen day mission
- 24th History: launch of Mariner 6; Mars flyby mission returned images showing the south polar cap as being com posed predominantly of carbon dioxide; refined estimates of the mass, radius and shape of Mars (1969)
- 24th History: Jocelyn Bell announces discovery of rapidly rotating radio sources, later determined to emanate from neutron stars or pulsars (1968)
- 24th History: launch of Bumper WAC, first two-stage liquid-propellant rocket and the first human-made object to achieve hypersonic speeds (1949)
- 25th History: flyby of Mars by the Rosetta spacecraft (2007)
- 25th History: Soviet spacecraft Luna 20 returns lunar soil sample (30 grams) to Earth (1972)
- 26th History: launch of the first Saturn 1B rocket booster (1966)
- 27th Moon at apogee (furthest distance from Earth)

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.

Image Credits

Front page and graphic calendars: Allan Ostergren

Page 3: **Orion**. Different views of the latest New Horizons scale model built by local craftsman and Observatory volunteer, Mr. Don Ross - Photo by Bill Cloutier

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

FREE EVENT

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

www.mccarthyobservatory.org

February 11th 7:00 - 9:00 pm

TERRAFORMING fact & fiction

Refreshments Family Entertainment Activity Center Stars & Planets Rain or shine



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February 2012 Celestial Calendar

Sunday	Monday	Tuesday	Wednesday	Thursday	Frid ay	Saturday
Moon's Eccentric Orbit		1	2	3	4	
rife tude refects of the compared of the compa	Source: Fourmilab Feb 11 Apoge 00 KM) Apoge (405, topographic (based on position of	a de Farther away a terrestrial observer.	Launch of Explorer I (1958)	Soviet space station, Salyut 4 reenters Earth's atmosphere (1977)	Chinese New Year Soviet Luna 9 lands on Moon (1966) Apollo 14, 3rd Moon landing- Shepard, Roosa, Mitchell (1971)	Clyde Tombaugh born (1906) discoverer of Pluto Launch of Lunar Orbiter 3, to locate Apollo landing sites (1967)
5 Flyby of Venus by	6	William Huggins bom, pioneer of astronomical spectroscopy (1824) Astronomical Society of the Pacific founded (1889) Launch of	Mars 8 meteorites found - Oman (2001); Antarctica (2000) Jules Verne born (1828)	9 Second Second	10 Flyby of Venus by Galileo spacecraft on way to Jupiter (1990)	Launch of Japanese satellite Oshumi (1970) Launch of NASA Solar Dynamics Observatory
Mariner 10 spacecraft en route to Mercury (1974)	Soviet space station Salyut 7 reenters Earth's atmosphere (1991)	Stardust spacecraft for rendezvous with comet Wild 2 (1999)	Return of Skylab 3 crew after 3 months on space station (1974)	activity, during shuttle mission STS-63 to Mir spacecraft, flown by first woman shuttle pilot, Eileen Collins (1995)	Flyby of Mars by Soviet Mars 4 spacecraft (1974)	2010 2nd Saturday Stars Open House McCarthy Observatory
Soviet Mars 5	John Louis Emil Dreyer born, Danish/Irish astronomer and biographer of Tycho Brahe; continued	Launch of study Sun during peak of cycle (1980)	Galileo Galilei born (1564)	Gerard Kuiper	Launch of NEAR spacecraft, asteroid, orbiter, lander (1996) Launch of Reaner & Content of Reaner & Content	
spacecraft in orbit (1974)	Herschel's work by publishing catalogue of nebulae and clusters (1852)	Syncom 1, first geosynchronous satellite (1963)	Hiten spacecraft (1992)	discovers Uranus' moon, Miranda (1948)	Launch of	American astronomer Clyde Tombaugh discovers Pluto (1930)
I 9 Nicholas Copernicus born (1473)	20 Launch of Mercury Atlas 6 and Friendship 7 With John Glenn, 1 st American in orbit (1962)	21 Soviet Moon rocket (N-1) explodes (1969) Tom Gehrels, astronomer and co-discoverer of over 4,000 asteroids (b. 1925)	22 Launch of Soviet spacecraft Kosmos 110, with dogs Veterok and Ugolyok (1966)	23 Cooperation 23 Supernova 1987A detected in Large Magellanic Cloud (1987)	Bumper 24 WAC, first two-stage liquid ropellant rocket (1949) Jocelyn Bell's discovery of pulsars (1968) Shuttle Discovery final mission (2011)	25 Flyby of Mars by Rosetta spacecraft (2007) Soviet spacecraft Luna 20 returns 30-gram soil sample to Earth (1972)
26 Example 26 Launch of first Saturn 1B rocket booster (1966)	27 Ernard Ferdinand Lyot born, French astronomer and inventor of the coronagraph to observe the sun's corona without waiting for an eclipse, (1907)	28 Launch of Discoverer 1, first of Corona reconnaissance satellite program (1959) Flyby of Jupiter by New Horizons spacecraft bound for pluto	29 Christopher Columbus uses prediction of lunar eclipse by astronomer Johannes Müller von Königsberg (Regiomontanus) to exact provisions from Jamaican natives (1504)	P Feb 7 Feb 7	hases of the M Key Control Feb 14 Key Control Feb 21 Feb 21 Feb	00n () () () () () () () () () () () () ()