IAAS Monthly Astronomy Newsletter April 2014

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 and 29436. More information on the WB0WDF repeater links and Allstar nodes can be found at k0jsc.com. The net meets on Tuesday nights at 7 P.M. Mountain Time (US).

Special Notice to Denver, CO residents and visitors to the area: The Plains Conservation Center in Aurora hosts Full Moon Walks every month, weather permitting, on or near the night of the full Moon. Visit http://www.plainsconservationcenter.org for more information and directions.

Also S&S Optika hosts Backyard Star Parties in Littleton several times a month, weather permitting. Come down and enjoy the fun and check out their fine selection of optical instruments.

Excerpts from JPL mission updates are provided as a public service as part of the JPL Solar System Ambassador / NASA Outreach program. http://www2.jpl.nasa.gov/ambassador/index.html

In This Newsletter...

The Month At-A-Glance

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

The Moon

Phases:

- First Quarter Moon occurs on the 7th.
- Full Moon occurs on the 15th.
- Last Quarter Moon occurs on the 22nd.
- New Moon occurs on the 29th.

- The Moon is at Apogee on the 8th, 251,344 miles from Earth.
- The Moon is at Perigee on the 27th, 227,238 miles from Earth.

Moon/Planet Pairs:

- The Moon passes 5° south of Jupiter on the 6th.
- Venus passes 0.7° north of Neptune on the 12th.
- The Moon passes 3° south of Mars on the 14th.
- The Moon passes 0.4° south of Saturn on the 17th.
- The Moon passes 5° north of Neptune on the 24th.
- The Moon passes 4° north of Venus on the 25th.
- The Moon passes 2° north of Uranus on the 27th.

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

The Planets & Dwarf Planets

Planetary Reports are generated by "TheSky" software. (http://www.ki0ar.com/planrpts.html) 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

"The first of 2014's two total lunar eclipses occurs at the midpoint of this action-packed month. April's other highlights include Mars reaching opposition and shining brighter than at any time in the past eight years, fine views of Jupiter in the evening and Saturn later at night, and Venus sliding past Neptune shortly before dawn." Astronomy Magazine, April 2014, p. 36.

Mercury

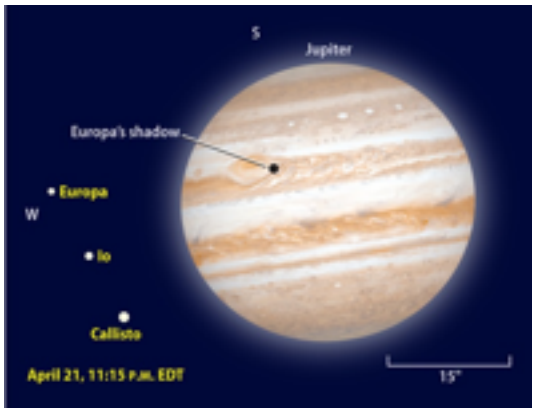
Is in superior conjunction with the Sun on the 25th. Mercury is visible, low on the eastern horizon within 30 minutes before sunrise during the first week or so of April. After that, Mercury disappears into the morning twilight glow, returning to the evening sky in early May. Mercury

rises about 6:05 a.m. on the 1st and about 6:18 a.m. by month's end. Mercury moves from the constellation of Aquarius into Aries shining at magnitude -0.2 on the 1st.

Venus
Venus - Rises at 4:48 a.m. on the 1st and about 4:22 a.m. by month's end. Venus will be easy to spot moving from the constellation Capricornus into Pisces shining at magnitude -4.3 on the 15th.

Earth
N/A.

Mars
Is at opposition on the 8th, rising as the Sun sets. Mars rises at 7:59 p.m. on the 1st and about 5:11 p.m. by month's end. On the 14th, Mars makes its closest approach to the Earth, 57.4 million miles away. Mars is at its best viewing for the year. Check out Mars with binoculars or a telescope. Mars is in the constellation of Virgo this month shining at magnitude -1.5 at opposition.



Jupiter
Sets at 2:38 a.m. on the 1st and about 12:54 a.m. by month's end. Look for Jupiter in the evening and very early morning skies after midnight. Jupiter is in the constellation of Gemini shining at magnitude -2.1.

Saturn
Rises at 10:33 p.m. on the 1st and about 8:26 p.m. by month's end. Saturn steadily brightens as the month progresses as Saturn approaches opposition next month. View Saturn through a telescope to truly appreciate the planet and its ring system. Saturn is in the constellation of Libra shining at magnitude 0.2.

Uranus
Is in conjunction with the Sun on the 2nd. Uranus rises at 6:50 a.m. on the 1st and about 4:56 a.m. by month's end. Uranus returns to the morning sky after the first week of April. Uranus will

be difficult to spot until later in the month when it climbs out of the morning twilight glow. Uranus is in the constellation of Pisces shining at magnitude 5.9.

Neptune
Rises at 5:24 a.m. on the 1st and about 3:28 a.m. by month's end. Neptune should be easier to spot this month, but you'll have to wait until mid-month to get better views of the planet in darker morning skies. Neptune is in the constellation of Aquarius shining at magnitude 7.9.

Dwarf Planets
Ceres
Is at opposition on the 15th, rising as the Sun sets. Ceres rises at 9:12 p.m. on the 1st and about 6:45 p.m. by month's end. Ceres is brighter than Neptune this month and backyard observers may be able to spot it if conditions are good. Ceres is in the constellation of Virgo shining at magnitude 7.0.

Pluto
Is stationary on the 14th. Pluto rises at 2:25 a.m. on the 1st and about 12:27 a.m. by month's end. Pluto is in the constellation of Sagittarius shining at magnitude 14.1.

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 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.

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

Comets

Look for Comet PANSTARRS (C/2012 K1) passing through the constellation of Ursa Major and Boötes this month. Comet PANSTARRS C/2012 K1 shines at 9th magnitude and may be visible through a 3 inch telescope under dark skies. However, viewing this comet through city lights will be a challenge.

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

- A total lunar eclipse occurs at 3:42 a.m. EDT on the 15th. Viewers in North and South America have front row seats for his lunar eclipse. The Moon dips into Earth's umbra (the darkest part of Earth's shadow) about 1:58 a.m. EDT on the morning of April 15th. Totality peaks at 3:42 a.m. EDT and ends at 4:25 a.m. EDT.

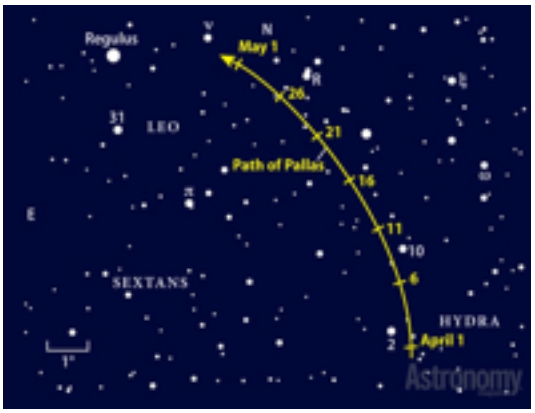
- An annular solar eclipse occurs at 2:14 a.m. EDT on the 29th. However, this eclipse can only be spotted by observers in Antarctica. Viewers in Australia and Tasmania will only get to see a partial eclipse.

Observational Opportunities

- View Jupiter shining brilliantly in the evening and very early morning skies.
- View Mars at opposition on the 8th and throughout the month all evening.
- Observe Saturn in the evening and after midnight.
- Catch Mercury in the morning sky early in the month.
- Observe Venus, in the early morning sky before sunrise.

- Try to find Uranus and Neptune in the early morning sky during the last half of the month.
- Try to spot some of the Lyrids streaking through the evening and morning skies during the last half of April.
- Enjoy the total lunar eclipse on the evening of the 14th/morning of the 15th. Look for Mercury in the morning sky.

Asteroids
(From west to east)
- **Juno** is in conjunction with the Sun on the 11th.
- **Pallus** is stationary on the 24th in the constellation of Hydra.
- **Vesta** is stationary on the 5th in the constellation of Virgo.

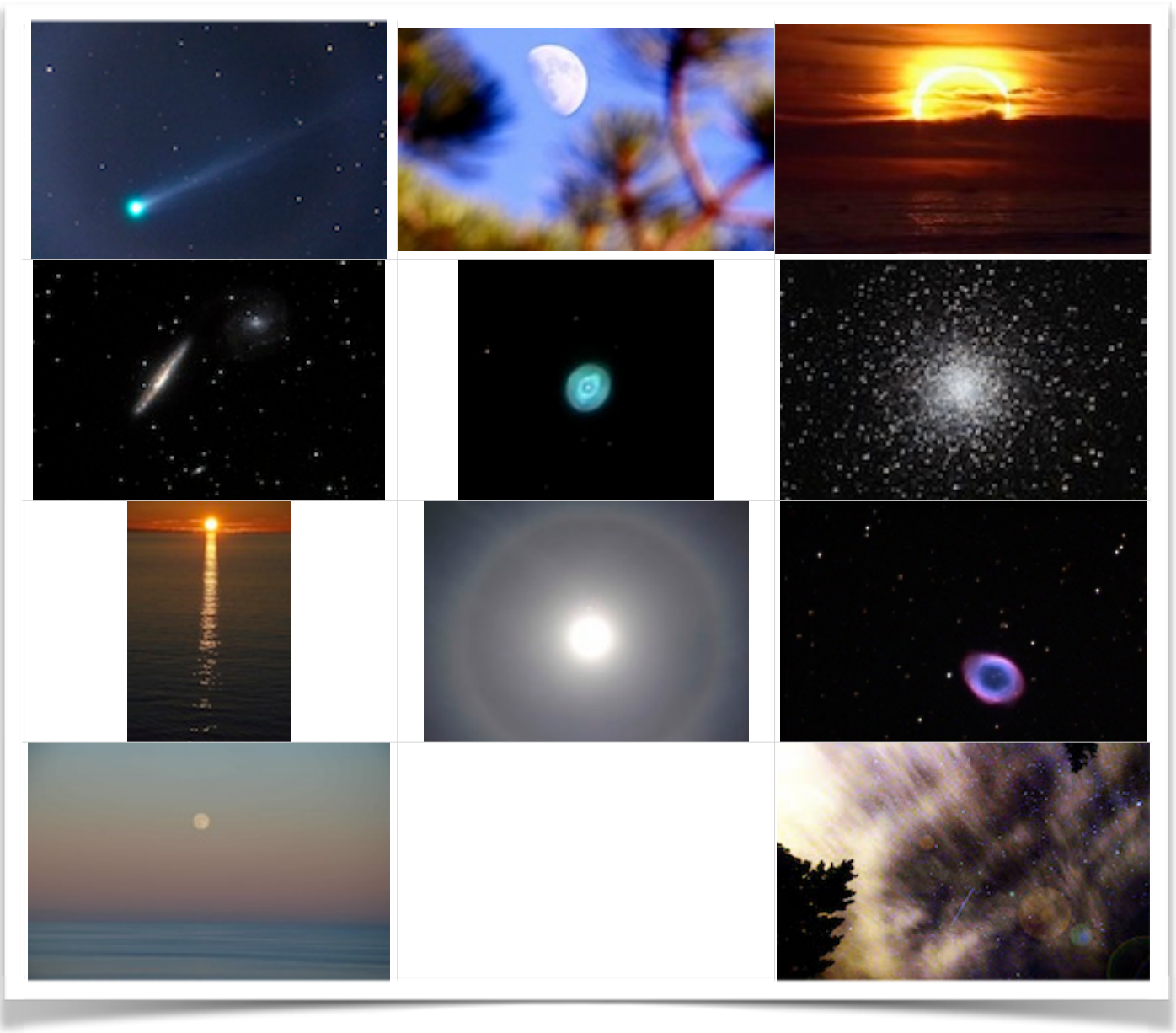


Information about the Minor Planets can be found at http://www.minorplanetobserver.com the Minor Planet Observer web site.

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.

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.

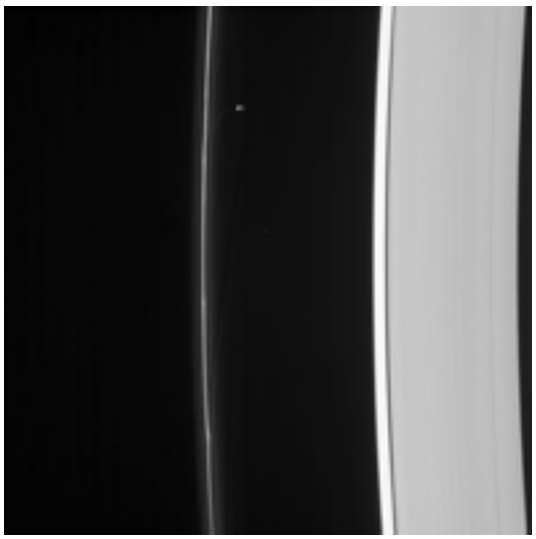


Planetary/Lunar Exploration Missions

(Excerpts from recent mission updates)

Cassini
March 31, 2014
Prometheus' Handiwork
Full-Res: PIA17158

"Saturn's moon Prometheus orbits near some of its handiwork in the F ring.



Prometheus (53 miles, or 86 kilometers across) and its partner Pandora gravitationally sculpt and maintain the narrow F ring.

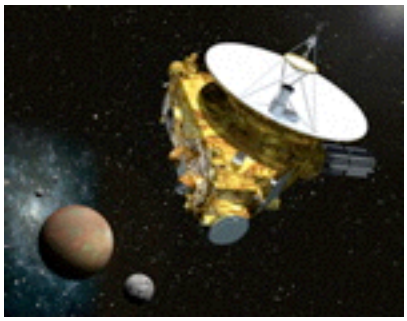
This view looks toward the unilluminated side of the rings from about 53 degrees below the ringplane. The image was taken in visible light with the Cassini spacecraft narrow-angle camera on Aug. 24, 2013.

The view was acquired at a distance of approximately 1.1 million miles (1.8 million kilometers) from Saturn and at a Sun-Saturn-spacecraft, or phase, angle of 104 degrees. Image scale is 7 miles (11 kilometers) per pixel."

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
February 27, 2014

What is Pluto? -Video

New Horizons Reaches the Final 4 (AU)

"New Horizons sailed past another milepost today when the NASA spacecraft moved to within four astronomical units (AU) of Pluto - which is less than four times the distance between the Earth and the sun, or about 371 million miles (598 million kilometers).

Did you know? An astronomical unit (AU) is the average distance between the Earth and sun, about 93 million miles or 149 million kilometers. New Horizons' journey from Earth to Pluto will cover more than 32 AU.

"We're as close to the Pluto system now as Earth ever gets to Jupiter, a first for any spacecraft," says New Horizons Principal Investigator Alan Stern, of the Southwest Research Institute, Boulder, Colo. “And hold on to your hat, it just gets more and more exciting from here."

Since launch on January 19, 2006, New Horizons has covered nearly 2.89 billion miles (4.62 billion kilometers). It makes a temporal connection with one NASA's legendary deep-space explorers this summer when it crosses the orbit of Neptune on Aug. 25 -- exactly 25 years after Voyager 2 made its historic flight past that giant planet. When New Horizons arrives at Pluto on July 14, 2015, it will have traveled farther than any spacecraft ever has to reconnoiter its prime target."

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 28, 2014
Dawn Wins National Air and Space Museum Trophy

"The team in charge of NASA's Dawn mission, history's first detailed exploration of a celestial body inside the main asteroid belt, received the Smithsonian National Air and Space Museum's highest group honor at a dinner in Washington on March 26. Dawn, managed by NASA's Jet Propulsion Laboratory, Pasadena, Calif., received the 2014 Trophy for Current Achievement, which honors outstanding achievements in the fields of aerospace science and technology.

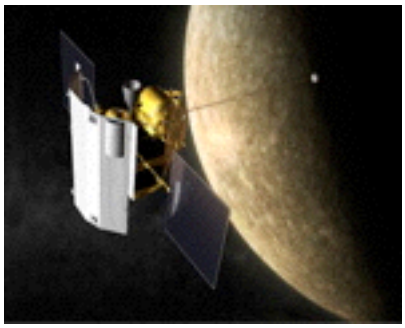
Having explored the giant asteroid Vesta and on its way to the dwarf planet Ceres, the Dawn spacecraft is designed to conduct an in-depth and up-close study of these two celestial bodies formed early in the history of the solar system. In 50 years of space exploration, no other

spacecraft has orbited a distant solar system body, then left to travel to—and eventually orbit—another extraterrestrial body."

Dawn's Virtual Flight over Vesta

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 17, 2014
Team Celebrates Orbital Anniversary, Reports on New Findings at Planetary Conference

"Today, the MESSENGER team celebrates the third anniversary of the probe's Mercury orbit insertion. On March 17, 2011 (Eastern Daylight Time), the spacecraft made history when it became the first probe to orbit the innermost planet. Over the last three years, MESSENGER instruments have fully mapped Mercury's surface and yielded discoveries that have changed views on how the inner planets formed and evolved.

The latest findings will be described in 25 papers presented this week at the 45th Lunar and Planetary Science Conference in The Woodlands, Texas. Now -- as a key part of MESSENGER's second extended mission -- the team is preparing to embark on a low-altitude imaging campaign that promises to reveal even more information about Mercury.

The altitude of the spacecraft at closest approach has been slowly decreasing as the Sun's gravity perturbs its orbit around Mercury, and the progressively closer approaches will provide MESSENGER's instruments with an unprecedented opportunity to make high-resolution observations of the planet. For example, the hollows first revealed by the probe's instruments in 2011 are suspected to have formed because volatile elements sublime off the surface, but observations to date could not confirm this hypothesis.

At spacecraft altitudes below 350 kilometers, the Mercury Dual Imaging Instrument's Narrow Angle Camera will acquire images with pixel scales ranging from 20 meters to as little as 2 meters. Such high-resolution images will reveal small features of the enigmatic hollows for the first time. "We will be seeing features at up to 10 times the resolution of the images acquired so far," noted MESSENGER Co-Investigator Scott Murchie of the Johns Hopkins University Applied Physics Laboratory (APL). "

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

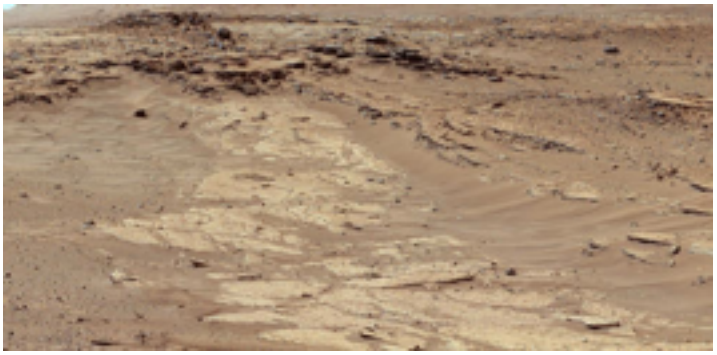
Mars website mobile version is here!
Simply type
http://mars.jpl.nasa.gov
into your mobile browser.

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.

Mars Science Laboratory - Curiosity
March 24, 2014
NASA Mars Rover's Next Stop Has Sandstone Variations
(**Full image and caption**)

"Variations in the stuff that cements grains together in sandstone have shaped the landscape surrounding NASA's Curiosity Mars rover and could be a study topic at the mission's next science waypoint.



On a journey with many months yet to go toward prime destinations on the lower slope of Mount Sharp, Curiosity is approaching a site called "the Kimberley." Scientists on the team picked this location last year as a likely place to pause for investigation. Its informal name comes from a northwestern Australia region known as the Kimberley. The Martian site's geological appeal, based on images taken from orbit, is that four types of terrain with different rock textures intersect there."

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 19, 2013

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: Helpful Wind Cleans Solar Panels - *sols 33603-3609, Mar. 13, 2014-Mar. 19, 2014*:

"Opportunity is exploring 'Murray Ridge' on Solander Point, part of the rim of Endeavour Crater.

The rover continues to investigate the region called 'Cook Haven.' On Sol 3603 (March 13, 2014), Opportunity completed the in-situ (contact) analysis of a target called 'Augustine' with a Microscopic Imager (MI) mosaic and a placement of the Alpha Particle X-ray Spectrometer (APXS) on the same. On the next two Sols, the rover conducted remote sensing with the collection of Navigation Camera (Navcam) and Panoramic Camera (Pancam) images and a measurement of atmospheric argon with the APXS. Atmospheric opacity (tau) measurements using the Navcam were performed in support of the InSIght mission. On Sol 3607 (March 17, 2014) a short bump was planned to approach a target rock, called 'Sugarloaf.' However, the drive stopped after just 2.3 meters (7.55 feet) due to the rover sensing higher average current in three of the rover wheels. This was a safety check to detect possible embedding events. Although the rover did experience as much as 50% slip, there was no risk of embedding, just a steep upward climb. Given the difficult terrain, the approach to Sugarloaf would require multiple additional drives to be able to use the robotic arm on the rock surface. So, the science team chose to document Sugarloaf with more color imagery and to drive further south and west to new targets. On Sol 3609 (March 19, 2014), Opportunity drove about 16.35 meters (53.64 feet) to the southwest. The rover experienced a solar panel dust cleaning event between Sols 3605 and 3606 (March 15 and March 16, 2014). This resulted in about a 10% improvement in power production.

As of Sol 3609, the solar array energy production was 574 watt-hours with an atmospheric opacity (Tau) of 0.450 and an improved solar array dust factor of 0.777.

Total odometry is 24.10 miles (38.79 kilometers)"

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

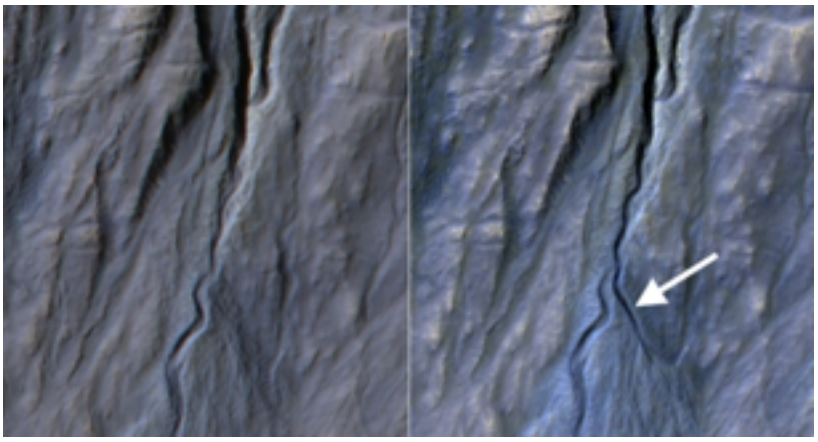
Visit the Mars Exploration Rover page at
http://marsrovers.jpl.nasa.gov/home/index.html.

Mars Reconnaissance Orbiter Mission
March 19, 2014
NASA Orbiter Finds New Gully Channel on Mars
(Full image and caption)

"A comparison of images taken by the High Resolution Imaging Science Experiment (HiRISE) camera on NASA's Mars Reconnaissance Orbiter in

November 2010 and May 2013 reveal the formation of a new gully channel on a crater-wall slope in the southern highlands of Mars.

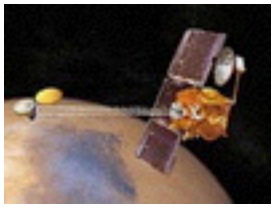
These before-and-after images are available online at http://www.nasa.gov/jpl/new-gully-channel-terra-sirenum-pia17958.



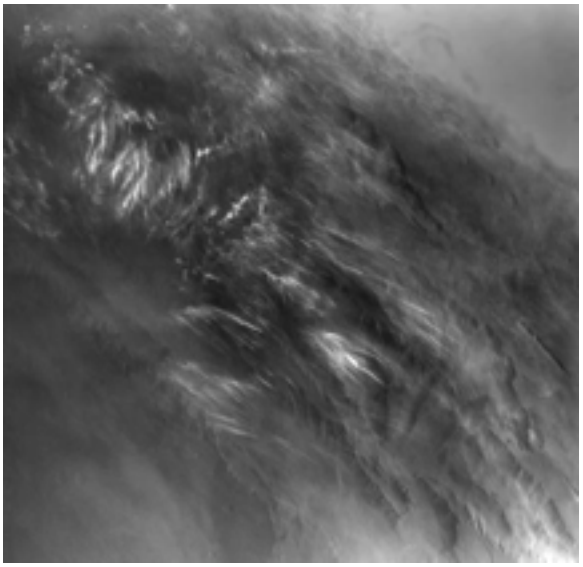
Gully or ravine landforms are common on Mars, particularly in the southern highlands. This pair of images shows that material flowing down from an alcove at the head of a gully broke out of an older route and eroded a new channel. The dates of the images are more than a full Martian year apart, so the observations did not pin down the Martian season of the activity at this site. Before-and-after HiRISE pairs of similar activity at other sites demonstrate that this type of activity generally occurs in winter, at temperatures so cold that carbon dioxide, rather than water, is likely to play the key role."

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
February 12, 2014
NASA Moves Longest-Serving Mars Spacecraft for New Observations
(Full image and caption)



"NASA's Mars Odyssey spacecraft has tweaked its orbit to help scientists make the first systematic observations of how morning fogs, clouds and surface frost develop in different seasons on the Red Planet.

The maneuver took place Tuesday, Feb. 11. Odyssey team engineers at NASA's Jet Propulsion Laboratory in Pasadena, Calif., and Lockheed Martin Space Systems of Denver, designed the gentle move to accelerate Odyssey's drift toward a morning-daylight orbit. The desired change will occur gradually until the intended orbit geometry is reached in November 2015 and another maneuver

halts the drift.

The change will enable observation of changing ground temperatures after sunrise and after sunset in thousands of places on Mars. Those observations could yield insight about the composition of the ground and about temperature-driven processes, such as warm-season flows observed on some slopes, and geysers fed by spring thawing of carbon-dioxide ice near Mars' poles.

"We're teaching an old spacecraft new tricks," said Odyssey Project Scientist Jeffrey Plaut of JPL. "Odyssey will be in position to see Mars in a different light than ever before."

Neither Odyssey, nor any other NASA Mars orbiter since the 1970s, has flown an orbital pattern with a view of the ground in morning daylight. Earlier NASA orbiters and the European Space Agency's Mars Express orbiter have provided some tantalizing views of morning mists on Mars, but have concentrated on afternoon observation times when views of the surface are less hazy.

Odyssey was launched in 2001 and began its science mission 12 years ago this month. It is the longest-working spacecraft ever sent to Mars."

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.

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/.

Links and Other Space News

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

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 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.

Astrogirl Homepage - http://www.astrogirl.org - 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.

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.

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

Colorado Springs Astronomical Society - http://csastro.org

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.

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.

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.

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 Part 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).

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.

Southern Colorado Astronomical Society - http://www.scasastronomy.info/ - Site under construction.

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

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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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- 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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