IAAS Monthly Astronomy Newsletter
April 2016

The International Association for Astronomical Studies provides this newsletter as a service for interested persons worldwide.

This newsletter is published on the World Wide Web at http://www.ki0ar.com/astro.html - The Home of KI0AR - and is received nationally and internationally. A PDF formatted downloadable version of the newsletter is at http://www.ki0ar.com/current_nl.pdf.

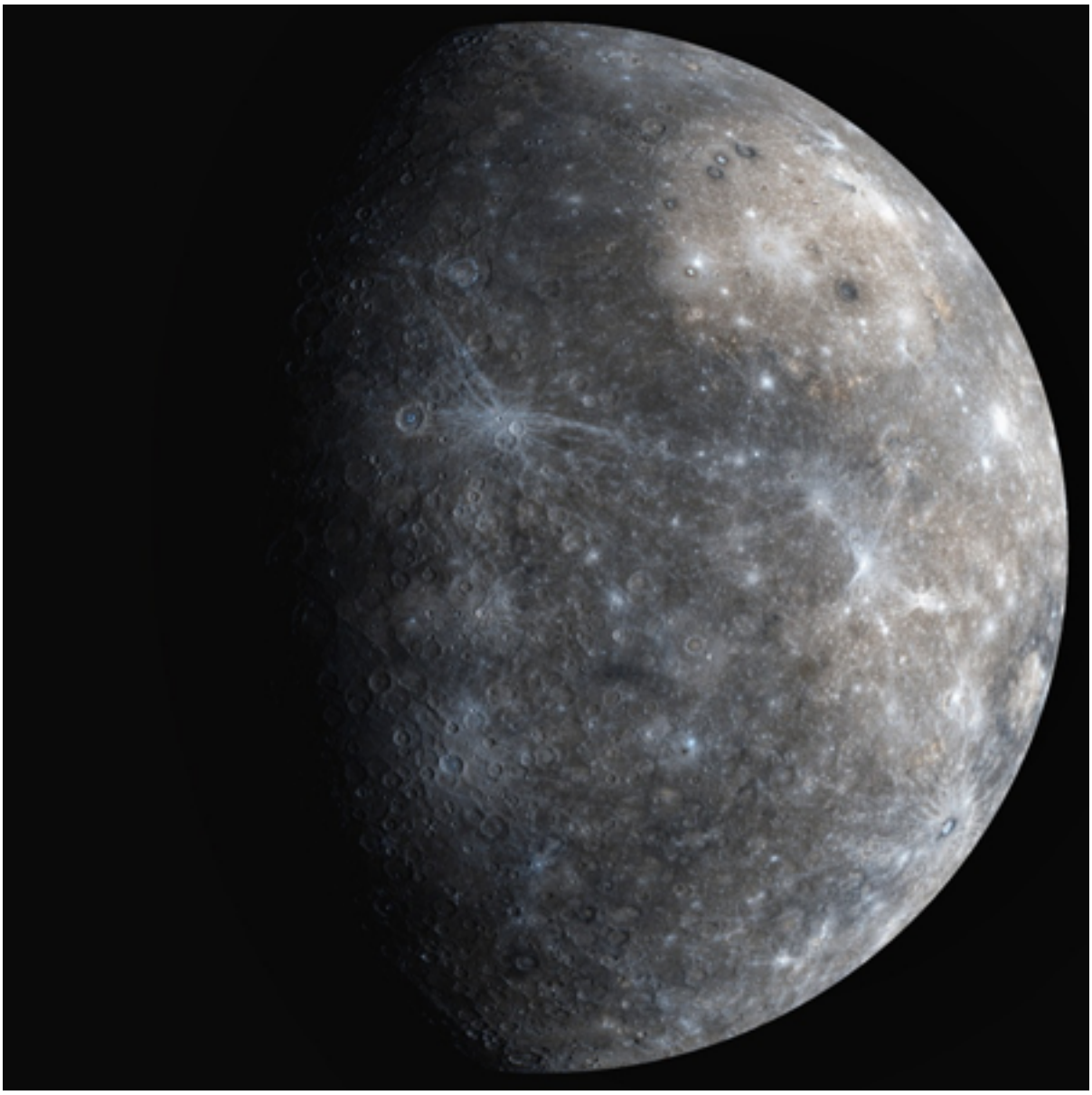
An Open Invitation - For amateur radio operators and scanner enthusiasts, when in the Denver metro area, please join the Colorado Astronomy Net on the Rocky Mountain Radio League's **146.94 MHz** and **449.825 MHz** repeaters. The RMRL **146.94** repeater is also linked with the WB0WDF Cripple Creek **447.400 MHz** repeater and Allstar nodes **28298**, **28299**, **29436**. We are also linked via Echolink, links are **k0jsc-r** and **canoncty**. More information on the WB0WDF repeater links, Allstar nodes and Echolinks can be found at k0jsc.com. The net meets on Tuesday nights at 7 P.M. Mountain Time (US).

Interested in obtaining your Amateur Radio (Ham) License? Visit the South Metro VE Team website for more information.

The Colorado Astronomy Net now has a Facebook page. Be sure to "Like" us.

Excerpts from JPL mission updates are provided as a public service as part of the JPL Solar System Ambassador / NASA Outreach program.

In This Newsletter...



Earthbound observers get superb views of Mercury in mid-April, though the detail will pale in comparison to what the MESSENGER spacecraft captured up close. Nasa/JHUAPL/CIW

The Month At-A-Glance

The current month's calendar displaying the daily astronomical events.

The Moon

Phases:

- New Moon occurs on the 7th.
- First Quarter Moon occurs on the 13th.
- Full Moon occurs on the 22nd.
- Last Quarter Moon occurs on the 29th.

- The Moon is at Perigee on the 7th, 221,931 miles from Earth.
- The Moon is at Apogee on the 21st, 252,495 miles from Earth.

Moon/Planet Pairs:

- The Moon passes 1.9° north of Neptune on the 4th.
- The Moon passes 0.7° north of Venus on the 6th.
- The Moon passes 5° south of Mercury on the 8th.
- The Moon passes 0.02° north of Vesta on the 8th.
- The Moon passes 0.3° north of Aldebaran on the 10th.
- The Moon passes 2° south of Jupiter on the 18th.
- The Moon passes 5° north of Mars on the 24th.
- The Moon passes 3° north of Saturn on the 25th.

For reference: The Full Moon subtends an angle of 0.5°.

The Planets & Dwarf Planets

Planetary Reports are generated by "TheSky" software. These reports provide predicted data for the planets on the first of each month for the current year. The rise and set times for the Sun and the Moon for each day of the month as well as meteor shower radiants are also included in the reports. These reports have been optimized for the Denver, Colorado location, however, the times will be approximate for other locations on Earth.

(All times are local unless otherwise noted.)

Planetary Highlights for April

Begin your evening viewing with Jupiter, now well above the eastern horizon after the Sun sets. Mars follows later in the evening. If you are up before dawn, begin your early morning observations with Jupiter setting in the west. Continue to scan the skies eastward to find Mars, Saturn, Pluto. Neptune and Venus may be too low to the eastern

horizon to be spotted easily this month. Uranus and Ceres are lost in the Sun's glow all month.

Mercury

Is at greatest eastern elongation (20° east of the Sun), which puts Mercury about 10° above the western horizon, on the 18th. Mercury is stationary on the 28th. Mercury sets at 8:12 p.m. on the 1st. Mercury sets about 8:53 p.m. by month's end. Look for Mercury low above the western horizon soon after sunset for most of the month. Mercury moves from the constellation of Pisces into Aries shining at magnitude -0.4.

Venus

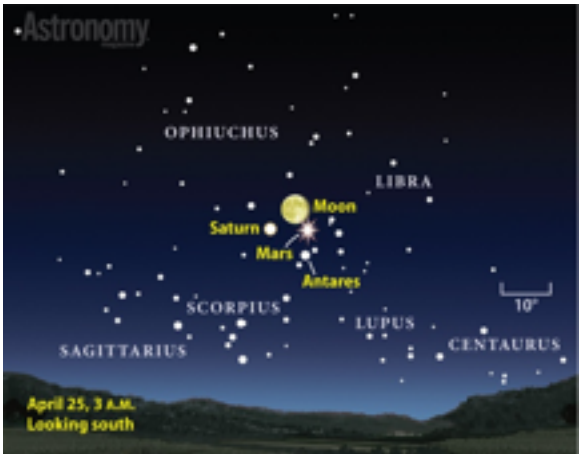
Rises at 5:31 a.m. on the 1st and about 6:10 a.m. by month's end. Venus lies about 1° above the eastern horizon about 30 minutes before sunrise. If you have a very flat eastern horizon, you might be able to spot Venus shining through the early morning twilight glow. Venus moves from the constellation of Aquarius into Aries shining at magnitude -3.8.

Earth

N/A.

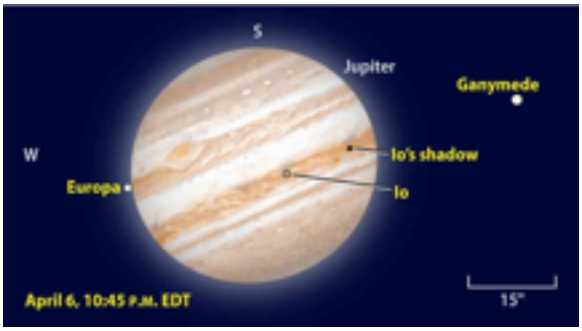
Mars

Rises at 11:49 p.m. on the 1st and about 9:54 p.m. by month's end. Mars is stationary on the 16th. As the month progresses, Mars will rise earlier in the late evening sky. Mars is best viewed in the east in the early morning after midnight. Mars is in the constellation of Scorpius this month shining at magnitude -1.0.



Jupiter

Sets at 5:54 a.m. on the 1st and about 3:51 a.m. by month's end. Begin your observing of Jupiter in the early evening. Jupiter reached opposition last month, but viewing still remains quite good as visibility has improved. Jupiter is in the constellation of Leo shining at magnitude -2.5.



Saturn
Rises at 12:32 a.m. on the 1st and about 10:25 p.m. by month's end. Saturn is stationary on the 25th. Even though Saturn returns to the evening sky by the end of the month, the best time to spot Saturn will be after midnight. Saturn is in the constellation of Ophiuchus shining at magnitude 0.3.

Uranus
Is in conjunction with the Sun on the 9th and is lost in the evening twilight glow. Uranus sets at 7:58 p.m. on the 1st. After conjunction, Uranus returns to the morning sky but is still lost in the morning twilight glow. Uranus rises about 5:12 a.m. by month's end. Uranus may be visible by the last week of the month but will still be very low to the eastern horizon to be spotted easily. Uranus is in the constellation of Pisces shining at magnitude 5.9.

Neptune
Rises at 5:33 a.m. on the 1st and about 3:38 a.m. by month's end. Neptune's visibility has improved since last month as it continues to rise earlier in the pre-dawn sky. Look to the east to spot Neptune in the early morning before sunrise. Neptune is in the constellation of Aquarius shining at magnitude 7.9.

Dwarf Planets
Ceres
Is still relatively close to the Sun this month and will be lost in the early morning twilight for all of April. Ceres moves from the constellation of Aquarius into Cetus this month.

Pluto
Rises at 2:43 a.m. on the 1st and about 12:45 a.m. by month's end. Pluto is stationary on the 18th. Look to the southeast to spot Pluto before sunrise. Pluto is in the constellation of Sagittarius shining at magnitude 14.2.

As always, good luck at spotting Neptune, Ceres and Pluto, a large telescope and dark skies will be needed.

Astronomical Events

Meteor Showers

The Lyrids [meteor shower] are typically visible between April 16 and 25. Maximum occurs during April 21-22. Although the maximum rate is about 10, there have been instances during the last 200 years when rates were near or over 100 per hour. The average magnitude of the meteors is near 2.4 and the speed is described as rapid. About 15% of the meteors leave persistent trains.

Unfortunately, the full Moon obstructs all but the brightest of the Lyrids this year. The best time to observe the Lyrids this year will be just before dawn on the 22nd.

"You might have just as much luck the morning of April 12. That's when the minor Virginid shower peaks. With the Moon setting just after midnight, observers at dark sites could see up to five meteors per hour coming from near Spica." Astronomy Magazine, April 2016, p. 37.

For more information about Meteor Showers, visit Gary Kronk's Meteor Showers Online web page at http://meteorshowersonline.com/.

Meteor Scatter (or Meteor burst communications) - http://en.wikipedia.org/wiki/Meteor_burst_communications "is a radio propagation mode that exploits the ionized trails of meteors during atmospheric entry to establish brief communications paths between radio stations up to 2,250 kilometres (1,400 mi) apart." Tune your shortwave or your HF amateur radio to 54.310 MHz SSB CW and see if you can hear any pings.

Comets

Comet Ikeya-Murikami (P/2010 V1) passes through the constellation of Leo this month shining around 10th magnitude. On the evenings of the 24th and 25th, Comet Ikeya-Murikami passes within 0.5° of 1st magnitude Regulus (the heart of the Lion).

For information, orbital elements and ephemerides on observable comets visit the Observable Comets page from the Harvard-Smithsonian Center for Astrophysics. (http://cfa-www.harvard.edu/iau/Ephemerides/Comets/index.html)

For more information about Comets, visit Gary Kronk's Cometography.com web page at http://cometography.com/.

Eclipses

- Solar Eclipses
  - N/A.

- Lunar Eclipses
  - N/A.

Observational Opportunities

(from evening to morning)

- Jupiter is at its best for the year this month.
- Look for Jupiter, Mars, Saturn, Pluto, and Neptune before sunrise, although Neptune and Pluto are not visible with the naked eye.

Asteroids

(From west to east)

- **Juno** is at opposition on the 26th in the constellation of Virgo.
- **Hygiea** is in the constellation of Virgo.

Information about the Minor Planets can be found at http://www.minorplanetobserver.com the Minor Planet Observer web site.

Occultations

Information on various occultations can be found at http://lunar-occultations.com/iota/iotandx.htm, the International Occultation Timing Association's (IOTA) web site.

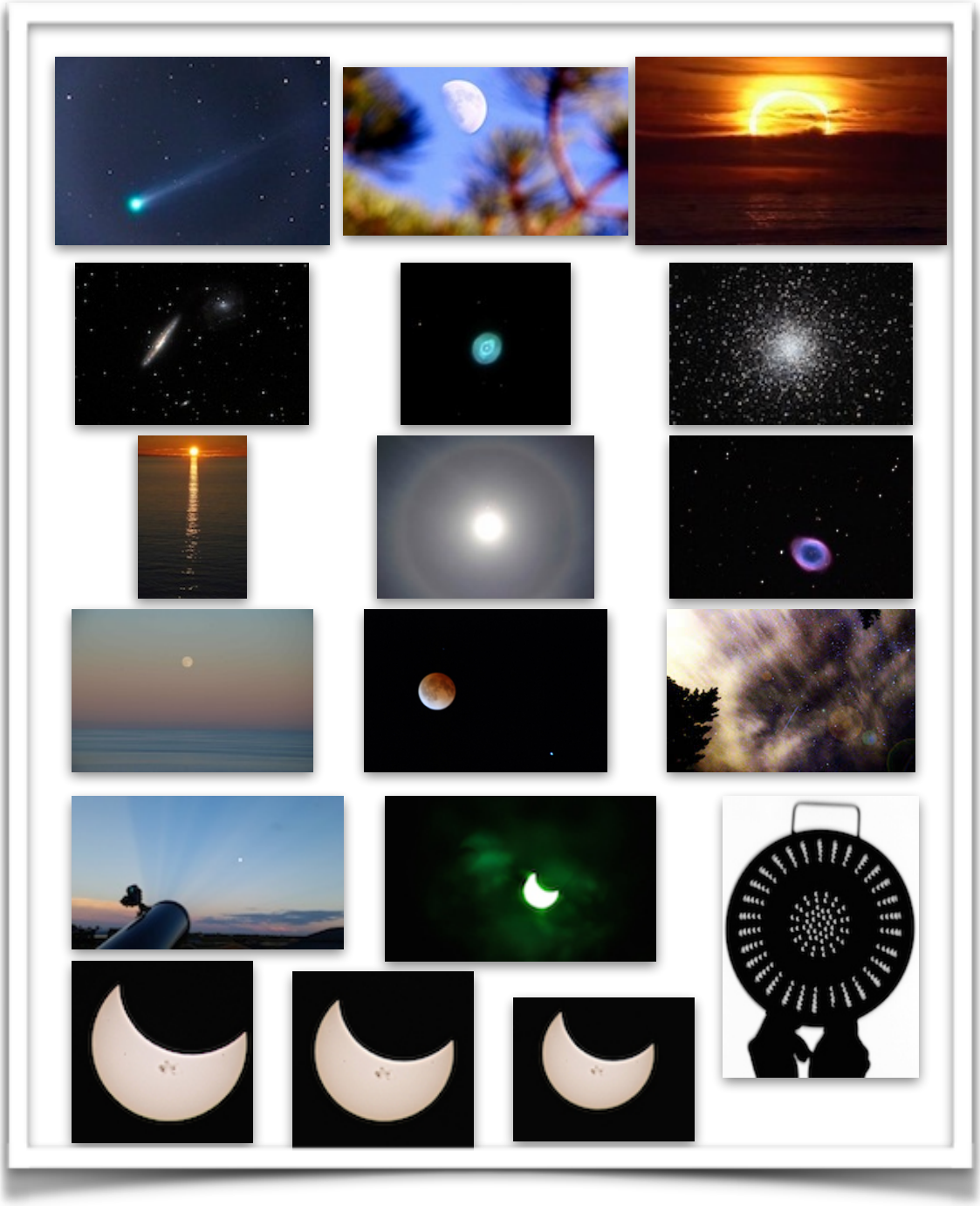
Member Meteor Sightings

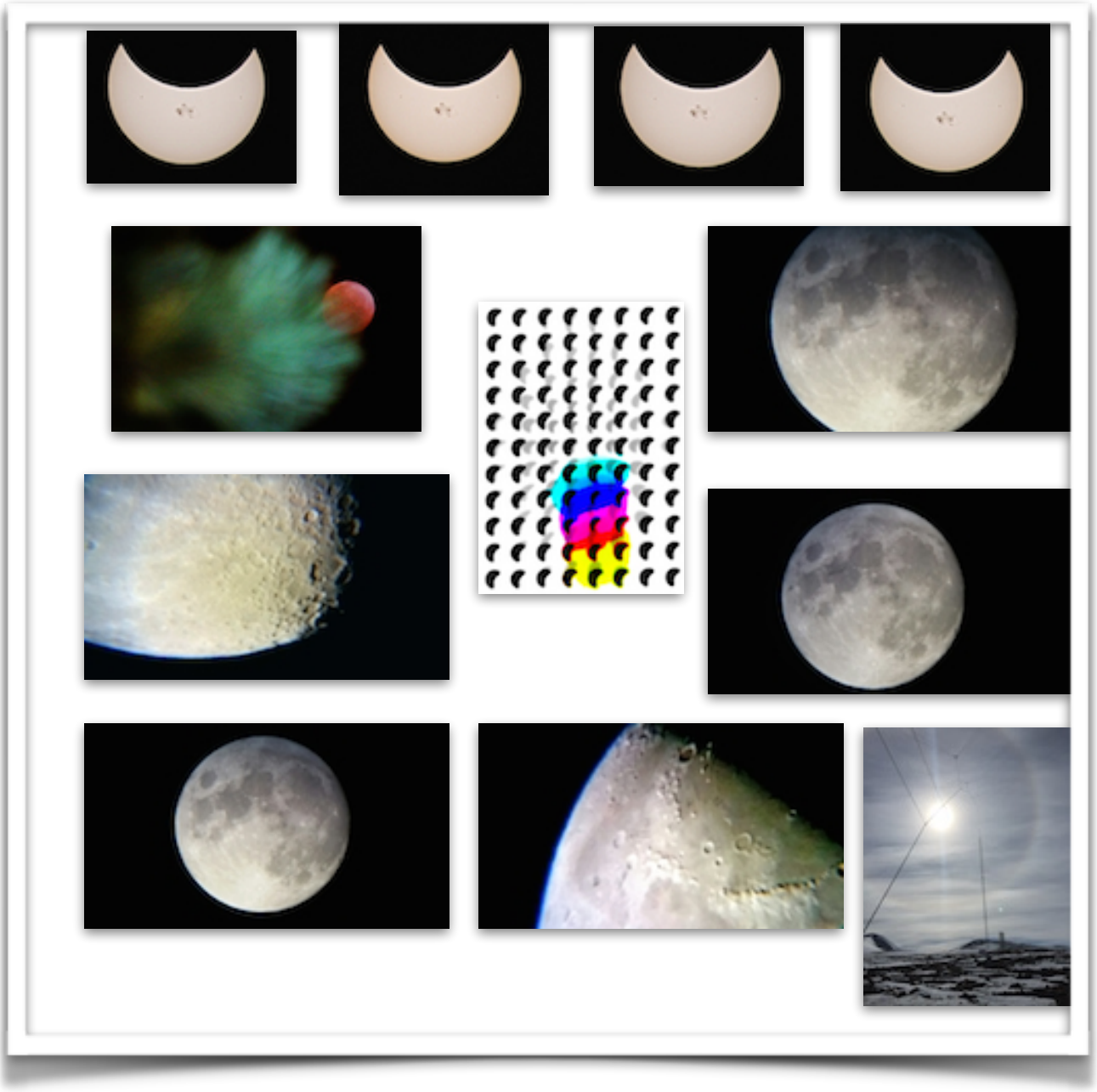
This is a new section where I will post meteor, fireball, etc sightings that have been published on the American Meteor Society's web site. I want to make this an active section of the web pages and newsletter and would like to publish the links to member sightings. If you have any published sightings, please provide me with the links and I will post them here for all to enjoy.

Event ID	Date/Time	Location	Observer	Link
3587-2015	2015-11-22 17:38 MST	CO	Kevin S	3587aw
3829-2015	2015-12-05 18:06 MST	CO	Burness A	3829a
3871-2015	2015-11-13 01:55 MST	CO	Charles N	3871a

Subscriber Gallery

I have created a web page containing images taken and submitted by subscribers to the email newsletter, check-ins to the Colorado Astronomy Net and readers of the online newsletter and some of my own images. Any one wishing to submit their images to the gallery, please let me know. The images must be taken by the submitter and be astronomy related. Please include a description and your information so that I can give proper credit to your work.





Planetary/Lunar Exploration Missions

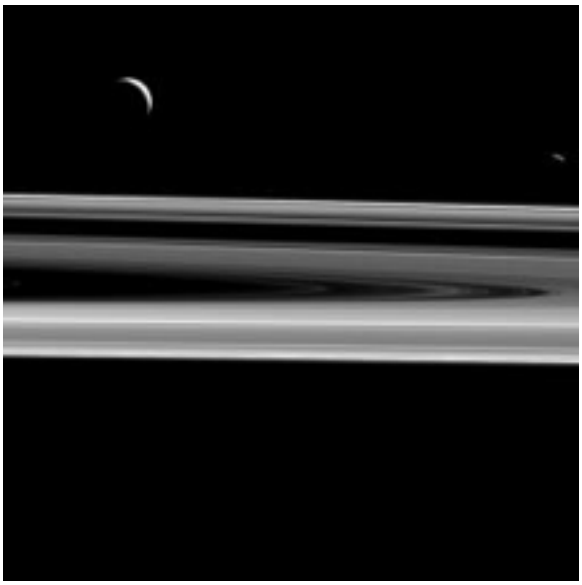
(Excerpts from recent mission updates)

Cassini

March 28, 2016

Dark Moons, Dark Rings

Full-Res: PIA18360



"When taking images in directions opposite from the sun, most objects appear dark. Surprisingly, however, some of Saturn's rings get brighter.

Parts of Saturn's main rings appear dark in backlit views, particularly the dense B ring (as can been seen in A Splendor Seldom Seen). However, some rings are comparatively tenuous and made up of dust particles that tend to scatter light in roughly the original direction it was traveling. This is called "forward scattering." Because of forward scattering, rings like the F ring, which encircles the outer edge of the main rings, appear to glow brightly at this large viewing angle.

Two moons hover above the rings from this perspective -- Enceladus (313 miles or 504 kilometers across), at left, and Janus (111 miles or 179 kilometers across), at right.

This view looks toward the unilluminated side of the rings from about 0.5 degrees below the ring plane. The image was taken in visible light with the Cassini spacecraft narrow-angle camera on Dec. 21, 2015.

The view was acquired at a distance of approximately 750,000 miles (1.2 million kilometers) from Saturn and at a Sun-Saturn-spacecraft, or phase, angle of 136 degrees. Janus' brightness was enhanced by a factor of two to improve its visibility in this image."

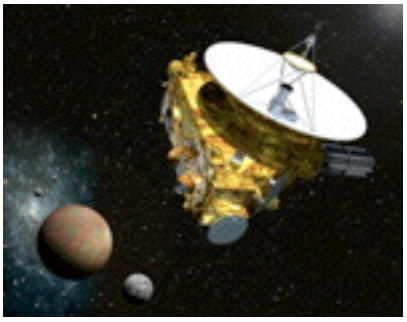
The Cassini-Huygens mission is a cooperative project of NASA, the European Space Agency and the Italian Space Agency. JPL, a division of the California Institute of Technology, Pasadena, manages the mission for NASA's Science Mission Directorate in Washington.

More information about Cassini is available at the following sites:
http://www.nasa.gov/cassini
http://saturn.jpl.nasa.gov

Raw images are available at http://saturn.jpl.nasa.gov/photos/raw/index.cfm.

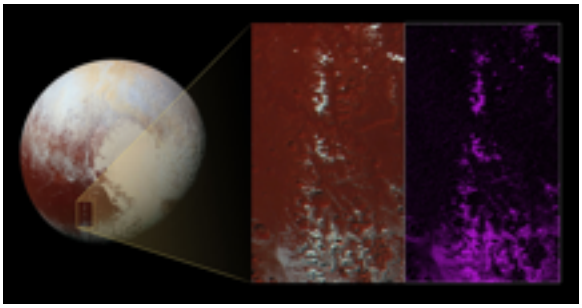
Cassini Imaging Team's website - http://ciclops.org.

For the latest mission status reports, visit http://saturn.jpl.nasa.gov/home/index.cfm. The speed and location of the spacecraft can be viewed on the "Present Position" web page.



New Horizons
March 03, 2016
Methane Snow on Pluto's Peaks

Full Image



"A chain of snow-capped mountains stretches across the dark expanse on Pluto informally named Cthulhu Regio.

Cthulhu (pronounced "k-thu-lu") extends nearly halfway around Pluto's equator, starting to the west of the great nitrogen ice plains informally named Sputnik Planum (see color image of Pluto below). Cthulhu measures approximately 1,850 miles (3,000 kilometers) long and 450 miles (750 kilometers) wide, and with an area of more than 700,000 square miles (1.8 million square kilometers) it's a little larger than Alaska.

Cthulhu's appearance is characterized by a dark surface, which scientists think is due to it being covered by a layer of dark tholins - complex molecules that form when methane is exposed to sunlight. Cthulhu's geology exhibits a wide variety of landscapes, from mountainous, to smooth, to heavily cratered and fractured."

It's always Pluto Time somewhere, and NASA wants to see your view.

What is Pluto? -Video

Follow New Horizons on its journey to Pluto and beyond.

"How Do We Get to Pluto? Practice, Practice, Practice"

Part I: The Encounter Begins
- Small mp4 (38 MB, 640x360)
- Large mp4 (116 MB, 1280x720)

Part II: Passing Pluto
- Small mp4 (34 MB, 640x360)
- Large mp4 (102 MB, 1280x720)

Find New Horizons in the iTunes App Store here. (http://itunes.com/apps/newhorizonsanasavoyagetopluto)

New Horizons gallery

For more information on the New Horizons mission - the first mission to the ninth planet - visit the New Horizons home page: http://pluto.jhuapl.edu/.

Dawn

March 22, 2016

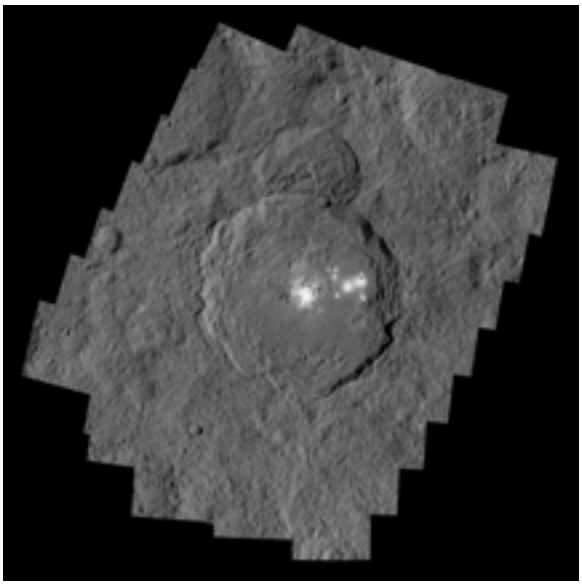
Bright Spots and Color Differences Revealed on Ceres

Full Image

Video Animation

"Scientists from NASA's Dawn mission unveiled new images from the spacecraft's lowest orbit at Ceres, including highly anticipated views of Occator Crater, at the 47th annual Lunar and Planetary Science Conference in The Woodlands, Texas, on Tuesday.

Occator Crater, measuring 57 miles (92 kilometers) across and 2.5 miles (4 kilometers) deep, contains the brightest area on Ceres, the dwarf planet that Dawn has explored since early 2015. The latest images, taken from 240 miles (385 kilometers) above the surface of Ceres,



reveal a dome in a smooth-walled pit in the bright center of the crater. Numerous linear features and fractures crisscross the top and flanks of this dome. Prominent fractures also surround the dome and run through smaller, bright regions found within the crater."

Ceres Topographic Globe Animation

Ion Propulsion Dawn Video

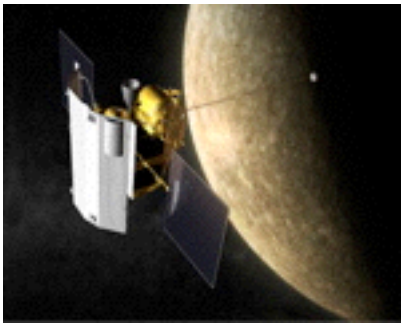
Ion propulsion isn't something found only in science fiction. Ion engines are a real deal and drive NASA's Dawn spacecraft, en route to dwarf planet Ceres. Big things do come in small packages.

Dawn's Virtual Flight over Vesta

Ceres Fly By

A gallery of images can be found online at: http://www.nasa.gov/mission_pages/dawn/multimedia/gallery-index.html.

For more information on the Dawn mission, visit the Dawn home page: http://www.nasa.gov/mission_pages/dawn/main/index.html.



MESSENGER

March 07, 2015

MESSENGER Data May Reveal the Remains of Mercury's Oldest Crust

Video Animation

"Mercury's surface is unusually dark, an observation that until recently had planetary scientists mystified. But in a new study published today in Nature Geoscience, a team of researchers provides evidence that the darkening agent is carbon, a finding that offers important clues to the nature of the planet's original crust.

Patrick Peplowski, a research scientist at the Johns Hopkins University Applied Physics Laboratory (APL) in Laurel, Maryland, and lead author of the paper, explains that earlier measurements of the chemistry of Mercury's surface only added to this mystery because they indicated that Mercury's surface has low abundances of iron and titanium, important constituents of the most common darkening agents on the Moon and other silicate bodies.

"A process of elimination led prior researchers to suggest that carbon may be the unidentified darkening agent, but we lacked proof," he said. "Spectral modeling of MESSENGER color imaging data suggested that weight-percent levels of carbon, likely in the form of graphite, would be required to darken Mercury's surface sufficiently. This level is unusually high, given that carbon is found at typical concentrations of only ~100 parts per million on the Moon, Earth and Mars."

Whatever the darkening agent, the scientists surmised that it was most concentrated in Mercury's low-reflectance material (LRM), which generally appears as deposits excavated from depth by impact cratering. The researchers examined MESSENGER Neutron Spectrometer measurements of LRM and surrounding materials, and they found that increases in low-energy neutrons are spatially correlated with LRM. Such increases require that the LRM have higher concentrations of an element that is inefficient at absorbing neutrons. Carbon is the only darkening agent suggested for Mercury that is also an inefficient neutron absorber."

The MESSENGER app is available for download on iTunes.

For more information on the MESSENGER mission, visit the MESSENGER home page: http://messenger.jhuapl.edu/.

Pack Your Backpack

Calling all explorers! Tour JPL with our new Virtual Field Trip site. Stops include Mission Control and the Rover Lab. Your guided tour starts when you select a "face" that will be

yours throughout the visit. Cool space images and souvenirs are all included in your visit.
+ http://virtualfieldtrip.jpl.nasa.gov/
Past, Present, Future and Proposed JPL Missions - http://www.jpl.nasa.gov/missions.

For special JPL programs and presentations in your area visit the JPL Solar System Ambassador web site at http://www2.jpl.nasa.gov/ambassador/index.html.

Mars Missions

Be A Martian

Mars website mobile version is here!
Simply type
http://mars.jpl.nasa.gov
into your mobile browser.

Mars on the Go! NASA Be A Martian Mobile App
If you want the latest news as it happens, try our Be A Martian app.
Download on Mobile Devices
Android | iPhone | Windows Phone

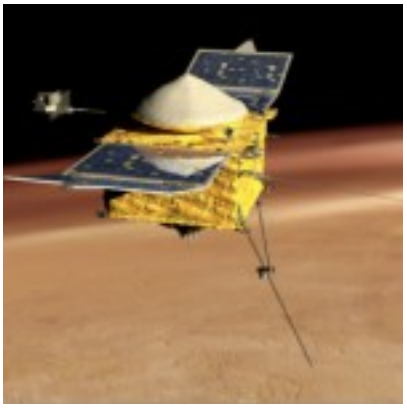
JMARS
https://jmars.mars.asu.edu/
JMARS is an acronym that stands for Java Mission-planning and Analysis for Remote Sensing. It is a geospatial information system (GIS) developed by ASU's Mars Space Flight Facility to provide mission planning and data-analysis tools to NASA's orbiters, instrument team members, students of all ages, and the general public.

Laboratory for Atmospheric and Space Physics

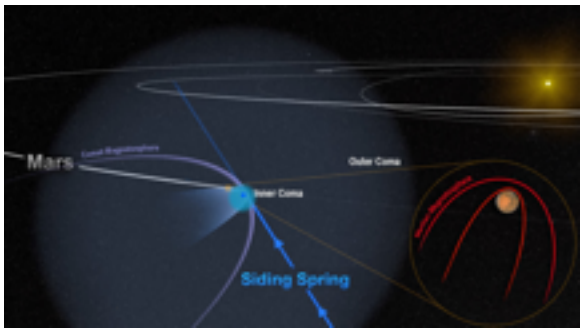
"The Laboratory for Atmospheric and Space Physics (LASP) at the University of Colorado Boulder (CU) began in 1948, a decade before NASA. We are the world's only research institute to have sent instruments to all eight planets and Pluto.

LASP combines all aspects of space exploration through our expertise in science, engineering, mission operations, and scientific data analysis. As part of CU, LASP also works to educate and train the next generation of space scientists, engineers and mission operators by integrating undergraduate and graduate students into working teams. Our students take their unique experiences with them into government or industry, or remain in academia to continue the cycle of exploration.

LASP is an affiliate of CU-Boulder AeroSpace Ventures, a collaboration among aerospace-related departments, institutes, centers, government labs, and industry partners."



MAVEN
March 09, 2016
Close Comet Flyby Threw Mars' Magnetic Field Into Chaos



"Just weeks before the historic encounter of comet C/2013 A1 (Siding Spring) with Mars in October 2014, the MAVEN spacecraft entered orbit around the Red Planet. To protect sensitive equipment aboard MAVEN from possible harm, some instruments were turned off during the flyby; the same was done for other Mars orbiters. But a few instruments, including MAVEN's magnetometer, remained on, conducting observations from a front-row seat during the comet's remarkably close flyby.

The one-of-a-kind opportunity gave scientists an intimate view of the havoc that the comet's passing wreaked on the magnetic environment, or magnetosphere, around Mars. The effect was temporary but profound.

"Comet Siding Spring plunged the magnetic field around Mars into chaos," said Jared Espley, a MAVEN science team member at NASA's Goddard Space Flight Center in Greenbelt, Maryland. "We think the encounter blew away part of Mars' upper atmosphere, much like a strong solar storm would."

Unlike Earth, Mars isn't shielded by a strong magnetosphere generated within the planet. The atmosphere of Mars offers some protection, however, by redirecting the solar wind around the planet, like a rock diverting the flow of water in a creek. This happens because at very high altitudes Mars' atmosphere is made up of plasma layer of electrically charged particles and gas molecules. Charged particles in the solar wind interact with this plasma, and the mingling and moving around of all these charges produces currents. Just like currents in simple electrical circuits, these moving charges induce a magnetic field, which, in Mars' case, is quite weak."

Visit LASP and MAVEN for more information.

Mars Science Laboratory - Curiosity

March 28, 2016
Curiosity Mission Updates
Sols 1296-1297: Driving Across Rough Terrain

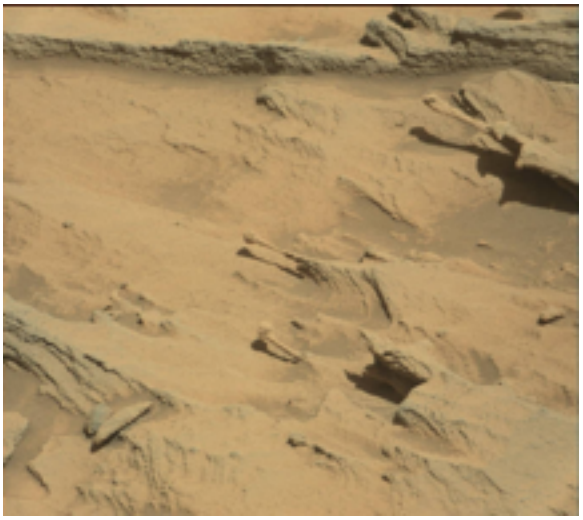


Image 1

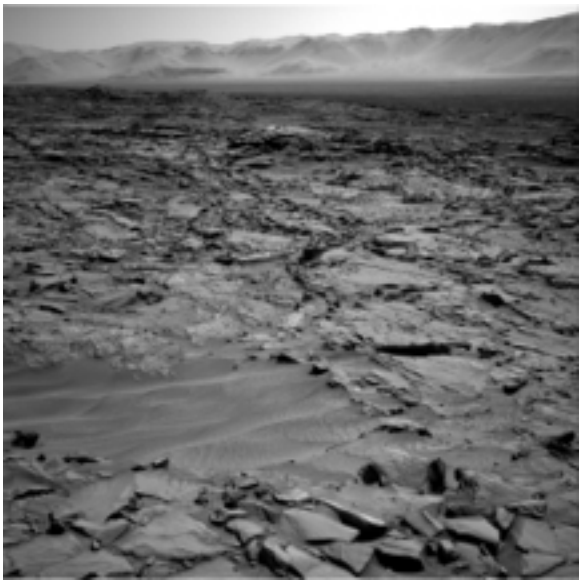


Image 2

"MSL drove about 17 meters on Sol 1294, continuing over rough terrain. Some of the images that have been recently received show delicate features (Image 1) that have apparently been formed by windblown sand abrasion. The path ahead is over more rough terrain (Image 2), but it looks like we will be able to drive ~50 meters on Sol 1296. Before driving, ChemCam and Mastcam will observe bedrock targets "Bloedkoppie," "Blaubeker" and "Blaubock," and Mastcam will acquire mosaics of ridges and outcrops of the Stimson sandstone. Planning is restricted, so we are planning untargeted remote sensing observations on Sol 1297: The RMI will acquire a mosaic of a distant target toward the northwest, Mastcam will measure the amount of dust in the atmosphere by imaging the Sun, and Navcam will search for dust devils. Finally, early on Sol 1298, the Left Mastcam will acquire another mosaic of the Stimson sandstone on the Naukluft Plateau."

To follow the Mars Curiosity rover and NASA on Foursquare, visit: http://www.foursquare.com/MarsCuriosity and http://www.foursquare.com/NASA

For information about NASA's partnership with Foursquare, visit: http://www.nasa.gov/connect/foursquare.html.

Mars Rover Landing - Free for the Xbox (requires Kinect)

Visit the Mars Science Laboratory page at http://mars.jpl.nasa.gov/msl.

Mars Exploration Rover Mission (Spirit and Opportunity)
March 22, 2016

SPIRIT UPDATE: Spirit Remains Silent at Troy - *sols 2621-2627, May 18-24, 2011*:

"More than 1,300 commands were radiated to Spirit as part of the recovery effort in an attempt to elicit a response from the rover. No communication has been received from Spirit since Sol 2210 (March 22, 2010). The project concluded the Spirit recovery efforts on May 25, 2011. The remaining, pre-sequenced ultra-high frequency (UHF) relay passes scheduled for Spirit on board the Odyssey orbiter will complete on June 8, 2011.

Total odometry is unchanged at 7,730.50 meters (4.80 miles)."

OPPORTUNITY UPDATE: Opportunity Moves to New Locations to the Southwest - *sols 4317-4323, March 16, 2016-March 22, 2016:*

"Opportunity is exploring the south side of 'Marathon Valley' located on the rim of Endeavour crater. The rover is up on the slopes of 'Knudsen Ridge.'

The objective is to identify specific outcrops for evidence of clay minerals. Opportunity recently backed down off of some of the steepest slopes of the mission and has begun the move to new locations to the southwest. Supporting Navigation Camera (Navcam) and Panoramic Camera (Pancam) images were collected on Sols 4318 and 4319 (March 17 and March 18, 2016), to identify future targets and drive paths.

On Sol 4320 (March 19, 2016), the rover drove about 31 feet (9.5 meters) to the southwest towards areas of putative phyllosilicate clays. Again, supporting Navcam and Pancam panoramas were collected after the drive to set up for the next drive. On Sol 4323 (March 22, 2016), Opportunity headed due west about 41 feet (12.5 meters). An atmospheric argon measurement with the Alpha Particle X-ray Spectrometer (APXS) was sequenced for that evening.

As of Sol 4323 (March 22, 2016), the solar array energy production was 576 watt-hours with an atmospheric opacity (Tau) of 0.423 and an improved solar array dust factor of 0.764.

Total odometry is 26.53 miles (42.69 kilometers), more than a marathon."

Landing sites link - http://marsoweb.nas.nasa.gov/landingsites/

Visit the Mars Exploration Rover page at
http://marsrovers.jpl.nasa.gov/home/index.html.

Mars Reconnaissance Orbiter Mission
March 21, 2016
New Gravity Map Gives Best View Yet Inside Mars

Video Animation

"A new map of Mars' gravity made with three NASA spacecraft is the most detailed to date, providing a revealing glimpse into the hidden interior of the Red Planet.

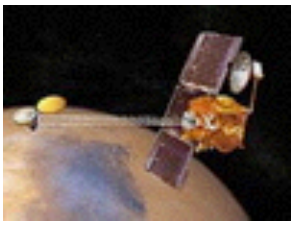
"Gravity maps allow us to see inside a planet, just as a doctor uses an X-ray to see inside a patient," said Antonio Genova of the Massachusetts Institute of Technology (MIT), Cambridge, Massachusetts. "The new gravity map will be helpful for future Mars exploration, because better knowledge of the planet's gravity anomalies helps mission controllers insert spacecraft more precisely into orbit about Mars. Furthermore, the improved resolution of our gravity map will help us understand the still-mysterious formation of specific regions of the planet." Genova, who is affiliated with MIT but is located at NASA's Goddard Space Flight Center in Greenbelt, Maryland, is the lead author of a paper on this research published online March 5 in the journal Icarus."

Video

This animation simulates a flyover of a portion of a Martian canyon detailed in a geological map produced by the U.S. Geological Survey and based on observations by the HiRISE camera on NASA's Mars Reconnaissance Orbiter. The landforms include a series of hills called Candor Colles.

MARS RECONNAISSANCE ORBITER HIRISE IMAGES

All of the HiRISE images are archived here: http://hirise.lpl.arizona.edu/.
More information about the MRO mission is available online at http://www.nasa.gov/mro.



Mars Odyssey Orbiter
March 30, 2016
'Mixed Reality' Technology Brings Mars to Earth

Video

"What might it look like if you were walking around on Mars? A group of researchers at NASA's Jet Propulsion Laboratory, Pasadena, California, has been working on methods to take this question from the realm of imagination to the mind-bending domain of mixed reality.
As a result, NASA and Microsoft have teamed up to offer the public a guided tour of an area of Mars with astronaut Buzz Aldrin this summer in "Destination: Mars," an interactive exhibit using the Microsoft HoloLens mixed reality headset. "Mixed reality" means that virtual elements are merged with the user's actual environment, creating a world in which real and virtual objects can interact.

The "Destination: Mars" exhibit will open at NASA's Kennedy Space Center Visitor Complex in Florida this summer. Guests will "visit" several sites on Mars, reconstructed using real imagery from NASA's Curiosity Mars Rover, which has been exploring the Red Planet since August 2012. Buzz Aldrin, an Apollo 11 astronaut who walked on the moon in 1969, will serve as "holographic tour guide" on the journey. Curiosity Mars rover driver Erisa Hines of JPL will also appear holographically, leading participants to places on Mars where scientists have made exciting discoveries and explaining what we have learned about the planet."

See the Mars As Art Gallery

Dulles Airport Full News Release

Global Martian Map

A simulated fly-through using the newly assembled imagery is available online at http://www.nasa.gov/mission_pages/mars/missions/odyssey/20060313.html.

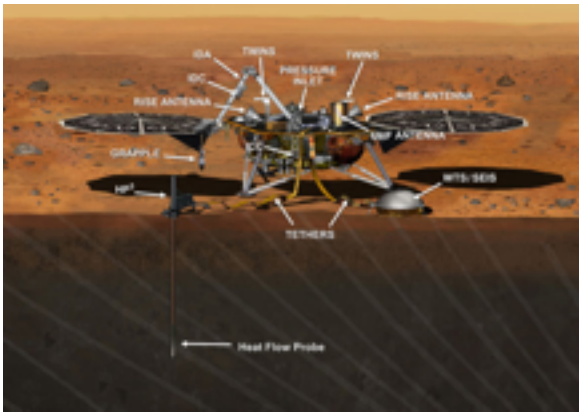
The fly-through plus tools for wandering across and zooming into the large image are at http://themis.asu.edu/.

DAILY MARS ODYSSEY THEMIS IMAGES
Thermal Emission Imaging System (THEMIS) web site: (http://themis.asu.edu/gallery)

The Odyssey data are available through a new online access system established by the Planetary Data System at: http://starbrite.jpl.nasa.gov/pds/

Visit the Mars Odyssey Mission page at http://mars.jpl.nasa.gov/odyssey/index.html.

Journey to Mars
InSight - Revealing the Heart of Mars
March 09, 2016
NASA Targets May 2018 Launch of Mars InSight Mission



"NASA's Interior Exploration using Seismic Investigations, Geodesy and Heat Transport (InSight) mission to study the deep interior of Mars is targeting a new launch window that begins May 5, 2018, with a Mars landing scheduled for Nov. 26, 2018.

InSight's primary goal is to help us understand how rocky planets -- including Earth -- formed and evolved. The spacecraft had been on track to launch this month until a vacuum leak in its prime science instrument prompted NASA in December to suspend preparations for launch.

InSight project managers recently briefed officials at NASA and France's space agency, Centre National d'Etudes Spatiales (CNES), on a path forward; the proposed plan to redesign the science instrument was accepted in support of a 2018 launch.

"The science goals of InSight are compelling, and the NASA and CNES plans to overcome the technical challenges are sound," said John Grunsfeld, associate administrator for NASA's Science Mission Directorate in Washington. "The quest to understand the interior of Mars has been a longstanding goal of planetary scientists for decades. We're excited to be back on the path for a launch, now in 2018."

NASA's Jet Propulsion Laboratory in Pasadena, California, will redesign, build and conduct qualifications of the new vacuum enclosure for the Seismic Experiment for Interior Structure (SEIS), the component that failed in December. CNES will lead instrument level integration and test activities, allowing the InSight Project to take advantage of each organization's proven strengths. The two agencies have worked closely together to establish a project schedule that accommodates these plans, and scheduled interim reviews over the next six months to assess technical progress and continued feasibility."

Learn more about the InSight mission at: http://insight.jpl.nasa.gov/home.cfm

Mars Missions Status

New Mars missions are being planned to include several new rover and sample collection missions. Check out the Mars Missions web page: http://mars.jpl.nasa.gov/missions/ and the Mars Exploration page: http://marsprogram.jpl.nasa.gov/.

Astronomy Links and Other Space News

(If you have a link you would like to recommend to our readers, please feel free to submit it.)

Colorado Astronomy Links

Brighton Astronomy Group, Brighton, Colorado - http://www.brightonastronomy.com - Astronomy in Brighton, Colorado (under construction).

Cloudbait Observatory, Guffey Colorado - http://www.cloudbait.com - Submit your fireball reports here. Interesting, knowledgeable site.

Colorado Amateur Satellite Net - http://www.amsatnet.info - On our net, we discuss anything that has to do with amateur satellites, ham radio with the space station, and more.

Colorado Springs Astronomical Society - http://csastro.org - The Colorado Springs Astronomical Society (CSAS) is a nonprofit organization dedicated to the enjoyment of the nighttime sky.

Denver Astronomical Society - http://www.denverastrosociety.org - Promotes the enjoyment and understanding of astronomical phenomena, history and lore by providing educational and observing opportunities for our members, general public, and outreach activities at the University of Denver's historic Chamberlin Observatory, schools, and nature centers.

Gateway2Space - http://www.gateway2space.com - More information about the Star Light -- Star Bright Observatory.

Little Thompson Observatory - http://www.starkids.org/ - The Little Thompson Observatory (LTO) offers no-charge public access to the wonders of the night sky, either on one of our regularly scheduled public nights, or as a private group affair. When the weather co-operates, each session includes a guided tour of the sky using our large (18") telescope.

Mike Coletta's SatWatch - http://www.kg0ufo.com - Orbiting object and satellite watching. ORBITING OBJECT TRACKING ... It's the thrill of the chase. Promoting and

supporting the hobby of amateur radio, Mike - KG0UFO, along with many other radio hobbyists around the globe use the reflected signals of the AF Space Fence to detect orbiting objects as they make their way over the US. - The AF Space Fence was shut down in Sept. 2013. These are recordings of Mike's many observations.

National Space Science & Technology Institute - http://www.nssti.org - NSSTI runs the Star Light--Star Bright Observatory in Colorado Springs, Colorado.

Northern Colorado Astronomical Society - http://ncastro.org/ - The purpose of our organization is to encourage the understanding & interest in the science & hobby of astronomy.

Rocky Mountain Star Stare - http://www.rmss.org - The Premier Star Party in The Rocky Mountains

Sangre Stargazers - http://sangrestargazers.skymtn.com/ - New astronomy club in the Wet Mountain Valley of Custer County (about 45 miles due west of Pueblo, CO).

Southern Colorado Astronomical Society - http://www.scaspueblo.com - The Southern Colorado Astronomical Society, CSU-P and the Pueblo Nature and Raptor Center welcomes everyone to participate in the discovery of our night sky.

Star Cruiser Bill's Astrophotography - http://www.kd0npt-astro.net - Great astrophotography from Aurora Colorado.

Radio Astronomy Links

HighQ Software Group - http://home.earthlink.net/~boydralp/highqsoftwaregroup/ - Blog of Ralph Boyd, Software engineer, amateur radio operator, radio astronomer.

Radio Astronomy News - http://www.radioastronomynews.com/ - Radio Astronomy news and information.

Radio Astronomy Research Posts - http://www.radioastronomyresearch.com/ - Radio Astronomy Research news posts and observations.

Radio Astronomy Supplies - http://www.radioastronomysupplies.com/ - Radio Astronomy Supplies, the International leader in research radio telescopes for universities, observatories and individual.

Radio JOVE Project - http://radiojove.gsfc.nasa.gov - Radio JOVE students and amateur scientists observe and analyze natural radio emissions of Jupiter, the Sun, and our galaxy.

Society of Amateur Radio Astronomers - http://www.radio-astronomy.org/ - The Society of Amateur Radio Astronomers (SARA) is an international society of dedicated enthusiasts who teach, learn, trade technical information, and do their own observations of the radio sky.

Other Astronomy Links

A Guide to the Galaxy Right from our Bedroom Window - http://www.bedroomfurniturespot.com/guide-to-galaxies - An interesting site suggested by the students from Lexington Middle School Science Club in Nebraska. Lots of good basic astronomy information.

A Kid's Guide to Astronomy - http://www.jmacsupply.com/astronomy-guide-for-kids-a/316.htm - A great site with other links to learn about stars and astronomy for kids of all ages.

"TheSky" Software - http://www.bisque.com - Astronomy software by Software Bisque.

A Sea of Stars - Voyages of a Merchant Mariner & Amateur Astronomer - http://gloriousseas.blogspot.com/ - I'm a retired Navy veteran, currently sailing with the US Navy's Military Sealift Command as an Operations Chief. My dominant interests are science (esp. astronomy), history and photography, and I enjoy naval and military wargaming WHEN I can find the time.

A Short Guide to Celestial Navigation - http://www.celnav.de/ - Celestial navigation is the art and science of finding one's geographic position by means of astronomical observations, particularly by measuring altitudes of celestial objects − sun, moon, planets, or stars.

Amateur Radio Relay League - http://www.arrl.org - Information about amateur radio and how to become an amateur radio operator.

American Meteor Society - http://www.amsmeteors.org - Provides amateur observers a place to learn about and report meteor, fireball and related sightings.

Astrogirl Homepage - http://home.pcisys.net/~astrogirl/ - Family friendly educational astronomy website.

Astronomical Lexicon - http://www.ki0ar.com/astrolex.html - Many of the astronomical terms used in this newsletter are defined here.

Astronomy Picture of the Day - http://antwrp.gsfc.nasa.gov/apod/astropix.html - A different picture of the cosmos every day.

Astronomy 2009 - http://www.surveillance-video.com/astronomy-sept-2009.html - This site has some good links a young, interested student wishes to share.

Be an Astronomer right from your Window - http://www.blindschalet.com/kba-be-an-astronomer-right-from-your-window-240.html - At-home astronomy techniques.

Black Hole Encyclopedia - http://blackholes.stardate.org/ - Excellent site from StarDate - University of Texas McDonald Observatory (http://mcdonaldobservatory.org/)

Caelum Observatory - http://www.caelumobservatory.com/index.html - The LARGEST dedicated public telescope in the Southwest at the Mount Lemmon SkyCenter!

Celestial Bodies and Astronomy - http://ellejet.com/celestial-bodies.php.

Celestron Telescopes - http://www.celestron.com/ - Celestron telescopes.

Clear Skies Observing Guides - http://www.clearskies.eu - CSOG, short for Clear Skies Observing Guides is a new concept in visual amateur astronomy. It is a digital publication that will enable observers to target all deepsky objects and carbon stars within reach of their equipment.

The Constellations and Their Stars - http://www.astro.wisc.edu/~dolan/constellations/constellations.html - Good site for finding out more about the 88 constellations and their associated stars.

CosmoQuest - http://cosmoquest.org/ - The place where you map other worlds, explore out universe and contribute to science.

Distant Suns - http://www.distantsuns.com/ - Desktop Astronomy package for PCs.

EarthSky - http://earthsky.org - Astronomy news.

Green Laser - http://www.greenlaser.com - If you're looking for a reasonably priced laser pointer that is great for astronomy work, visit this site.

Groovy Adventures - http://www.groovyadventures.com - Unique adventures and vacations including astronomy related vacations.

Heavens Above - http://www.heavens-above.com - As the name implies - What's up in the heavens, particularly satellite passes.

The International Dark-Sky Association - http://www.darksky.org - To preserve and protect the nighttime environment and our heritage of dark skies.

informED: 10 Teaching Tools for Educators - http://www.opencolleges.edu.au/informed/teacher-resources/ - informED - Teacher Resources.

iTelescope.net - http://www.itelescope.net - iTelescope.Net is the world's premier network of Internet connected telescopes, allowing members to take astronomical images of the night sky for the purposes of education, scientific research and astrophotography.

JPL Solar System Ambassador Program - http://www.jpl.nasa.gov/ambassador/front.html - "Volunteers Bringing the Solar System to the Public"

JPL Solar System - http://www.jpl.nasa.gov/solar_system/ - Jet Propulsion Laboratory information on our solar system.

Kids Space Center - Telescopes and Astronomy - http://www.orlandofuntickets.com/kids-space-center-telescopes-and-astronomy/ - Another site suggested by a young student - Great info about telescopes.

Mars Exploration, Mars Rovers Information, Facts, News, Photos - http://science.nationalgeographic.com/science/space/space-exploration/mars-exploration-article/ - National Geographic - Mars Exploration - Investigating the Red Planet.

Meade Advanced Products Users Group - http://www.mapug-astronomy.net/ - Mapug-Astronomy Topical Archive & information resource, containing a massive 335 page archive of discussions about Meade equipment, and much more: observatories, observing lists, permanent piers, equatorial wedges, remote operations, software, eyepieces, etc.

My Stars Live - http://www.mystarslive.com/ - Interactive Star Chart

NASA - Lunar and Planetary Science - http://nssdc.gsfc.nasa.gov/planetary/planets/cometpage.html - General information, Missions to Comets, Data, Press Releases, Meteors and Meteorites, Other topics of Interest.

NASA Science News - http://science.nasa.gov/ - NASA missions, updates, astronomy news, excellent resource.

National Archives info on space exploration - http://www.archives.gov/research/alic/reference/space-exploration.html - Archives Library Information Center (ALIC) - Space Exploration - Information about the United States' space flight programs, including NASA missions and the astronauts who participate in the efforts to explore space.

Skymaps.com - http://www.skymaps.com - Free sky maps each month.

Skywatch Sightings from NASA - http://spaceflight.nasa.gov/realdata/sightings/ - This site gives you the best times to watch the ISS pass over or near your location.

Space.com - http://space.com - Interesting space and astronomy articles.

Spaceflight Now - http://spaceflightnow.com/ - Launches and satellite news.

SpaceLinks/Space Careers - http://www.spacelinks.com/SpaceCareers/ - SPACELINKS is a specialist staffing consultancy sourcing and supplying high caliber professionals for a wide range of world class organizations in the Space and Defense industry.

"SpaceRef.com" - http://www.spaceref.com/ - SpaceRef's 21 news and reference web sites are designed to allow both the novice and specialist alike to explore outer space and Earth observation.

Space Weather - http://www.spaceweather.com - Check out what the Sun is doing as seen from space.

Stellarium - http://www.stellarium.org - Free, downloadable planetarium/astronomy software.

Universe Today - http://www.universetoday.com - Short, interesting articles about space and related topics.

Wikisky - http://www.wikisky.org - WIKISKY is a non-commercial project. The main purpose of WIKISKY is to consolidate astronomical, astrophysical and other information about different space objects and astrophysical facts.

Acknowledgments and References

Much of the information in this newsletter is from "Astronomy Magazine" (Kalmbach Publishing), JPL mission status reports, "Meteor Showers - A Descriptive Catalog" by Gary W. Kronk and other astronomical sources that I have stashed on my book shelves.

The author will accept any suggestions, constructive criticisms, and corrections. Please feel free to send me any new links or articles to share as well. I will try to accommodate any reasonable requests. Please feel free to send questions, comments, criticisms, or donations to the email address listed below. Enjoy!

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- Email Newsletter archives -
http://ki0ar.com/pipermail/astronews_ki0ar.com/

- Full documentation of the online administration system is available at http://ki0ar.com/mailman/listinfo/astronews_ki0ar.com.

- The latest version of the newsletter is accessible from http://www.ki0ar.com/astro.html.

Keep looking UP!

73 from KI0AR

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