

# **G***alactic Observer*

John J. McCarthy Observatory

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## ***Equine Apparition***

***The Horsehead Nebula, seen in infrared light by the Hubble telescope's latest optical upgrade, the Wide Field Camera 3. The nebula is about 1,500 light years away, in the constellation Orion, a popular destination for stargazers.***

***Source: NASA***

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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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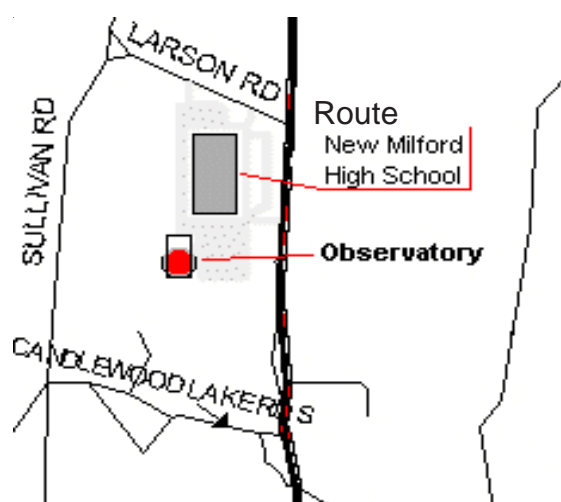
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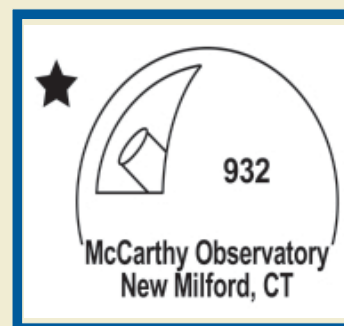
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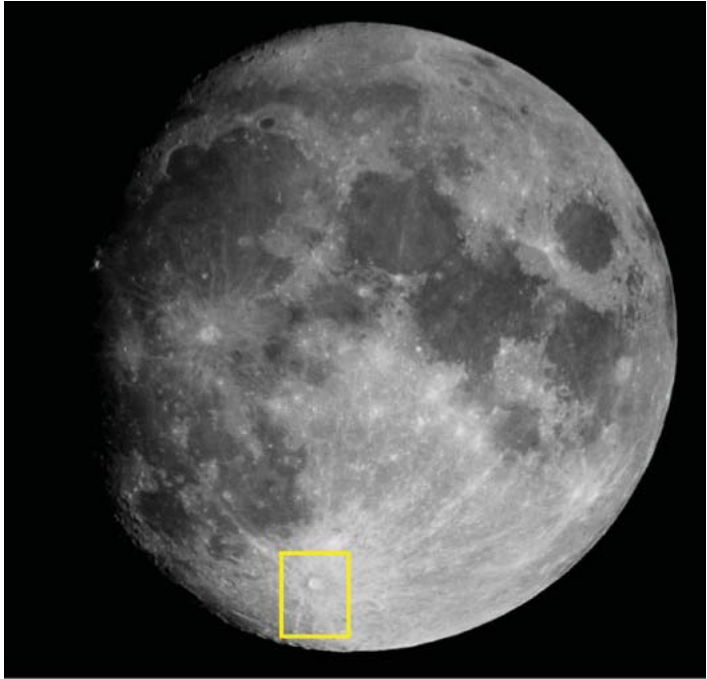
## May Astronomy Calendar and Space Exploration Almanac





## "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 citi-



zen had the means to visit our only natural satellite; what would they see out the window of their spacecraft as they entered orbit around the Moon? This column may provide some thoughts to ponder when planning your visit (if only in your imagination).

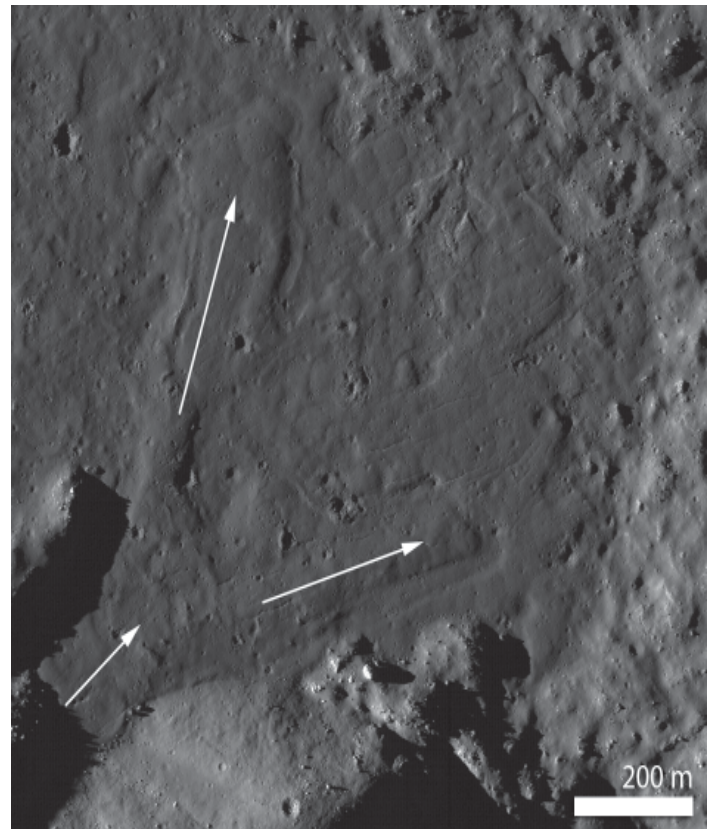
The view this month captures a portion of the southern lunar highlands surrounding the young impact crater Tycho.

Tycho is a classic complex impact crater with prominent central peaks, terraced walls and a broad, flat floor. While sometimes difficult to distinguish from the jumble of craters in the southern highlands during the Moon's waxing and waning phases, Tycho's grandeur is on display near and around the full Moon. Its youth is revealed by the bright rays of impact material extending out from the 53 mile (85 km) diameter crater and across the face of the Moon. Rays are generally associated with most recent impacts as they gradually darken and fade with exposure to the solar wind and "gardening" of the soil by micrometeorites. The asymmetry of the rays (particularly absent to the west of the crater) suggest an oblique impact. Another distinguishing feature of this young crater is a dark halo that encircles the outer ramparts, believed to be comprised of glassy impact melt.

The Apollo astronauts never visited Tycho, although it was originally targeted for the later (canceled) missions. Its age has been estimated from material collected at the Apollo 17 landing site 1,400 miles (2,300 km) away, as one of Tycho's rays crosses the Taurus-Littrow region on the southeastern rim of the Serenitatis basin. Samples of the impact melt collected by astronauts Gene Cernan and Harrison Schmitt, and believed to have originated from Tycho, are estimated to be 108 million years old. If related, the samples would also date the crater.

The area around Tycho is saturated with the remnants of ancient impact craters. Clavius, located at the bottom of the image, is believed to have formed 4 billion years ago. As one of the largest craters on the near side, Clavius' splendor is diminished by its southern location and chaotic surroundings, although its 152 mile (245 km) diameter outline can be seen with the unaided eye at certain times of the lunar cycle.

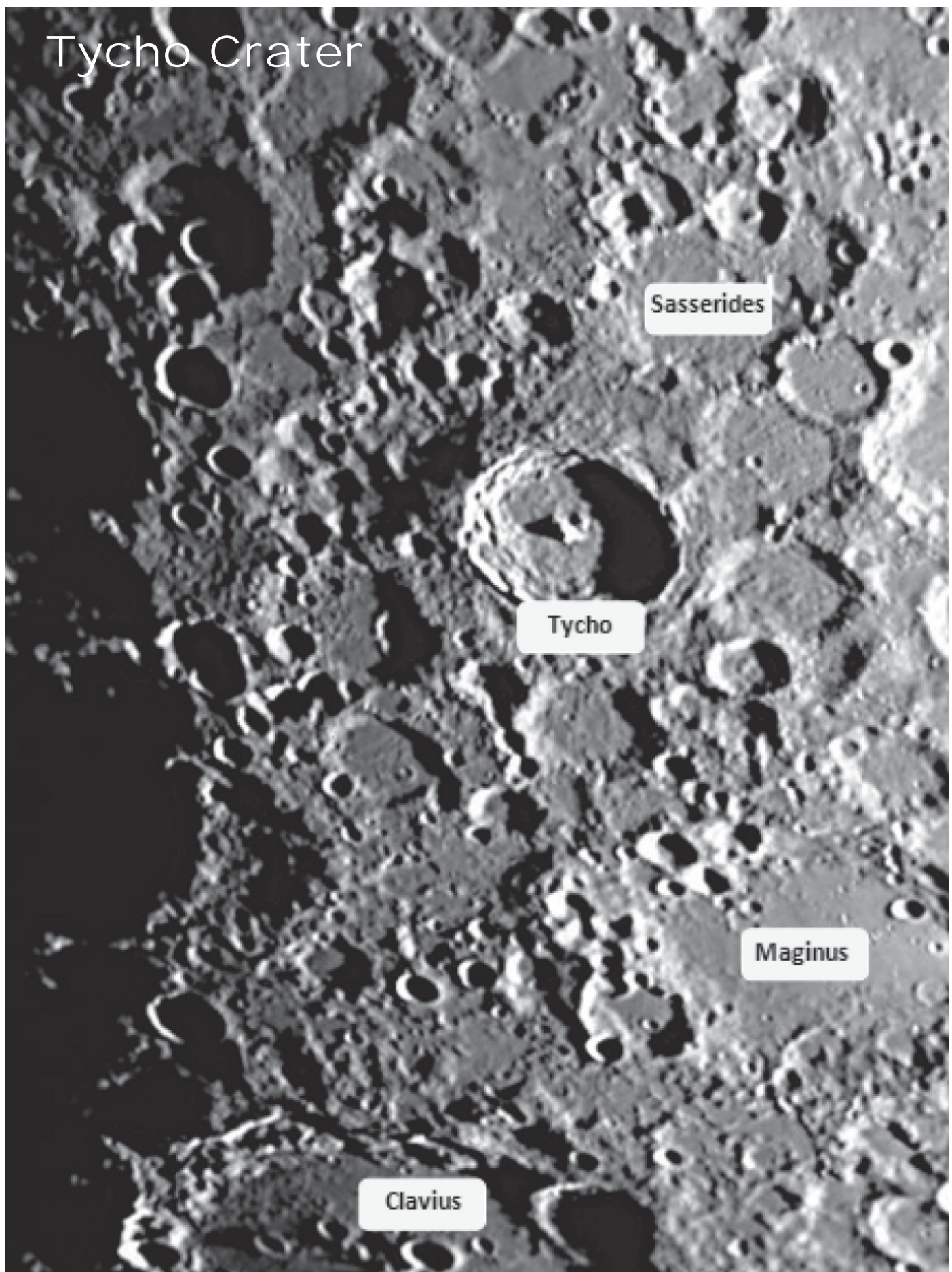
Sasserides, to the north of Tycho, and Maginus to the south, are even older and less preserved than Clavius. The original walls of Sasserides and Maginus have been broken and, in some instances obliterated, by more recent bombardments that have blurred their boundaries.



Boulders and impact melt lining the floor of Tycho Crater are estimated to date from 108 million years ago, a recent event in geologic time. (Credit: NASA/Goddard/Arizona State University)



# Tycho Crater





## Endeavour's Legacy

On May 16, 2011, the space shuttle Endeavour lifted off from Pad 39A at the Kennedy Space Center for a 16 day mission to the International Space Station (ISS). The STS-134 mission, which included the delivery of the Alpha Magnetic Spectrometer, or AMS, would be Endeavour's last.

Endeavour first arrived at the Kennedy Space Center on May 7, 1991 as a replacement for the lost Challenger. It was built out of spare parts from the Atlantis orbiter. Endeavour was first launched (STS-49) a year later on May 7, 1992. The orbiter's name was selected through a national competition among students and was named after the ship commanded by British explorer James Cook in his exploration of the South Pacific in 1768-71. Cook, among other accomplishments, observed the transit of the Sun by Venus from Tahiti in June 1769.

AMS is a cosmic-ray particle detector. It is mounted on the exterior of the ISS and was designed, constructed and is operated by an interna-



tional consortium of scientific institutions. Since its installation, the AMS has detected 30 billion cosmic rays and collected data on over 400,000 electrons and positrons (the electron's antiparticle or antimatter counterpart). As these particles pass through the detector, the speed, energy and direction are recorded. The data from the AMS may validate the presence of dark energy particles, if it can be confirmed that the positrons are a product of dark energy particle collisions.

## Dragon History

One year ago, on May 22, 2012, Space Exploration Technologies (Space X) made history when it became the first commercial company to send a spacecraft to the International Space Station (ISS). The Fal-

con 9 rocket lit up the sky around the Cape Canaveral Air Force Station in a pre-dawn launch. The cargo-carrying Dragon spacecraft delivered 1,146 pounds of food and provisions to the ISS. Nine days later, the Dragon returned to Earth with 1,455 pounds of cargo from the ISS.



## Origin of Meteor Showers

Meteor showers occur when the Earth passes through a cloud of debris or meteoroids, most of which are no larger than a grain of sand. The high-speed collision of the meteoroids with air molecules in the Earth's upper atmosphere (at speeds up to 160,000 mph) creates a flash of visible light along the meteoroid's trajectory.

Most major meteor showers are associated with a periodic comet and occur with predictability each year as the Earth encounters the cometary remnants in its travel around the Sun. The much anticipated comet ISON is currently shedding more than 112,000 pounds (51,000 kg) of material per minute.



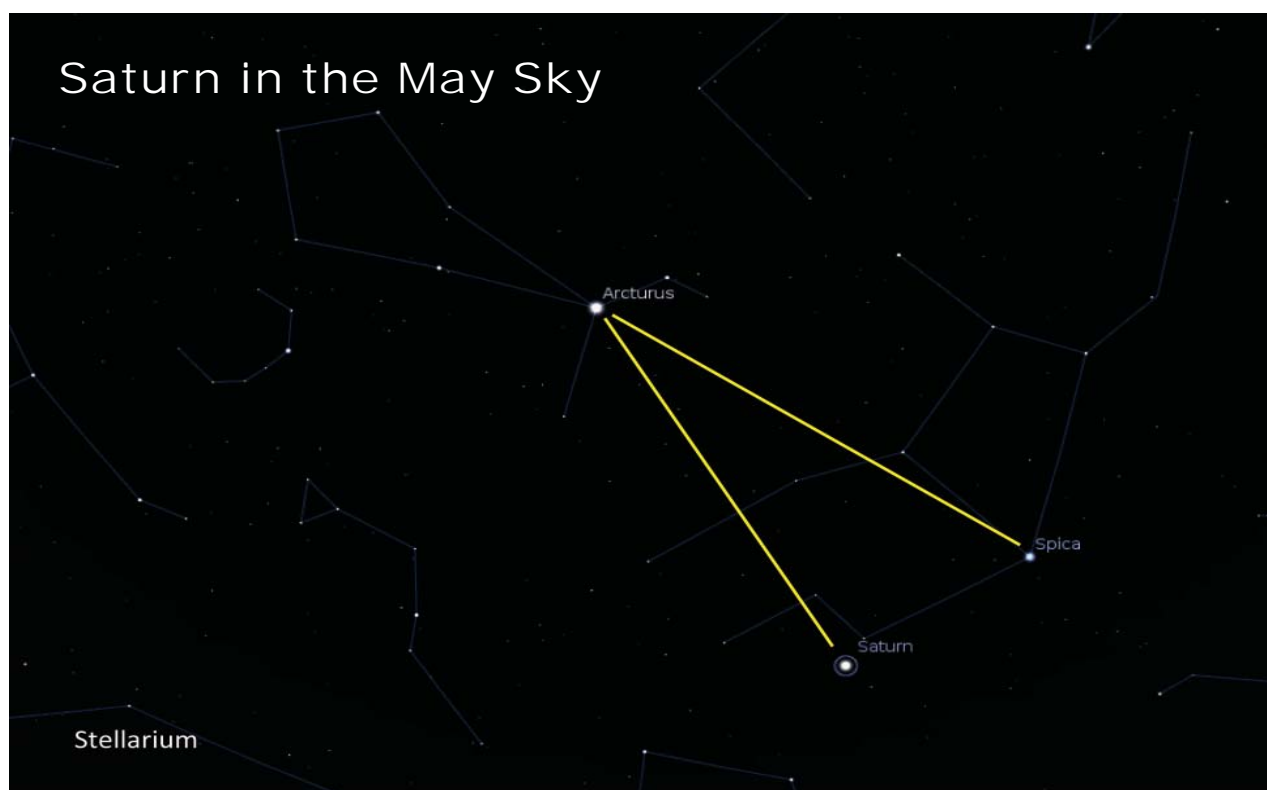
This Perseid was caught streaking through the Milky Way in 2001. Credit: NASA/Nathalie Dautel



The yellow dusty tail of comet Hale-Bopp leaves a trail of debris along its path through the inner solar system

### Saturn

May is an excellent time to observe the ringed planet. While faded a bit from its peak brilliance in late-April, Saturn is well placed in the early evening sky. Saturn can be found by star-hopping through several prominent constellations. Follow the arc of the Big Dipper's handle to the orange giant Arcturus in the constellation Boötes. Continue on towards Spica in Virgo. Saturn and Spica form a triangle with Arcturus.





## America's First Space Station

**T**HE IDEA OF A MANNED SPACE station that could serve as an observation platform, for lunar staging or as a base for interplanetary travel, goes back almost 100 years. Even in the midst of the Moon race in the 1960s, at least three different NASA centers were working on conceptual space station designs, from Langley's Manned Orbital Research Laboratory to Houston's Project Olympus, that could accommodate a crew of up to 24. However, with the majority of NASA's budget allocated to achieving Kennedy's goal of a moon landing, there was little funding available for another major space initiative.

It was Wernher von Braun's Marshall Space Flight Center that would take the concept of a space station to reality under the Apollo Applications Program. Skylab was an empty third stage of a Saturn V rocket, outfitted as a laboratory, workshop and living quarters for a crew of three astronauts. Three crews (nine astronauts) traveled to and from Skylab in Apollo capsules and spent a total of six months at the space station.

Skylab was launched into Earth orbit on May 14, 1973. Unfortunately, occupancy was delayed when one of the two solar arrays and the heat/meteoroid shield were torn off during launch and the second solar array entangled so that it could not be deployed. Over the next 10 days, NASA would work round the clock in an attempt to save the station. Ultimately, success was due to the ingenuity of people like Jack Kinzler who devised a deployable

sunshade out of fiberglass extendable fishing poles and coated nylon material. On May 25<sup>th</sup>, the crew of Pete Conrad, Paul Weitz and Joe Kervin rode a Saturn IB into orbit, carrying the tools and materials to repair the damaged station. Their work on orbit stabilized the station and allowed the mission to continue to a successful conclusion.

On July 11, 1976, the empty station entered into the Earth's atmosphere, scattering debris over the Indian Ocean and parts of Australia.

NASA is currently developing its next generation Space Launch System to support missions beyond Earth orbit. With a rocket rivaling the Saturn V in payload capacity, the idea of another "Skylab" has already been advanced. While only a concept, the experience from the original project could lead someday to the establishment of a deep space outpost using converted rocket parts.

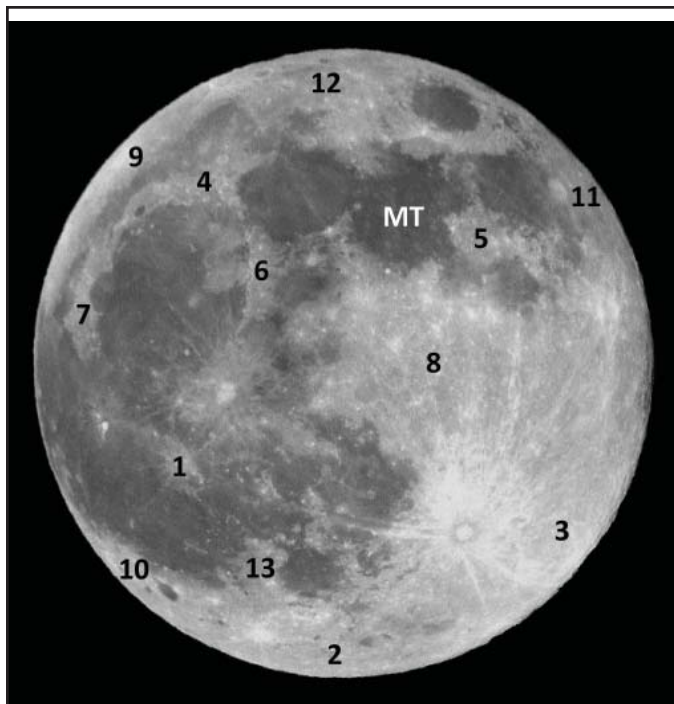
## Forgotten Names for an Ancient World

Lunar maps include the names of the prominent features: craters, mountain ranges and the large, expansive lunar seas. Few, if any, include the names of the brighter lunar highlands: the original crust before it was transformed by a cosmic bombardment lasting several hundred million years.

Lunar cartography or mapping was both limited and crude until Galileo first trained his telescope upon the Moon. With the ability provided by the telescope to resolve individual features came the need for a uniform or standard naming convention. The first such detailed map was created by Belgian







### Key to Major Land Features

1. Insula Ventorum (Island of Winds)
2. Terra Colaris (Land of Heat)
3. Terra Fertilitatis (Land of Fertility)
4. Terra Grandinis (Land of Hail)
5. Terra Manna (Land of Manna)
6. Terra Niuiu (Land of Snows)
7. Terra Pruinae (Land of Frost)
8. Terra Sanitatis (Land of Healthiness)
9. Terra Siccitatis (Land of Dryness)
10. Terra Sterilitatis (Land of Sterility)
11. Terra Vigoris (Land of Cheerfulness)
12. Terra Vitae (Land of Liveliness)
13. Peninsula Fulminu (Peninsula of Thunder)

astronomer Michel Langren in 1645. Features on Langren's map were named for prominent leaders of the Catholic Church, scholars, philosophers and saints. Two years later, Johannes Hevelius, a wealthy Polish brewer, published the first treatise devoted to the Moon. His publication "Selenographia" included maps of every lunar phase developed over several years of observing. Unlike Langren, Hevelius used the names of terrestrial features for his lunar maps, specifically from ancient Greece and Rome. His naming convention was widely used by European astronomers for over a century. However, Hevelius' lunar nomenclature was gradually replaced by a naming convention developed by Jesuit astronomer Giovanni Riccioli.

Riccioli included lunar maps in a dissertation defending the Catholic Church's view of the universe (Earth-centered) against the views being expressed by Galileo, Kepler and Copernicus (Sun-centered). Riccioli's lunar drawings were created by fellow Jesuit Francesco Grimaldi. Riccioli assigned names to the lunar seas associated with weather or other conditions (Sea of Rain, Clouds, Cold, Serenity, and Crises). Other features were given names of scientists and philosophers from ancient Greece, Rome or from medieval Europe. The craters around the Sea of Nectar did include names of Catholic saints, although most were associated with astronomy.

Many of Riccioli's original names remain in use today after being officially recognized by the International Astronomical Union in 1935. What have been lost are the names of the areas between the

seas or the Moon's bright crust. Riccioli originally assigned names to these areas in a manner similar (although sometimes opposite) to what he used for the lunar seas (Land of Heat, Hail, Frost, Dryness and Sterility).

Today, references to the lunar crust or "land" are generally non-descript and sterile in comparison (south polar region, eastern limb, Descartes highlands) to Riccioli's imaginative and sometimes poetic labels. Several of the areas described by Riccioli on Grimaldi's maps (shown above) are indicated below.

So, the next time you see the Moon in the sky, take a few minutes and reacquaint yourself with a part of history. Once you have located Mare Tranquillitatis (MT) or the Sea of Tranquility on the moon's eastern (right) limb, look for Terra Sanitatis or the Land of Healthiness, the adjoining brighter area to the southwest.

### May History

On May 25, 1961, President Kennedy, in an address before a joint session of Congress, set forth a challenge to the American people: "I believe this nation should commit itself, before this decade is out, to landing a man on the Moon and returning him safely to the earth." With what started out as an attempt to reverse the political setbacks in Laos, the Congo, the Bay of Pigs in Cuba, and as a response to the first flight into space by cosmonaut Yuri Gagarin, Kennedy's speech set the gears of a technological revolution into motion. The post-

Sputnik world of the 1960's would see two great nations compete to control the "high ground," the new frontier in the Cold War.

Lost in the political posturing and often overlooked is that, in less than 10 years, on May 20<sup>th</sup>, 1969, the 456 foot tall doors on the Vehicle Assembly Building at the Kennedy Space Center opened to reveal AS506, the official designation of the Saturn V rocket that would carry Apollo 11 to the moon. More than 20,000 private firms and hundreds of thousands of workers participated in this program, for a fraction of the cost of the Vietnam War. Not only did the United States reach the Moon, it built a national infrastructure of technology, manufacturing and education that has not been rivaled. In 1969, the United States was truly on top of the world.

### May Showers

The *Eta Aquarids* meteor shower peaks in the early mornings of the 5<sup>th</sup> and 6<sup>th</sup>. The dust producing the shooting stars is from *Comet Halley*. As with all meteor showers, the Aquarids are named for the constellation (Aquarius) from which they appear to radiate. Under clear skies, you can expect to see up to 20 meteors per hour (more from the southern hemisphere where the radiant is higher). This year there should be minimal interference from a waning Moon.

### Sunrise and Sunset

	<u>Sunrise</u>	<u>Sunset</u>
May 1 <sup>st</sup> (EDT)	05:50	19:52
May 15 <sup>th</sup>	05:34	20:06
May 31 <sup>st</sup>	05:22	20:21

### May Nights

For those of you who like to do your stargazing early in the evening, a myriad of spectacular objects appear out of the twilight, winking into view as the Earth turns away from the Sun. Leo dominates the southwestern sky with its backward shaped question mark arrangement of stars, punctuated by the star Regulus, forming the front of the lion, and a triangular arrangement of stars forming the back or tail of the creature. To the west of Leo is an open star cluster called the Beehive (M44) in the constellation Cancer. On a dark night it can be seen with the naked eye. East of Leo, towards the constellation Boötes is the globular cluster M3. Boötes is easily identified by its bright star Arcturus. Follow the arc in the handle of the Big Dipper to find Arcturus, at the base of the kite-shaped constellation. M3 is located further away than the center of our galaxy, the Milky Way, and is one of the many outstanding globular clusters that will grace the late spring and summer skies.

### Astronomical and Historical Events

- 1<sup>st</sup> Distant flyby of Saturn's largest moon *Titan* by the Cassini spacecraft
- 1<sup>st</sup> History: discovery of the Mars meteorite *Dar al Gani 476* (1998)
- 1<sup>st</sup> History: discovery of Neptune's moon *Nereid* by Gerard Kuiper (1949)
- 2<sup>nd</sup> Last Quarter Moon
- 2<sup>nd</sup> Kuiper Belt Object 90568 (2004 GV9) at Opposition (38.315 AU)
- 4<sup>th</sup> History: launch of the AQUA satellite to study precipitation, evaporation, and the cycling of Earth's water (2002)
- 4<sup>th</sup> History: launch of the Magellan/Venus radar mapping spacecraft and attached Inertial Upper Stage from the space shuttle Atlantis (STS-30) (1989)
- 5<sup>th</sup> *Eta Aquarids* meteor shower peak (best viewing: early morning on the 5<sup>th</sup> and 6<sup>th</sup>)
- 5<sup>th</sup> History: launch of Freedom 7 and astronaut Alan Shepard aboard a Mercury-Redstone rocket, first American in space (1961)
- 6<sup>th</sup> History: groundbreaking for the John J. McCarthy Observatory, a world-class observatory in New Milford, CT., with a mission to promote science literacy (2000)
- 7<sup>th</sup> Distant flyby of Saturn's largest moon *Titan* by the Cassini spacecraft
- 9<sup>th</sup> New Moon
- 9<sup>th</sup> History: launch of MUSES-C (Hayabusa), Japanese sample return mission to asteroid *Itokawa* (2003)
- 9<sup>th</sup> History: first Earth-based laser aimed at the Moon: crater Albategnius (1962)
- 9<sup>th</sup> History: launch of first production model of the Project Mercury capsule from Wallops Island, VA. to test the escape system (1960)
- 10<sup>th</sup> History: President Truman signs Public Law 507, creating the National Science Foundation (1950)



## Astronomical and Historical Events (continued)

- 11<sup>th</sup> History: launch of the space shuttle Atlantis (STS-125), final Hubble Space Telescope servicing mission (2009)
- 11<sup>th</sup> **Second Saturday Stars - Open House at McCarthy Observatory**
- 13<sup>th</sup> Moon at apogee (furthest distance from Earth)
- 13<sup>th</sup> History: launch of first Project Bumper rocket from White Sands, NM; the two stage rocket was a combination of a German V-2 and American WAC Corporal rocket (1948)
- 14<sup>th</sup> History: launch of the Herschel infrared telescope and the Planck microwave observatory (2009)
- 14<sup>th</sup> History: launch of Skylab (1973)
- 14<sup>th</sup> History: the American Interplanetary Society (later renamed the American Rocket Society) launches its first liquid fueled (liquid oxygen and gasoline) rocket from Staten Island, N.Y. (1933)
- 14<sup>th</sup> History: the German Society for Space Travel (Verein für Raumschiffahrt or VfR) launches the Repulsor-1, a liquid fueled (liquid oxygen and gasoline) rocket (1931)
- 15<sup>th</sup> History: sixth docking of a space shuttle (Atlantis) with Russian space station Mir (1997)
- 15<sup>th</sup> History: launch of Faith 7 and astronaut Gordon Cooper aboard a Mercury-Atlas rocket, final Mercury mission (1963)
- 15<sup>th</sup> History: Soviet Union launches Sputnik IV containing a self-sustaining biological cabin and dummy astronaut (1960)
- 16<sup>th</sup> History: launch of the space shuttle Endeavor on its final mission (2011)
- 16<sup>th</sup> History: Soviet spacecraft Venera 5 returns 53 minutes of data while descending by parachute through the atmosphere of Venus and before impacting the surface (1969)
- 17<sup>th</sup> History: Soviet spacecraft Venera 6 returns 51 minutes of data while descending by parachute through the atmosphere of Venus and before impacting the surface (1969)
- 18<sup>th</sup> First Quarter Moon
- 18<sup>th</sup> History: launch of Apollo 10 with astronauts John Young, Tom Stafford and Gene Cernan; the lunar module Snoopy was flown within 50,000 feet of the lunar surface while the command module Charlie Brown orbited the Moon (1969)
- 19<sup>th</sup> History: launch of the first Army Hermes A-1 rocket from White Sands, NM (1950)
- 20<sup>th</sup> History: launch of the Pioneer Venus 1 spacecraft (1978)
- 21<sup>st</sup> History: launch of the Japanese Venus Climate Orbiter Akatsuki or Planet-C spacecraft and the Ikaros solar sail (2010)
- 22<sup>nd</sup> History: Space X successfully launches a Falcon 9 rocket, carrying a cargo-carrying Dragon capsule, to the International Space Station (ISS) from the Cape Canaveral Air Force Station; first commercial company to send a spacecraft to the ISS (2012)
- 23<sup>rd</sup> Flyby of Saturn's largest moon *Titan* by the Cassini spacecraft
- 24<sup>th</sup> History: launch of Aurora 7 and astronaut Scott Carpenter aboard a Mercury-Atlas rocket; second American to orbit Earth (1962)
- 24<sup>th</sup> History: launch of Midas 2; first Experimental Infrared Surveillance Satellite (1960)
- 25<sup>th</sup> Full Moon (Full Flower Moon), (largest full moon of 2013)
- 25<sup>th</sup> Moon at perigee (closest distance from Earth)
- 25<sup>th</sup> History: the Phoenix spacecraft lands in the Martian arctic (2008)
- 25<sup>th</sup> History: launch of Skylab I crew; astronauts Pete Conrad, Paul Weitz and Joseph Kerwin (1973)
- 25<sup>th</sup> History: President John F. Kennedy's Moon goal speech to Congress (1961)
- 26<sup>th</sup> History: launch of the first "Navaho Missile," a pilotless aircraft consisting of a missile and a booster; program goal was to determine the feasibility of an intercontinental missile (1948)
- 27<sup>th</sup> Kuiper Belt Object 278361 (2007 JJ43) at Opposition (40.372 AU)
- 28<sup>th</sup> Scheduled launch of the next expedition crew to the International Space Station aboard a Russian Soyuz spacecraft from the Baikonur Cosmodrome in Kazakhstan
- 28<sup>th</sup> Venus passes within a degree of Jupiter in the western sky shortly after sunset

### Astronomical and Historical Events (continued)

- 28<sup>th</sup> History: launch of Mars 3 (USSR) lander and rover; lander became the first spacecraft to attain soft landing on Mars, although transmissions ceased after 15 seconds (1971)
- 28<sup>th</sup> History: launch of an Army Jupiter missile carrying two primates (Able and Baker) to an altitude of 300 miles; monkeys survived the flight (1959)
- 28<sup>th</sup> History: Frank Drake born, radio astronomer devised the “Drake Equation” as an attempt to estimate the number of worlds in our galaxy that might harbor intelligent life (1930)
- 29<sup>th</sup> History: launch of Luna 22 (USSR), lunar orbiter mission that included imaging as well as studying the Moon’s magnetic field, the composition of lunar surface rocks, and the gravitational field (1974)
- 29<sup>th</sup> History: measurements during solar eclipse agree with predictions based on Einstein’s General Relativity theory (1919)
- 30<sup>th</sup> History: launch of Mariner 9, Mars orbiter and first artificial satellite of Mars; mapped Martian surface and imaged moons *Phobos* and *Deimos* (1971)
- 30<sup>th</sup> History: launch of Surveyor 1, Moon lander; transmitted over 11,000 images from Oceanus Procellarum (1966)
- 31<sup>st</sup> Last Quarter Moon
- 31<sup>st</sup> Distant flyby of Saturn’s largest moon *Titan* by the Cassini spacecraft
- 31<sup>st</sup> History: European Space Agency’s birthday (1975)🌐

### 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).

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


















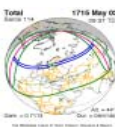










**Second Saturday Stars poster:** Sean Ross, Ross Designs

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



# May 2013

## Celestial Calendar

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
<b>Phases of the Moon</b> 			<b>1</b>  Gerard Kuiper discovers Neptune's Moon Nereid 1949   Discovery of Mars meteorite <i>Dar al Gani</i> 1998	<b>2</b>  Cassini, Enceladus Flyby Cassini: Distant Flyby of Polydeuces, Atlas & Dione   Asteroid 1992 JD Near-Earth Flyby (0.024 AU)	<b>3</b>  Edmund Halley observes total eclipse phenomenon "Baily's Beads" (1715)	<b>4</b>  Launch of Magellan spacecraft to Venus by space shuttle Atlantis (1989)   Launch of the AQUA satellite to study precipitation, evaporation, and the cycling of Earth's water (2002)
<b>5</b>  Eta Aquarids meteor shower peak   Alan Shepard first American in space 1961   Space Day	<b>6</b>  Groundbreaking for the John J. McCarthy Observatory (2000)	<b>7</b>  Distant flyby of Saturn's largest moon Titan by the Cassini spacecraft   16th Anniversary (1997), Galileo, Ganymede 8 Flyby	<b>8</b>  First snapshot of Earth and its moon, captured by NASA's Mars Global Surveyor (MGS) spacecraft while orbiting Mars (2003)	<b>9</b>  Launch of MUSES-C (Hayabusa), Japanese sample mission to asteroid Itokawa (2003)   First Earth-based laser aimed at Moon crater Albategnius (1962)	<b>10</b>  Konstantin Eduardovich Tsiolkovsky, Russian Rocketry Pioneer created his calculations about space flight theory - 1897	<b>11</b>  Space Shuttle Atlantis, last Hubble Space Telescope Servicing Mission (2009)   2nd Saturday Stars Open House McCarthy Observatory
<b>12</b>  NASA astronaut, Gregory Harold "Box" Johnson born, veteran of two space flights, STS-123 and STS-134 (1962)	<b>13</b>  Moon at Apogee (furthest distance from Earth)   Launch of first Bumper rocket, from White Sands New Mexico (1948)	<b>14</b>  Herschel/Planck Ariane 5 Launch 2009   Launch of Skylab 1973   Early liquid fueled rockets: German Society for Space Travel (1931); American Interplanetary Society (1933)	<b>15</b>  6th docking of a space shuttle (Atlantis) with Russian space station Mir (1997)   Launch of Faith 7 - Final Mercury mission 1963	<b>16</b>  Soviet spacecraft Venera 5, 6 send data on Venus, then impact planet May 16-17, (1969)   Space Shuttle Endeavour final launch (2011)	<b>17</b>  Norman Lockyer born, co-discoverer of helium (1836)	<b>18</b>  Apollo 10 to Moon Young/Stafford/Cernan (1969)
<b>19</b>  Launch of first Army Hermes A-1 rocket from White Sands, NM (1950)	<b>20</b>  Launch of Pioneer Venus 1 spacecraft (1978)   Annular Solar Eclipse	<b>21</b>  Launch of Japanese Venus Climate Orbiter Akatsuki or Planet-C spacecraft and the Ikaros solar sail (2010)	<b>22</b>  Space X first successful commercial launch of spacecraft to the ISS, Cape Canaveral (2012)   First Hubble images of Saturn ring plane as the rings are edge-on to the Sun, viewed from Earth (1995)	<b>23</b>  Cassini spacecraft 91st flyby of Saturn's moon Titan (602 miles, or 970 kilometers).   Dr. H. Paul Shuch born, American scientist and engineer, has coordinated radio amateurs in the search for extraterrestrial intelligence (1946)	<b>24</b>  Moon at perigee (closest to earth)   Launch of Midas 2, 1st experimental infrared surveillance satellite 1960   Scott Carpenter, second American in space (1962)	<b>25</b>  Launch of Skylab 1 crew 1973   Phoenix spacecraft lands on Martian soil 2008   JFK Moon goal speech (1961)
<b>26</b>  Launch of first "Navaho Missile", ICBM precursor (1948)	<b>27</b>  Lawrence Maxwell Krauss born, Canadian-American theoretical physicist and author <i>The Physics of Star Trek</i> and <i>A Universe from Nothing</i> (1954)	<b>28</b>  Abel and Baker 1st primates in orbit (1959)   Frank Drake born, author of "the Drake Equation" on intelligent life (1930)   Launch of Mars 3 (USSR) lander and rover - 1st spacecraft to attain soft landing on Mars (1971)	<b>29</b>  Launch of Luna 22 (USSR), orbiter mission to study the Moon's magnetic field, the geology, and gravitational field (1974)   Measurements during solar eclipse confirm Einstein's relativity theory - 1919	<b>30</b>  Mariner 9, 1st artificial satellite of Mars (1971)   : Launch of Surveyor 1 Moon lander; transmitted over 11,000 images from Oceanus Procellarum (1966)	<b>31</b>  European Space Agency Born 1975	



# 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)

**May 11th**  
**8:00 - 10:00 pm**

## EXPLORING THE OUTER SOLAR SYSTEM

Refreshments  
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Activity Center  
Stars & Planets  
Rain or shine

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