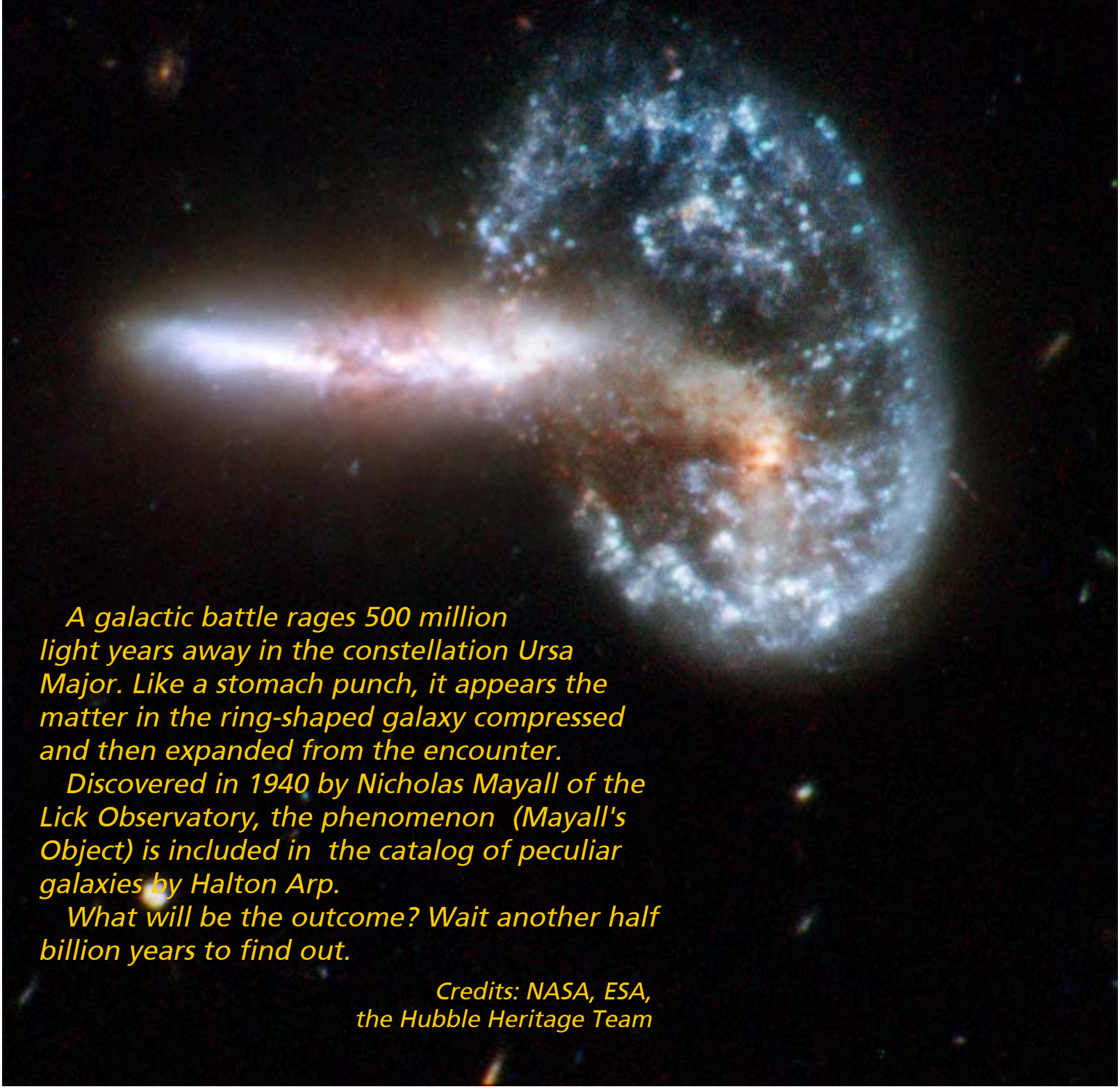
Galactic Observer

John J. McCarthy Observatory

Volume 7, No. 9 September 2014

When Galaxies Collide



A galactic battle rages 500 million light years away in the constellation Ursa Major. Like a stomach punch, it appears the matter in the ring-shaped galaxy compressed and then expanded from the encounter.

Discovered in 1940 by Nicholas Mayall of the Lick Observatory, the phenomenon (Mayall's Object) is included in the catalog of peculiar galaxies by Halton Arp.

What will be the outcome? Wait another half billion years to find out.

Credits: NASA, ESA, the Hubble Heritage Team

The John J. McCarthy Observatory

New Milford High School
388 Danbury Road
New Milford, CT 06776

Phone/Voice: (860) 210-4117
Phone/Fax: (860) 354-1595
www.mccarthyobservatory.org

JJMO Staff

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

Steve Allison
Steve Barone
Colin Campbell
Dennis Cartolano
Mike Chiarella
Jeff Chodak
Bill Cloutier
Cecilia Detrich
Dirk Feather
Randy Fender
Randy Finden
John Gebauer
Elaine Green
Tina Hartzell
Tom Heydenburg
Jim Johnstone
Carly KleinStern
Bob Lambert
Roger Moore
Parker Moreland, PhD
Allan Ostergren
Marc Polansky
Joe Privitera
Monty Robson
Don Ross
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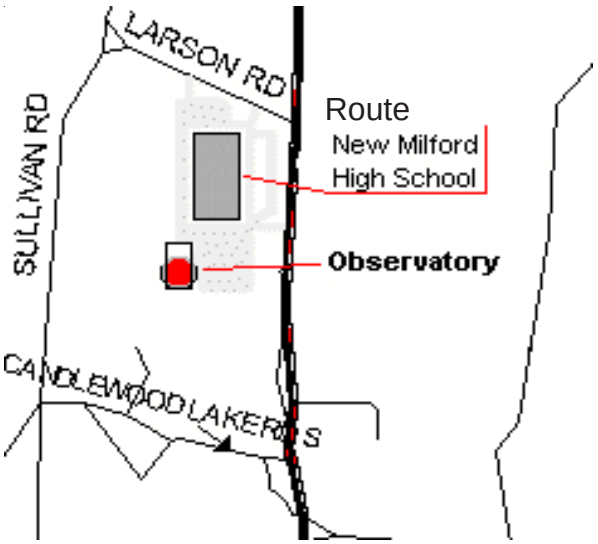
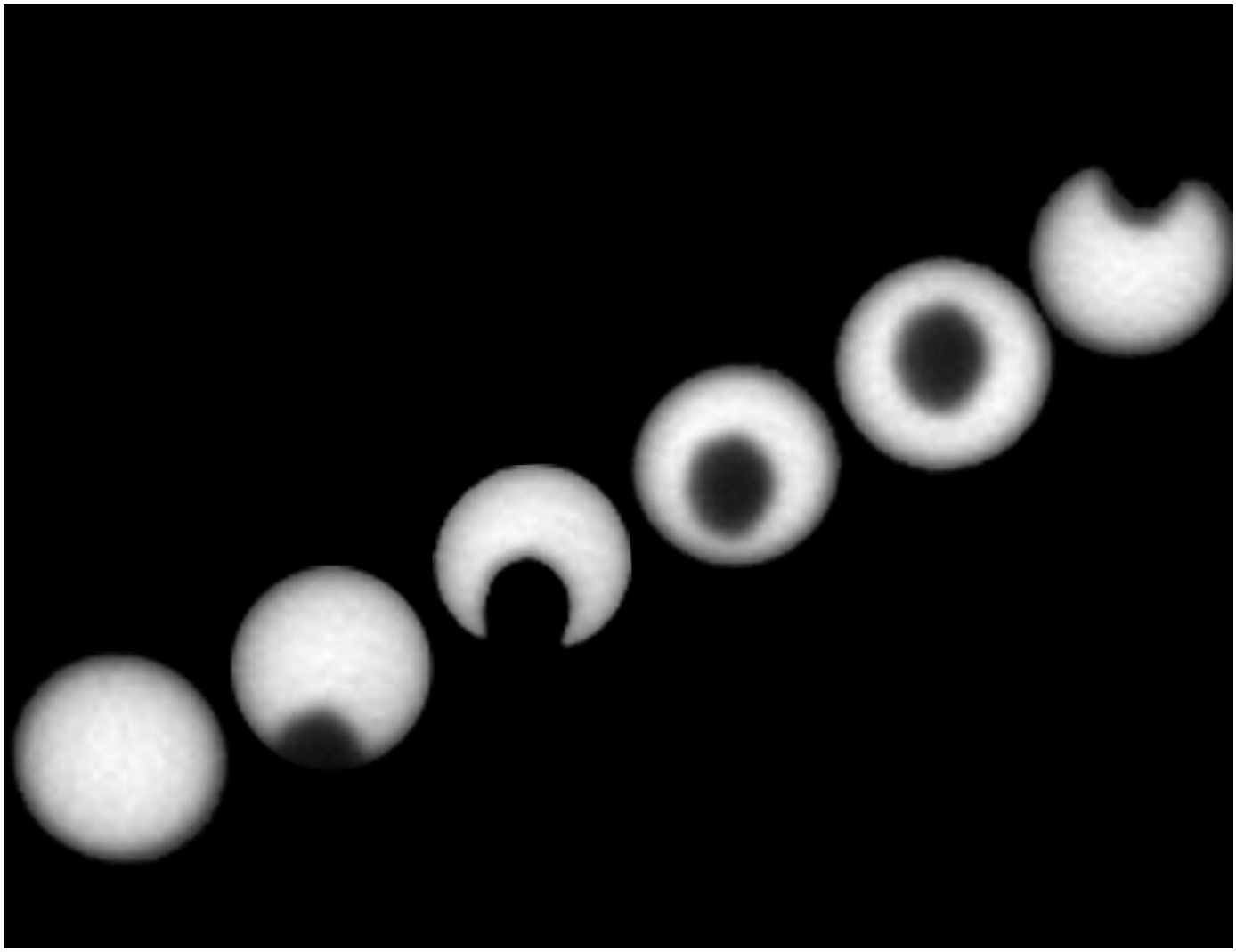
Jon Wallace
Paul Woodell
Amy Ziffer



In This Issue

September AstronomyCalendar and Space Exploration Almanac



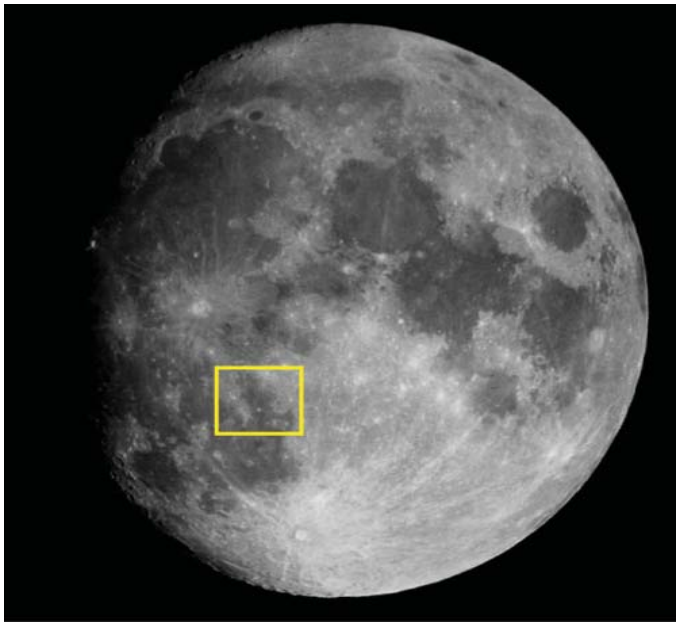
The Mars Exploration Rover "Opportunity" imaged Phobos, Mars' largest moon as it passed in front of (or transited) the Sun on August 7, 2014. Transit observations are being used to improve the orbit of the irregular moon. Phobos is a small, battered body, 17 miles (27 km) across at its longest. It orbits 3,700 miles (6,000 km) above the Red Planet's surface. Being so close to Mars, the orbit of Phobos changes (degrades) over time. These changes provide information about the internal structure of the moon as well as insight into the eventual fate of the moon.

Located just above the equator, Phobos isn't visible at the poles. The diminutive moon travels so quickly that it overtakes the planet's rotation; appearing to rise in the west and set in the east. With a slowly decaying orbit, Phobos will eventually succumb to tidal forces and break apart (in 50 to 100 million years). Conversely, Deimos, the smaller of Mars' two moons, is slowly moving further away from the Red Planet.

Of local interest, Ms. Kyle Cloutier, McCarthy Observatory volunteer and now member of the Jet Propulsion Laboratory's Mars Exploration Rover team, was the Tactical Activity Planner/ Sequence Integration Engineer who built the command sequence bundle for this particular Martian sol (day) that included the instructions on photographing the transit of Phobos

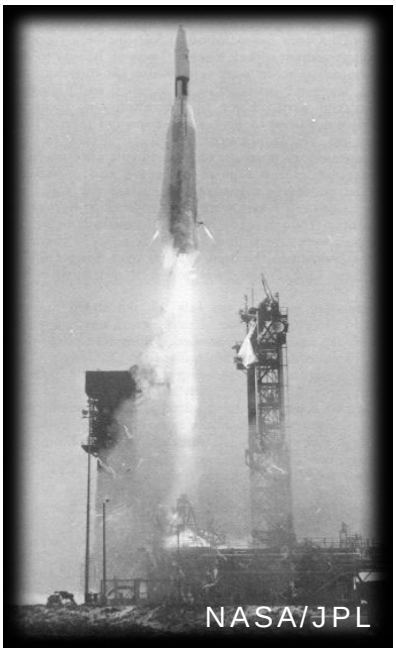
"Out the Window on Your Left"

It's been over 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).



In the early 1960s, NASA launched a series of unmanned spacecraft ("Ranger") to the Moon. The spacecraft were designed to take high-quality images of the Moon for scientific study as well as for selecting landing sites for the Apollo missions. On the morning of July 31, 1964, Ranger 7 took the first close up images of the Moon (by a U.S. spacecraft).

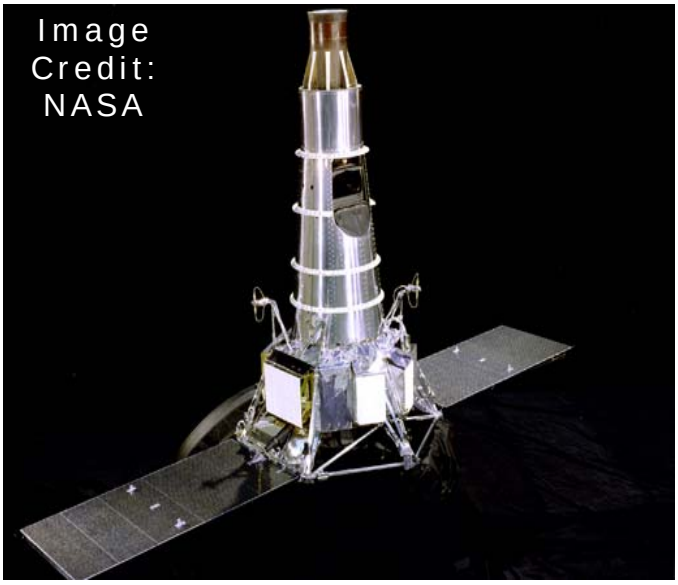
Ranger 7 transmitted over 4,300 high-quality images in the last 17 minutes of its flight (which ended upon impact with the lunar surface). The first and last images from Ranger 7's cameras (the spacecraft was equipped with six television cameras) are shown on the following page. The cameras were designed to provide different exposure times and fields of view. The cameras' video signals were converted to a radio frequency signal for transmittal by the spacecraft's high-gain antenna. The signals were received by the large antenna at the Goldstone tracking station in the Mojave Desert, where it was recorded on 35-millimeter film and magnetic tape.



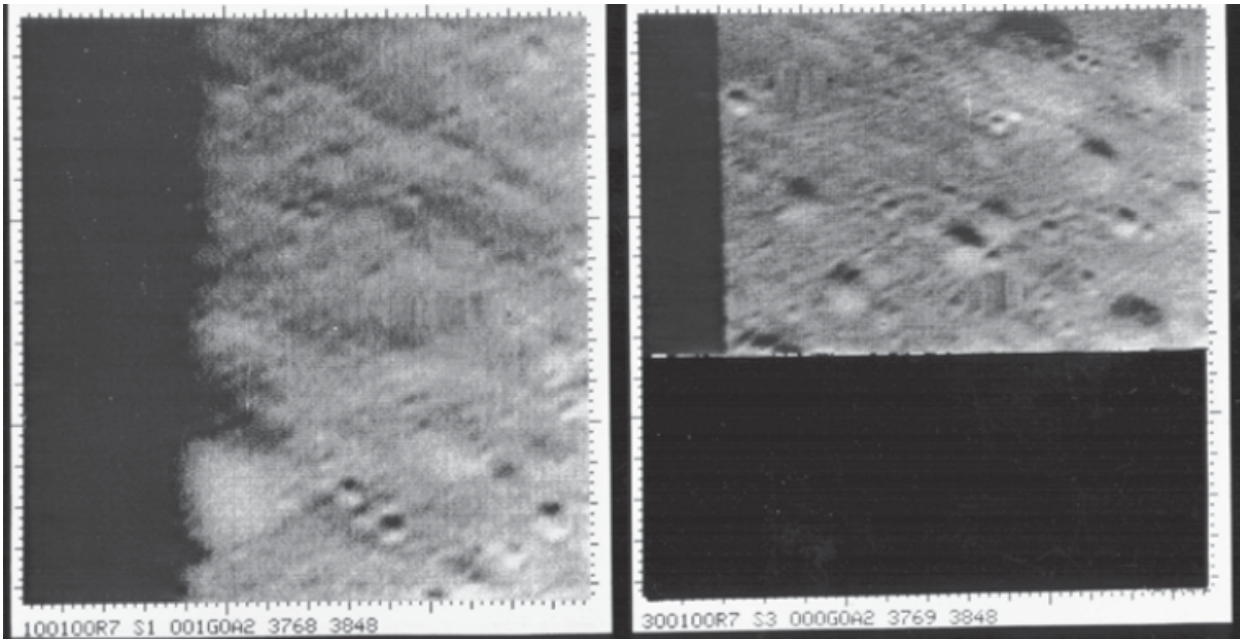
The large crater in the top right corner of the first photo is the crater Ptolemaeus, with adjacent craters Alphonsus and Arzachel below. The northeastern reach of Mare Nubium (Sea of Clouds) is at the lower center of the image. The last pictures were taken less than a second before impact at approximately 1,700 feet (519 meters) above the lunar surface. Transmission of the pictures was cut off on impact.

The image resolution on the final photos was a factor of 1,000 times better than Earth-based views of the Moon. Craters as small as 20 inches across (50 cm) were discernable in the last transmission. Ranger 7's mission ended when it impacted the Moon in an area between Mare Nubium and Oceanus Procellarum (Ocean of Storms).

The Ranger 7 spacecraft was the first successful Ranger mission (previous missions had been marred by launch or equipment failures). It was followed by the equally successful Ranger 8 and 9 missions. In total, the Ranger missions provide unprecedented views of the lunar surface. However, NASA would have to wait until the Surveyor lander missions to confirm that the lunar soil could support the weight of a spacecraft (a passionately debated question at the time).



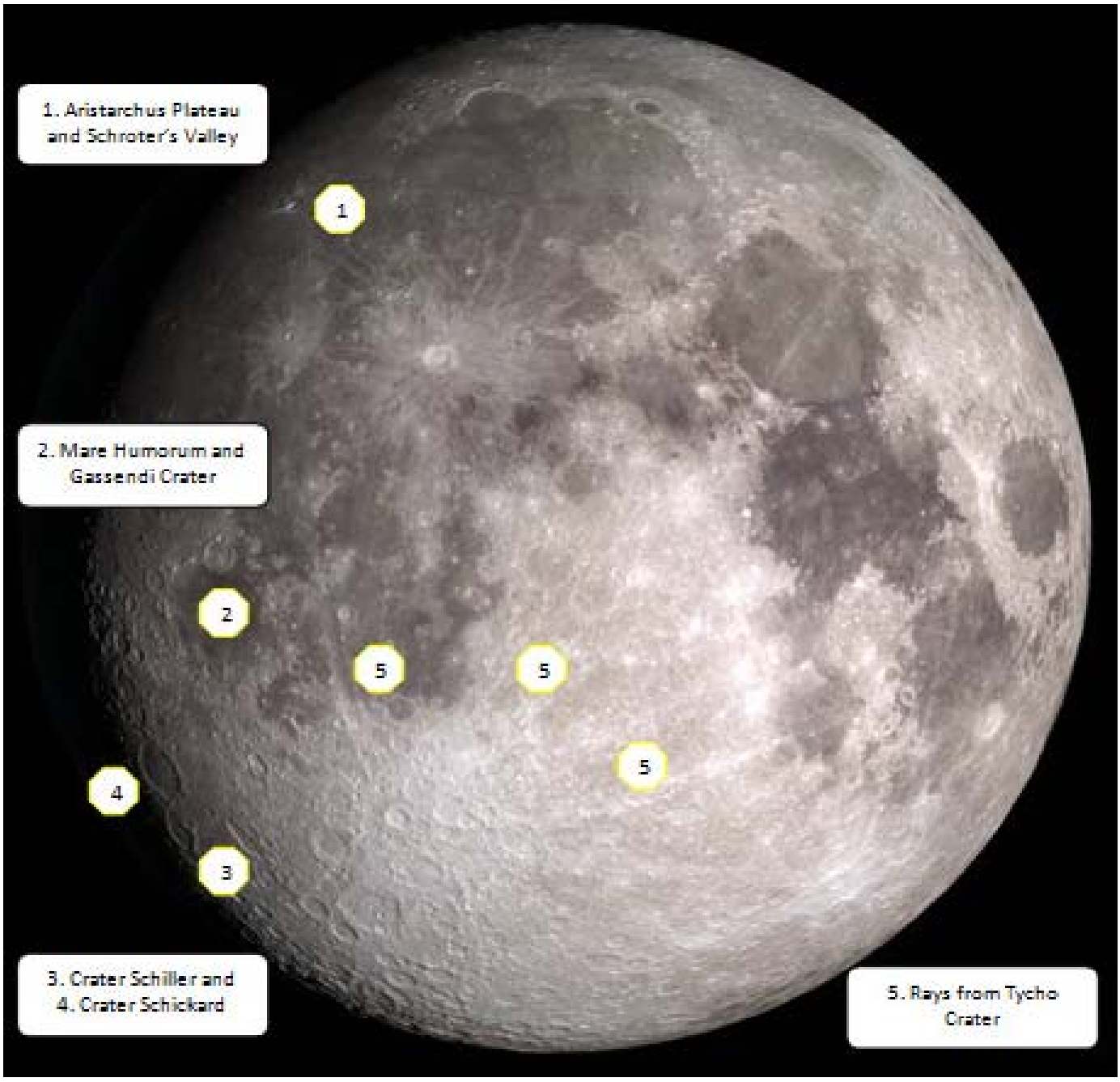
Ranger 7 Images of the Moon (first and last)
(Image Credits: NASA/JPL



International Observe the Moon Night

September 6th is this year's annual International Observe the Moon Night (InOMN). The event was first inspired by public outreach events held in August 2009 by the Lunar Reconnaissance Orbiter (LRO) and Lunar CRater Observation and Sensing Satellite (LCROSS) educational teams at the Goddard Space Flight Center in Greenbelt, Maryland and at the Ames Research Center in Moffett Field, California, respectively. In 2010 the Lunar and Planetary Institute and Marshall Space Flight Center joined Goddard and Ames in a world-wide event to raise public awareness of lunar science and exploration. Additional information on scheduled events can be found on *http://observethemoonnight.org/*.

The Moon will rise around 5:33 pm (EDT) on the 6th. Approximately 90% of the near-side surface will be illuminated, as shown in the simulated image (below). The image has been annotated with features of interest for that evening.

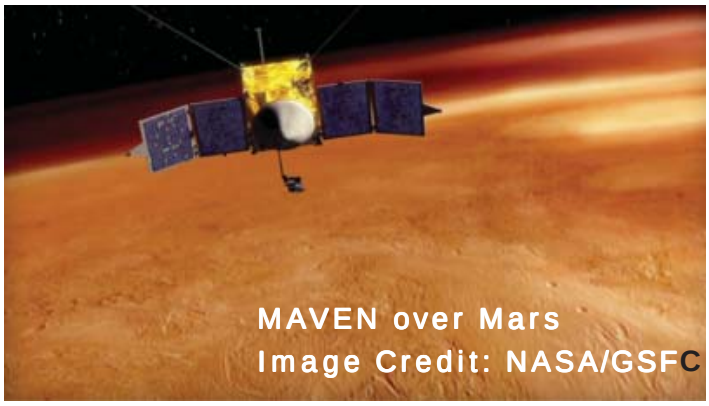


MAVEN's Arrival

NASA's Mars Atmosphere and Volatile Evolution (MAVEN) orbiter is the first spacecraft designed exclusively to study the upper atmosphere of Mars and explore the processes through which the planet's atmosphere could be lost to space. MAVEN was launched on November 18, 2013 and is on track to arrive at Mars on September 21, 2014.

Today, Mars is cold and dry with a thin atmosphere composed entirely of CO_2. However, everywhere we look on its surface, we find evidence of a much warmer and wetter Mars at some point in the very distant past. The climate had to be much different than today for liquid water (including lakes and rivers) to have existed on Mars. To regulate and maintain a surface temperature that allows liquid water, particularly for a planet as far away from the Sun as Mars, requires a thick atmosphere.

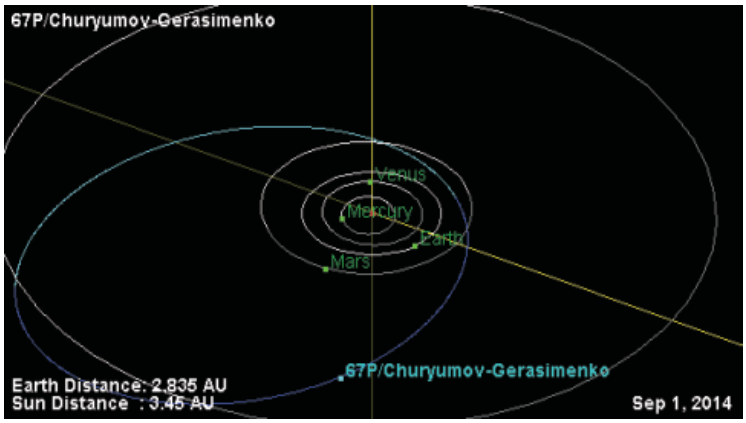
MAVEN's mission is to explore the upper atmosphere and the atmosphere's interaction with the Sun and the solar wind. The solar wind, generated by the Sun, is comprised of charged particles. The wind's speed can reach a million miles an hour as it crosses the orbit of Mars (the solar wind may have been even much more energetic when the Sun was young). The charged particles interact with the gas molecules in Mar's upper atmosphere, allowing them to escape into space through various processes such as sputtering. Gradually, over billions of years, the atmosphere of a planet can be stripped off (there are indications that these same processes are at work today, eroding away the atmosphere of Venus).



Data gathered by MAVEN is expected to aid in the modeling of a wet and warm Mars, and provide answers on the potential habitability, past and present. Mapping of the solar wind in the space around Mars will also provide insight into how the solar wind interacts with a planet with no global (but some localized) magnetic field. MAVEN is expected to operate for up to a decade.

Close Encounter with Comet 67P/Churyumov-Gerasimenko

More than 10 years after being launched from the Guiana Space Centre in French Guiana, the Rosetta spacecraft entered orbit around Comet 67P/Churyumov-Gerasimenko. The spacecraft's 10 year journey included flybys of Mars and two asteroids, 2867 Šteins and 21 Lutetia along the way, as well as multiple encounters with the Earth.



Comet 67P/Churyumov-Gerasimenko was first observed in 1969. Its orbit suggests that it came from the Kuiper Belt, an icy disk beyond Neptune. Until the late 1800s, the comet stayed far from the Sun, too far for the frozen nucleus to become active (and visible to observers). Shortly thereafter, a series of encounters with Jupiter modified the comet's orbit, sending it into the inner solar system. The comet currently orbits the Sun once every 6.45 years. The simulation (below) from JPL's Small-Body Database shows the position of the comet on September 1, 2014. The comet is well

Artist's view of ESA's Rosetta cometary probe.

inside the orbit of Jupiter (outer white ellipse) and heading towards the inner solar system.

Rosetta is the first spacecraft to fly alongside a comet as it makes its close approach to the Sun and returns to deep space. In the next few months, Rosetta will release a small lander. The lander (Philae) will touch down on the comet's surface, firing harpoons into its icy surface to prevent it from bouncing off. Philae will take the first images from the surface of a comet and be able to conduct in-situ analysis of the comet's composition.

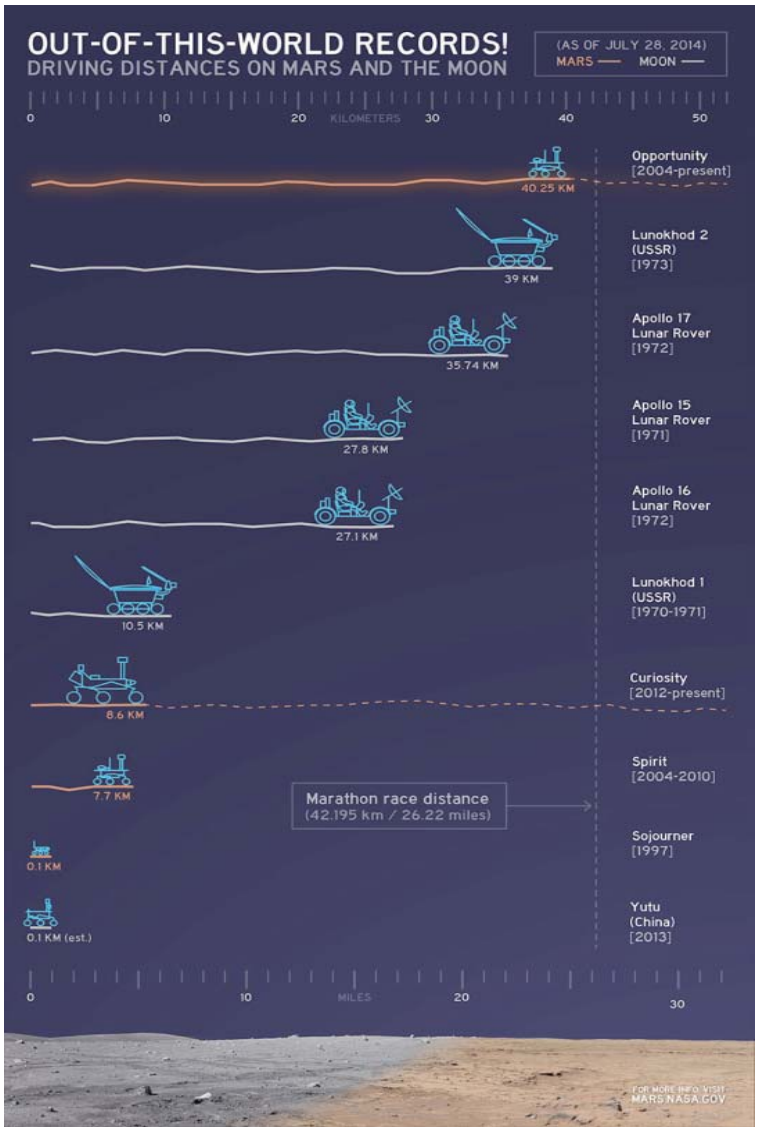
The spacecraft is named after the Rosetta Stone and the lander after the Philae Obelisk that together provided the key to unlocking the meaning of Egyptian hieroglyphs.

The photo of the comet (below) was taken on August 3rd, from a distance of 177 miles (285 kilometers). The spacecraft has since moved into an orbit only 48 miles (80 km) above the surface.

Comet 67P/Churyumov-Gerasimenko
Credit: ESA/Rosetta/MPS for OSIRIS Team
MPS/UPD/LAM/IAA/SSO/INTA/UPM/DASP/IDA

Images returned by Rosetta show an icy body with two lobes, one considerably larger than the other. The comet completes a rotation every 12.4 hours. The terrain is diverse, ranging from smooth, icy fields to ragged cliffs and boulder fields. Features akin to impact craters can also be seen in some views. Density measurements suggest that the nucleus is a porous, loosely packed, dirty snow ball.

Photo reconnaissance is being used to scout potential landing sites for Philae. The landing needs to be accomplished before the comet gets too close



to the Sun and the now frozen surface becomes unstable. However, Philae cannot land too early since it needs sufficient sunlight to power its solar cells. The landing is currently targeted for November.

Closest approach to the Sun (perihelion) occurs in August 2015. Rosetta's mission is currently scheduled to conclude four months later, in December 2015.

Out of this World Record

NASA's Mars Exploration Rover "Opportunity" set an off-world driving record on July 27th, when its odometer hit 25.01 miles (40 km) as it traveled along the rim of Endeavour Crater. The previous record was established by the Soviet Lunokhod 2 rover on the Moon in 1973. Tracks in the lunar soil, imaged by the Lunar Reconnaissance Orbiter's cameras were used to determine the distance covered by Lunokhod 2 in its five month of exploration (it has taken Opportunity more than 10 years).

India's Mars Orbiter Mission

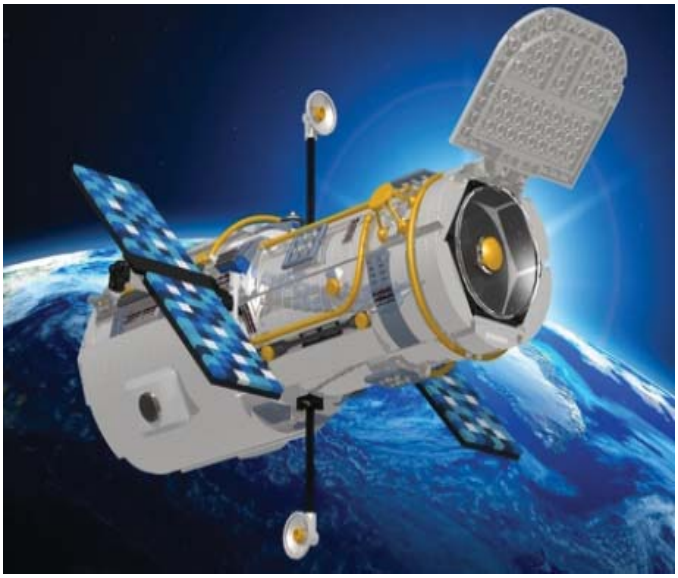
In November 2013, India launched its first interplanetary mission to Mars. The Mars Orbiter Mission (MOM) is expected to arrive at Mars on September 24th, three days after NASA's MAVEN spacecraft. While the science objectives are ambitious (explore Mars' surface features, mineralogy and atmosphere), the MOM mission has provided the Indian Space Research Organisation (ISRO) with important technological experience on launching and conducting a deep-space mission.

Photo Credit: ISRO

A LEGO Hubble Space Telescope?

Have you ever had a great idea for a LEGO product? Well, the Danish toy company has established a process (at *https://ideas.lego.com/)* where anyone can propose a new idea (or "project" in LEGO terminology), as long as it is within established guidelines. Once a project is posted, the public reviews your proposal on line and votes for those projects that they would like to see become a LEGO product. You need 10,000 votes (within a 365 day time limit) before LEGO group considers your project for production.

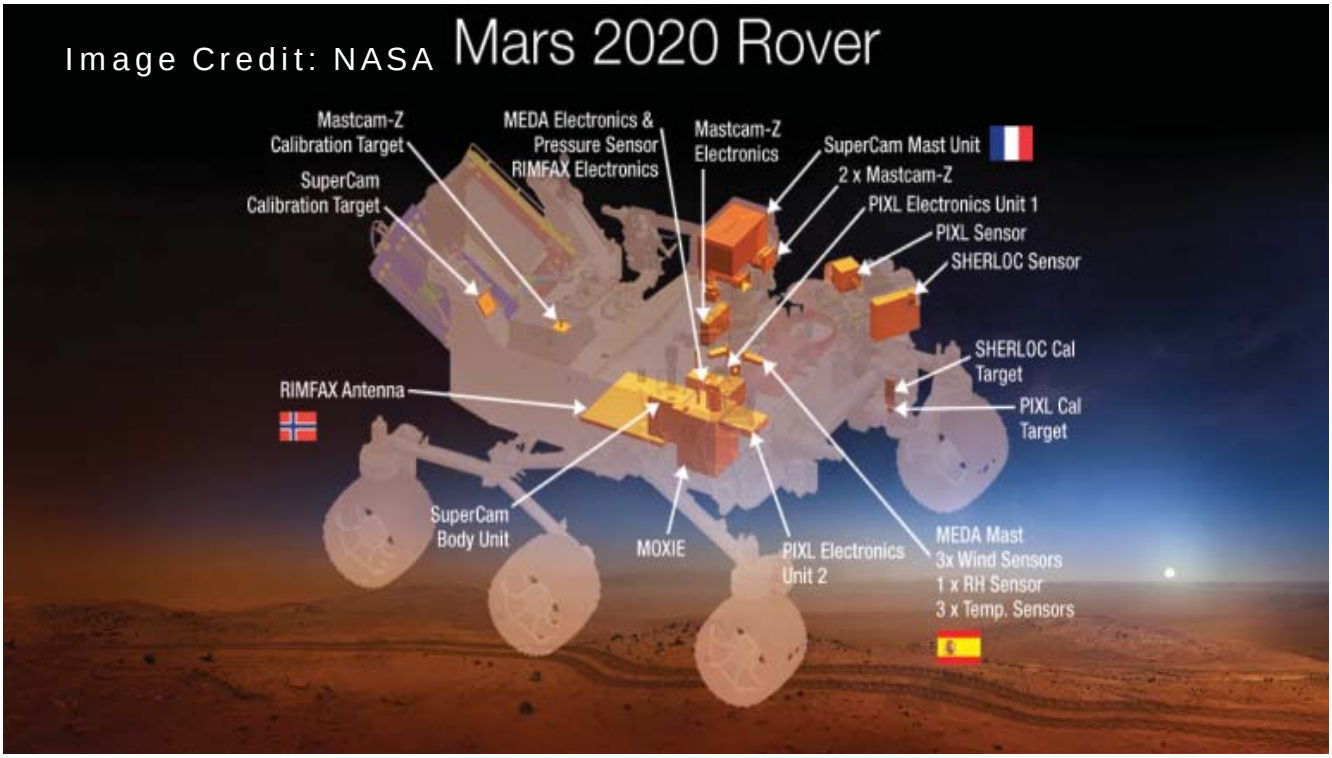
A model of the Hubble Space Telescope was posted for public approval earlier this year. In the first 100 days, it has gathered over 8,700 votes. The builder, Gabriel Russo, is hoping that the model is approved and on toy store shelves by the telescope's 25th anniversary in 2015.



Mars 2020

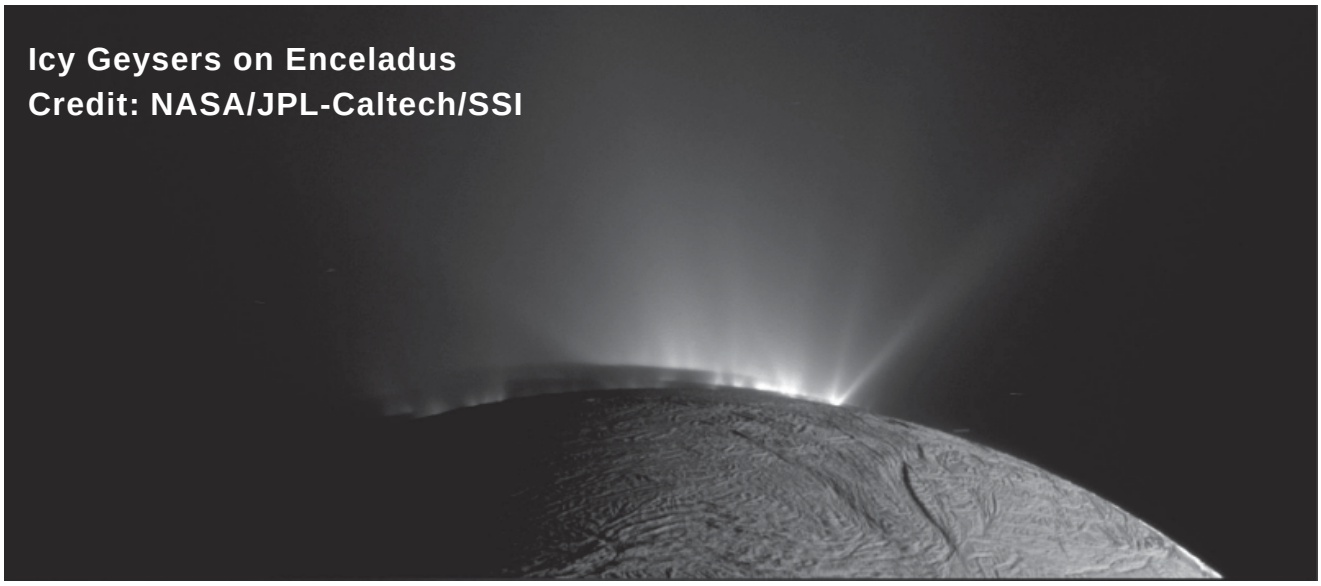
NASA is ready to build upon its success with the Mars Science Laboratory (Curiosity) with "Mars 2020." The proposed rover will be built around the same platform, but carry more sophistical hardware and instrumentation. NASA received 58 proposals for instruments and experiments from individuals and organizations worldwide – seven were selected. One of the more intriguing payloads selected is the Mars Oxygen ISRU Experiment (MOXIE). The proposed technology will demonstrate the practicality of producing oxygen from Martian atmospheric carbon dioxide. Large scale production of oxygen would reduce the need to transport breathing air, drinking water and rocket fuel from Earth for future manned expeditions.

Mars 2020 is tentatively scheduled to launch in July/August 2020 and arrive at Mars 8 to 9 months later. Similar to the Mars Science Laboratory mission, Mars 2020 will use a combination of parachutes, rockets and a powered sky crane for descent and landing (at a site to be determined). Its primary mission will be for one Mars year (669 days).



101 Icy Geysers

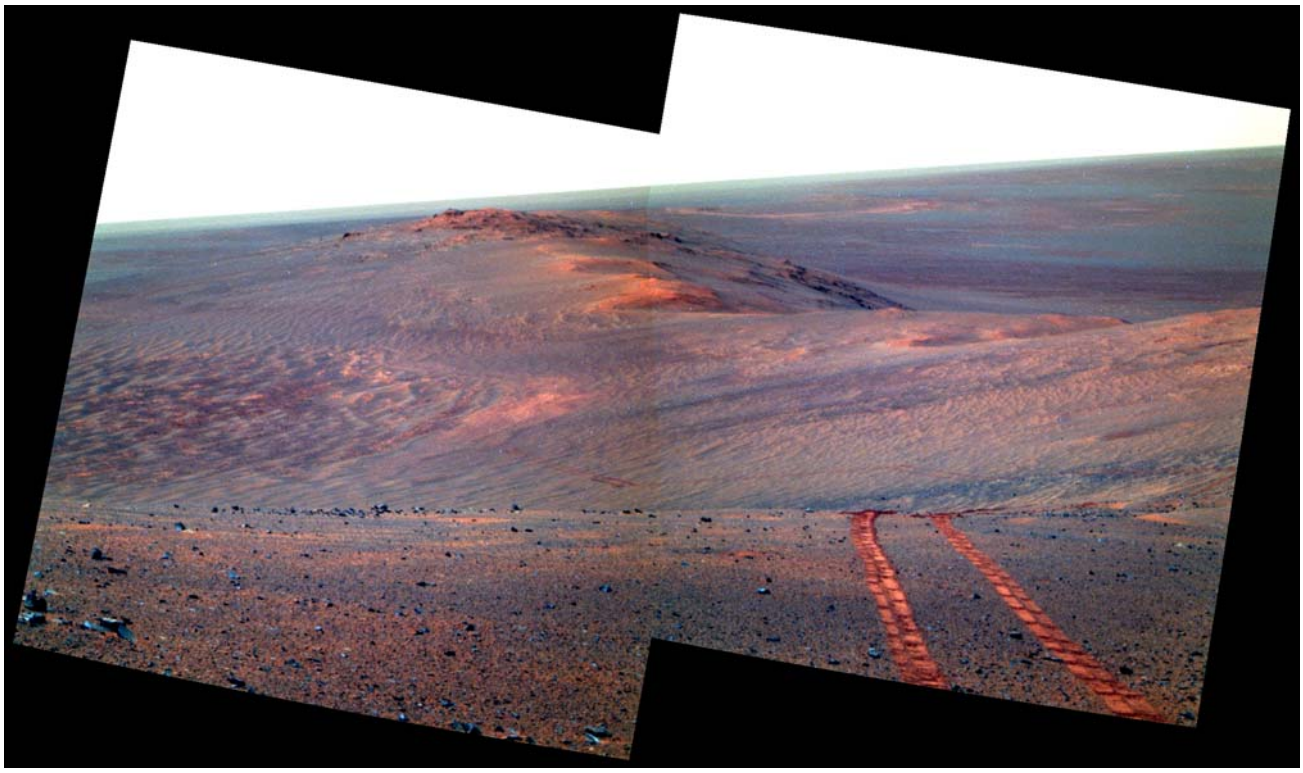
Data returned from NASA's Cassini spacecraft has been used to identify 101 distinct geysers erupting on Saturn's icy moon Enceladus. The geysers were first sighted almost 10 years ago and originate from fractures in the icy surface around the moon's south pole. A six mile deep ocean under the moon's crust is the suspected source of the water vapor.



Icy Geysers on Enceladus
Credit: NASA/JPL-Caltech/SSI

Opportunity Leaves Its Mark

The Mars Exploration Rover (MER) "Opportunity" has been driving south along the west rim of Endeavour Crater. The rover is heading towards its next major investigation site "Marathon Valley." Observations of the valley from orbit suggest the presence of several clay mineral layers along the valley's steep sides. Scientists had hoped to reach the valley before winter; however, Opportunity is experiencing intermittent memory problems. While the MER team at JPL is keeping a watchful eye on the rover and not getting much sleep, all science activities have been suspended until the team can identify a remedy (if there is one for the 10+ year old rover).



Harvest Moon

The Full Moon that occurs closest to the Autumnal Equinox is known as the Harvest Moon. This year the Full Moon occurs late in the evening of September 8th. The Harvest Moon traditionally appears around the time when farmers in the northern hemisphere are working long days to bring in their crops. The full moon provides a bit more light, longer into the evening. However, what is really special at this time of the year is the appearance of the Moon in the days just before and after it reaches its full phase.

Throughout the year the Moon rises, on average, 50 minutes later each day. The difference can be more than an hour in the spring and closer to 30 minutes in the fall. On the following graph, the average difference in the time of moonrise on the three days preceding and following the full moon are plotted. In September, the difference is as little as 37 minutes (from one night to the next). The effect is that an almost fully illuminated moon is in the evening sky earlier each evening, benefiting farmers still out in the field (and children playing after school).

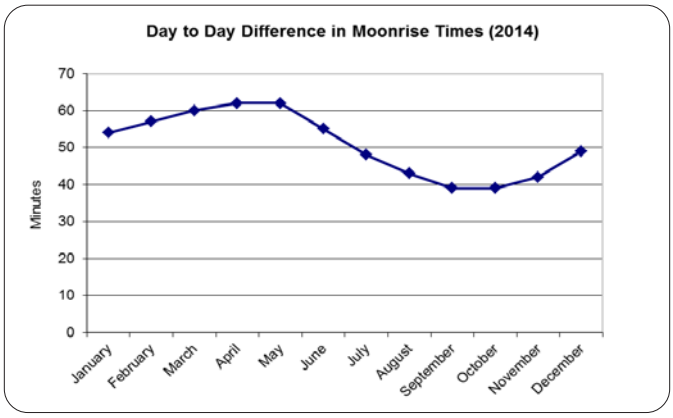
For example, the Moon rises at 6:53 p.m. on September 8th, the night of the full Moon. The next two nights the Moon rises about a half hour later. As such, on September 11th, (three days after full) a bright moon is back in the sky an hour and one half after sunset.

Autumnal Equinox

The Sun crosses the celestial equator at 10:29 pm EDT on the evening of September 22rd, marking the beginning of the fall season in the northern hemisphere.

Aurora and the Equinoxes:

Geomagnetic storms that are responsible for auroras happen more often during the months around the equinox (March and September). Check your evening sky or log onto *www.spaceweather.com* for the latest on solar activity.



Sunrise and Sunset

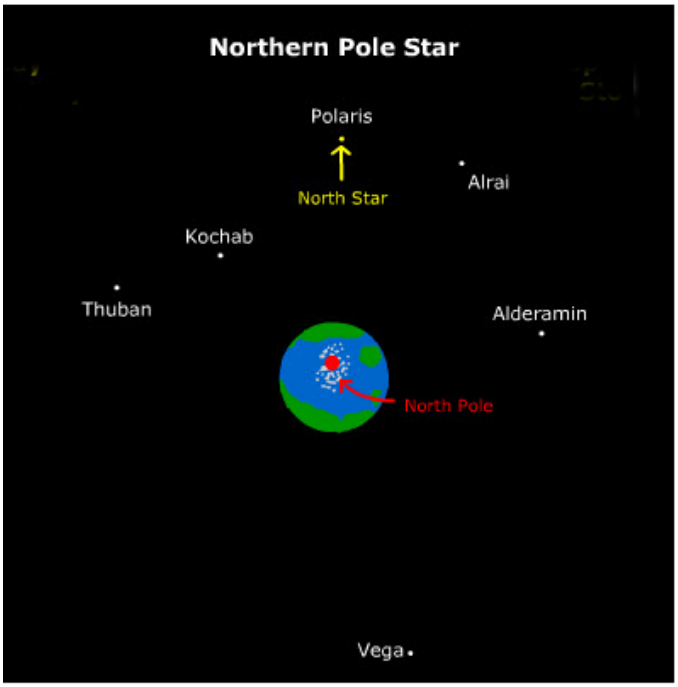
Sun	Sunrise	Sunset
September 1st (EDT)	06:20	19:27
September 15th	06:34	19:03
September 30th	06:49	18:37

September Nights

Enjoy the jewels of the summer Milky Way while the nights are still warm and the skies are clear. From Cygnus to Sagittarius, follow the star clouds and dust lanes that comprise the inner arms of our spiral galaxy. In the south after sunset, the stars in the constellation Sagittarius form an asterism, or pattern, of a teapot. The spout of the teapot points the way to the center of the Milky Way galaxy with its resident black hole. Check out the July/August calendar for more details.

Present and Future Pole Stars

Vega, the fifth brightest star and located in the constellation Lyra, is placed high in the evening sky during September. Vega is also destined to become the Pole Star in 12,000 years. Precession, or the change in the direction of the rotational axis of the Earth over time, is best exemplified in a comparison of the position of Vega to that of Polaris (the current Pole Star).



The Earth's wobble will eventually tilt our north pole in the direction of Vega at the bottom of the image. Source: Office of Naval Research

Astronomical and Historical Events

1st Kuiper Belt Object 145452 (2005 RN43) at Opposition (39.645 AU)
1st History: flyby of Saturn by the Pioneer 11 spacecraft (1979)
2nd First Quarter Moon
2nd Asteroid 40 Harmonia at Opposition (9.3 Magnitude)
2nd History: discovery of asteroid *3 Juno* by Karl Harding (1804)
3rd History: controlled impact of the SMART-1 spacecraft on the lunar surface at the conclusion of a successful mission; precursor of NASA's LCROSS mission (2006)
3rd History: Viking 2 spacecraft lands on the Martian surface (1976)
4th Kuiper Belt Object 2010 RF43 at Opposition (51.982 AU)
5th History: launch of Voyager 1 to the planets Jupiter and Saturn (1977); at almost 12 billion miles (19.3 billion km) from Earth, Voyager 1 has entered the interstellar space
6th International Observe the Moon Night (http://observethemoonnight.org/)
7th Moon at perigee (closest distance to Earth)
8th Full Moon (Full Harvest Moon)
8th History: sample return canister from the Genesis spacecraft crashes back to Earth when drogue parachute fails to deploy. Spacecraft was returning to Earth from Lagrange Point 1 with its collection of solar wind particles (2004)
8th History: launch of the Surveyor 5 spacecraft (lunar science mission); landed on Mare Tranquillitatis three days later (1967)
8th History: first Star Trek episode airs on television (1966)
8th History: discovery of Comet Ikeya-Seki by Kaoru Ikeya and Tsutomu Seki (1965)
8th History: Marshall Space Flight Center's dedication by President Eisenhower (1960)
9th Asteroid 12 Victoria at Opposition (9.0 Magnitude)
9th Asteroid 33 Polyhymnia at Opposition (9.8 Magnitude)
9th History: launch of Conestoga I, first private rocket (1982)
9th History: launch of Soviet spacecraft Venera 11 (Venus lander) to the planet Venus (1978)
9th History: discovery of Jupiter's moon *Amalthea* by Edward Barnard (1892)
10th Moon Occults Uranus
10th History: launch of the GRAIL spacecraft aboard a Delta 2 rocket from the Canaveral Air Force Station; lunar gravity mapping mission (2011)
10th History: debut flight of the Japanese H-2 Transfer Vehicle (or HTV) to the International Space Station (2009)
11th History: Mars Global Surveyor enters orbit around Mars (1997)
11th History: flyby of Comet Giacobini-Zinner by the International Cometary Explorer (ICE), first spacecraft to visit a comet (1985)
12th History: launch of Soviet Luna 16; first robotic probe to land on the Moon and return a sample to Earth (1970)
12th History: launch of Gemini XI with astronauts Charles Conrad and Richard Gordon (1966)
12th History: launch of the Soviet spacecraft Luna 2, first to impact the Moon's surface (1959)
13th Second Saturday Stars – Open House at the McCarthy Observatory
13th History: launch of the Japanese Moon orbiter "Kaguya" (Selene 1) (2007)
14th History: launch of Soviet spacecraft Venera 12 (Venus lander) to the planet Venus (1978)
14th History: discovery of Jupiter's moon *Leda* by Charles Kowal (1974)

Astronomical and Historical Events (continued)

14th History: John Dobson born, architect of the Dobsonian alt-azimuth mounted Newtonian telescope (1915)
15th Last Quarter Moon
17th History: Konstantin Tsiolkovsky born in Izhevskoye, Russia; one of the fathers of rocketry and cosmonautics, along with Goddard and Oberth (1857)
17th History: discovery of Saturn's moon *Mimas* by William Herschel (1789)
18th History: launch of Vanguard 3, designed to measure solar X-rays, the Earth's magnetic field, and micrometeoroids (1959)
19th History: NASA unveiled plans to return humans to the moon (2005)
19th History: first launch of the Wernher von Braun-designed Jupiter C rocket from Cape Canaveral (1956)
19th History: discovery of Saturn's moon *Hyperion* by William and George Bond and William Lassell (1848)
20th Moon at apogee (furthest distance from the Earth)
20th Kuiper Belt Object 120347 Salacia at Opposition (43.579 AU)
21st Scheduled orbital insertion of the MAVEN (Mars Atmosphere and Volatile Evolution) spacecraft
21st Mercury at its Greatest Eastern Elongation (26°); apparent separation from the Sun in the evening sky
21st History: second flyby of Mercury by the Mariner 10 spacecraft (1974)
21st History: Gustav Holst born, composer of the symphony "The Planets" (1874)
21st History: Soviet spacecraft Zond 5 returns after circumnavigating the Moon (1968)
21st History: Galileo spacecraft impacts Jupiter after completing its mission (2003)
22nd Autumnal Equinox at 10:29 pm (EDT)
22nd Flyby of Saturn's largest moon Titan by the Cassini spacecraft
22nd History: Deep Space 1 spacecraft passes within 1,400 miles (2,200 km) of the 5 mile long potato-shaped nucleus of Comet Borrelly (2001)
23rd History: Johann Galle discovers the planet Neptune (1846)
24th New Moon
24th Scheduled orbital insertion of India's MOM (Mars Orbiter Mission) spacecraft
24th History: John Young born (1930), first person to fly in space six times, including Gemini 3 (1965), Gemini 10 (1966), Apollo 10 (1969), Apollo 16 (1972), STS-1, the first flight of the Space Shuttle (1981), and STS-9 (1983)
24th History: Soviet spacecraft Luna 16 returns 101 grams of lunar soil to Earth (1970)
25th Plutino 2001 QF298 at Opposition (42.310 AU)
25th Scheduled launch of a Russian Soyuz rocket from the Baikonur Cosmodrome, Kazakhstan, to the International Space Station with the next expedition crew
26th Connecticut Star Party, Ashford, CT, http://www.asnh.org (through the 28th)
26th History: Cosmonauts V. Titov and Strekalov escape moments before Soyuz T-10-1 explodes on the pad (1983)
27th History: launch (2007) of the Dawn spacecraft to Vesta (2011) and Ceres (2015)
27th History: launch of SMART-1, the first European lunar probe (2003)
28th History: launch of Soviet lunar orbiter Luna 19; studied lunar gravitational fields and mascons (mass concentrations), radiation environment, and the solar wind (1971)
28th History: launch of Alouette, Canada's first satellite (1962)
28th History: discovery of Jupiter's moon Ananke by Seth Nicholson (1951)
29th History: launch of Salyut 6, first of a second generation of Soviet orbital space station designs (1977),
30th History: all instruments deployed on the Moon by the Apollo missions are shut off (1977)
30th History: discovery of Jupiter's moon *Themisto* by Charles Kowal (1975)

References on Distances

• The apparent width of the Moon (and Sun) is approximately one-half a degree (½°), less than the width of your little finger at arm's length which covers approximately one degree (1°); three fingers span approximately five degrees (5°)

• One astronomical unit (AU) is the distance from the Sun to the Earth or approximately 93 million miles

International Space Station/Space Shuttle/Iridium Satellites

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

Solar Activity

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

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Second Saturday Stars poster: Sean Ross, Ross Designs

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

September 13th

8:00 - 10:00 pm

GRAIL

Unraveling the Mystery of the Moon's Formation

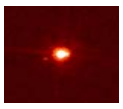
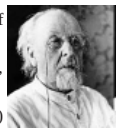
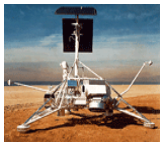
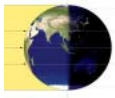
Refreshments
Family Entertainment
Activity Center
Stars & Planets
Rain or shine

Map

art & design · sean ross · rossgrafix13@yahoo.com

September 2014

Celestial Calendar

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1  Flyby of Saturn by Pioneer spacecraft (1979)	**2**  Discovery of asteroid 3 Juno by Karl Harding (1804)	**3**  Viking 2 lands on Mars (1976)  SMART-1 spacecraft controlled impact on Moon (2006)	**4**  Oscar E. Monnig born, American amateur astronomer, contributed to the study of Meteoritics - a science that deals with meteorites and other extraterrestrial materials (1902)	**5**  Launch of Voyager 1 to Jupiter and Saturn (1977)	**6** International Observe the Moon Night
7  Moon at Perogee (Closest to Earth)  James Alfred van Allen born, an American space scientist whose proposal to use geiger counters on Explorer missions to detect charged particles gave his name to the van Allen Belt (1914)	**8** Comet Ikeya-Seki (1965)   Marshall Space Center born (1960) launch of the Surveyor 5 spacecraft to Mars (1967)   first Star Trek episode airs on television (1966)	**9** Launch of Conestoga 1, first private rocket 1982   Discovery of Jupiter's moon Analthea by Edward Barnard (1892)	**10** GRAIL spacecraft launch to study Moon's gravity (2011)   James Edward Keeler, American astronomer, discovered gap in Saturn's rings; later gave name to Keeler Gap, discovered by Voyager (1857)	**11**  Mars Global Surveyor enters orbit around Mars (1997) Flyby of Comet Giacobini-Zinner by the ICE spacecraft, first to visit a comet (1985) 	**12**  Launch of Luna 2, 1st to impact Moon's surface (1959) and Luna 16, 1st robotic probe to return a sample to Earth (1970) Launch of Gemini XI with astronauts Charles Conrad and Richard Gordon (1966) 	**13**  Trans-Neptunian dwarf planet, 2003 UB313, is officially named "Eris", after Greek goddess of strife and conflict; estimated to be 27% more massive than pluto (2006)  2nd Saturday Stars Open House McCarthy Observatory
14  John Dobson born, father of dobsonian telescope (1915) Discovery of Jupiter's moon Leda by Charles Kowal (1974)  Scheduled demonstration flight of Orbital Sciences' Cygnus spacecraft to the ISS.	**15**  Jean-Sylvain Bailly, French astronomer, mathematician, and political revolutionary leader; predicted return of Halley's Comet and researched the satellites of Jupiter; died on guillotine (born 1736)	**16**  Robert Jay GaBany born, American amateur astronomer and astrophotographer, developed use of smaller telescopes and CCD cameras to produce long-exposure high resolution images of distant galaxies (1954)	**17**  Discovery of Saturn's Moon Mimas by William Herschel - 1789 Konstantin Tsiolkovsky born in Izhevskoye, Russia; one of the fathers of rocketry and cosmonautics, along with Goddard and Oberth (1857) 	**18**  Launch of Vanguard 3, designed to measure solar x-rays, the Earth's magnetic field and micrometeoroids (1959)	**19**  Launch of von Braun-designed Jupiter-C rocket from Cape Canaveral (1956)   Discovery of Saturn's Moon Hyperion by William and George Bond and William Lassell (1848)	**20**  Moon at Apogee (furthest distance from Earth)  Surveyor 2 lunar lander launched, loses mission control, tumbles and crashes onto surface of Moon two days later (1966)
21  Jupiter impact ends successful Galileo mission (2003) Gustav Holst born, composer of The Planets (1874)   THE CHALLENGES OF GETTING TO MARS: Orbit Insertion MAVEN Spacecraft	**22**  Autumnal Equinox at 10:29`pm EDT)  Flyby of comet Borrelly by Deep Space 1 (2001)	**23**  Johann Gottfried Galle discovers planet Neptune (1846)	**24** John Young born - first to fly six times in space (1930) Soviet spacecraft Luna 16 returns 101 grams of lunar soil to Earth (1970) Scheduled orbital insertion of India's MOM (Mars Orbiter Mission) spacecraft	**25** Launch of NASA Mars Observer spacecraft, also known as the Mars Geoscience/Climatology Orbiter, a robotic space probe; communication with the spacecraft was lost on August 21, 1993, 3 days prior to orbital insertion. (1992)	**26** Cosmonauts V. Titov and Strelkov escape moments before Soyuz T-10-1 explodes on pad (1983) CSP23 CONNECTICUT STAR PARTY Connecticut Star Party Ashford, CT, Sept 26-29	**27** Launch of SMART-1, first European lunar probe - 2003 Launch of Dawn spacecraft to Vesta and Ceres (2007)
28 Discovery of Jupiter's moon Ananke by Seth Nicholson (1951) Launch of Alouette, Canada's first satellite (1962) 	**29** SpaceshipOne X1 achieves altitude of 102.9 kilometers, first of two flights to win X Prize competition (2004) Launch of Salyut 6, first of a second generation of Soviet orbital space station designs (1977) 	**30** Discovery of Jupiter's moon Themisto by Charles T. Kowal (1975)				

Phases of the Moon

Sept 2 Sept 8

Sept 15 Sept 24