IAAS Monthly Astronomy Newsletter December 2017

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 or your General Radio Operator's License (GROL)? Visit the South Metro VE Team website for more information. The South Metro VE Team provides test sessions on the 1st Saturday of each month at our new Eagle Street Facility, The City of Centennial, 7272 South Eagle Street, Centennial, Colorado 80112-4244 from 9am until 1pm.

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.

Donate to the IAAS!

If you shop Amazon.com, sign up or sign in to smile.amazon.com and select the **International Association for Astronomical Studies**. 0.5% of every purchase will be donated to the group. Thank you!

In This Newsletter...

"On December 1, 2008, a crescent Moon stood to the left of Jupiter while brilliant Venus hung below the other two. The three solar system objects meet again in the predawn sky November 16."
Alan Dyer

The Month At-A-Glance

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

The Moon

Phases:

- Full Moon occurs on the 3rd. (Supermoon)
- Last Quarter Moon occurs on the 10th.
- New Moon occurs on the 18th.
- First Quarter Moon occurs on the 26th.

- The Moon is at Perigee on the 4th, 222,135 miles from Earth.
- The Moon is at Apogee on the 18th, 252,651 miles from Earth.

Moon/Planet Pairs:

- The Moon passes 0.8° north of Aldebaran on the 3rd.
- The Moon passes 0.7° north of Regulus on the 8th.
- The Moon passes 4° north of Mars on the 13th.
- The Moon passes 4° north of Jupiter on the 14th.
- The Moon passes 0.2° south of asteroid Vesta on the 14th.
- The Moon passes 1.4° south of Neptune on the 24th.
- The Moon passes 5° south of Uranus on the 27th.
- The Moon passes 0.8° north of Aldebaran on the 30th.

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

The Planets & Dwarf Planets

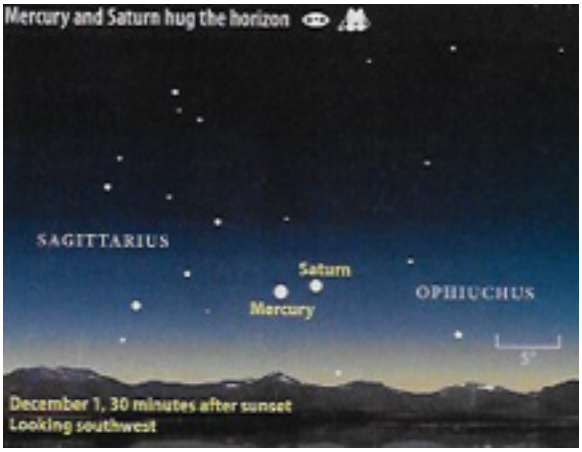
Planetary Reports are generated by "TheSky" software. These reports provide predicted data for the planets on the first of each month for the current year. The rise and set times for the Sun and the Moon for each day of the month as well as meteor shower radiants are also included in the reports. These 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 December

Start this month by observing the Full Moon on the 3rd. This will be the first of 3 "Supermoons" in a row and the only Supermoon for 2017. The Moon will appear much larger and brighter than usual. Get out and enjoy a nice moonlit stroll. December also hosts the best meteor shower of 2017, the Geminids meteor shower peaks on the morning of the 14th. Mercury and Saturn make brief appearances during the first week of the month. Try to spot them before they disappear in the Sun's glow. Uranus and Neptune are better placed for early evening viewing soon after sunset. Venus also disappears behind the Sun early in the month. If you have a clear, unobstructed view to the East, you might be able to spot Venus about 30 minutes before sunrise. Jupiter and Mars continue to climb higher in the morning sky as the month progresses.

Mercury



Is stationary on the 3rd. Mercury is in inferior conjunction with the Sun on the 12th. Mercury is again stationary on the 22nd. Mercury sets at 5:45 p.m. on the 1st. After inferior conjunction Mercury will appear in the morning sky. By the last week of the month, Mercury will be visible to the East about 30 minutes before sunrise. Mercury rises about 5:37 a.m. by month's end. Mercury is visible in the evening sky after sunset during the 1st week of the month, then disappears as it passes in front of the Sun, returning to morning sky visibility during the last week of December. Mercury moves

from the constellation of Sagittarius into Ophiuchus this month shining at magnitude-0.3 on the 31st.

Venus
Rises at 6:15 a.m. on the 1st and about 7:17 a.m. by month's end. Look for Venus shining brightly just a couple of degrees above the eastern horizon in the early morning minutes before sunrise. Venus is best viewed during the 1st week of the month. Venus moves from the constellation of Libra into Sagittarius shining at magnitude-3.9 on the 1st.

Earth
The Winter Solstice occurs at 11:28 a.m. EST on the 21st.

Mars
Rises at 3:18 a.m. on the 1st and about 2:54 a.m. by month's end. Look to the Southeast to spot Mars as it moves from the constellation of Virgo into Libra shining at magnitude 1.6.

Jupiter
Rises at 4:40 a.m. on the 1st and about 3:07 a.m. by month's end. Watch Jupiter and Mars throughout he month as Mars appears to get closer and closer as the month progresses. Jupiter is in the constellation of Libra shining at magnitude-1.7.

Saturn
Is in conjunction with the Sun on the 21st. Saturn sets at 5:50 p.m. on the 1st. After conjunction, Saturn will return to the morning sky, but will be lost in the twilight glow until next month. The best time to spot Saturn will be during the first week of the month to the West soon after sunset. Saturn is in the constellation of Sagittarius shining at magnitude 0.5 on the 1st.

Uranus
Sets at 3:25 a.m. on the 1st and about 1:21 a.m. by month's end. By the time the Sun sets, Uranus will easily be visible towards the South through a good pair of binoculars. Uranus is in the constellation of Pisces shining at magnitude 5.7.

Neptune
Sets at 11:44 p.m. on the 1st and about 9:44 p.m. by month's end. By the time the skies darken well after sunset, Neptune will be visible in the Southwest with a small telescope. Neptune is in the constellation of Aquarius shining at magnitude 7.9.

Dwarf Planets

Ceres

Rises at 9:19 p.m. on the 1st and about 7:08 p.m. by month's end. Ceres is best viewed later in the evening towards the Southeast. Ceres moves from the constellation of Cancer into Leo shining at magnitude 7.8 on the 15th.

Pluto

Sets at 7:18 p.m. on the 1st and about 5:20 p.m. by month's end. Pluto may be visible during the first half of the month to the west-southwest. After mid-month, Pluto will probably be too low to the horizon to be spotted. Pluto is in the constellation of Sagittarius shining at magnitude 14.3.

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

Astronomical Events

Meteor Showers

- The Geminids - This shower is active during the period December 6 to December 19. Upon reaching maximum activity during December 13 to 14, hourly rates are typically near 80. The meteors are described as rapid and yellowish, with about 4% displaying persistent trains. They possess an average magnitude of 2.4.

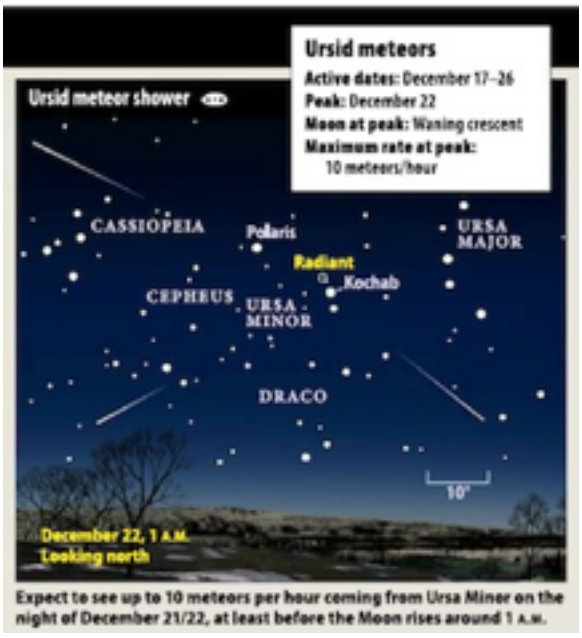
  Luckily, this year, this shower peaks on a nearly moonless morning.

- The Ursids - Occurring primarily between December 17 and 24, this meteor shower reaches maximum on December 22. The maximum hourly rate is usually between 10 and 15. Meteors belonging to this stream are typically faint.

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

Meteor Shower Radiant Report

Meteor Scatter (or Meteor burst



Expect to see up to 10 meteors per hour coming from Ursa Minor on the night of December 21/22, at least before the Moon rises around 1 A.M.

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 USB CW and see if you can hear any pings.

Comets

Comet PANSTARRS (C/2016 R2) is passing from the constellation of Orion heading west through Taurus. The best time to spot this comet will be during the middle of the month. An 4 inch telescope (or larger) and dark skies will be required to spot this 10th to 11th magnitude fuzzball.

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

- No solar eclipse activity this month.

- No lunar eclipse activity this month.

Observational Opportunities

(from evening to morning)

- Enjoy Uranus and Neptune in the evening skies after sunset.
- Look for Jupiter, Venus and Mars in the morning skies before sunrise.
- Try to observe some of the Geminids during mid-month.
- Try to spot Comet PANSTARRS in Orion and Taurus.

Asteroids

(From west to east)

- **Iris** is in the constellation of Aries.
- **Pallas** is in the constellation of Fornax.
- **Dembowska** is at opposition on the 1st in the constellation of Perseus.
- **Massalia** is at opposition on the 17th in the constellation of Orion.
- **Flora** is in the constellation of Gemini.
- **Vesta** is in the constellation of Libra.

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

Occultations

The Moon occults Aldebaran for most of North America on the 30th.

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

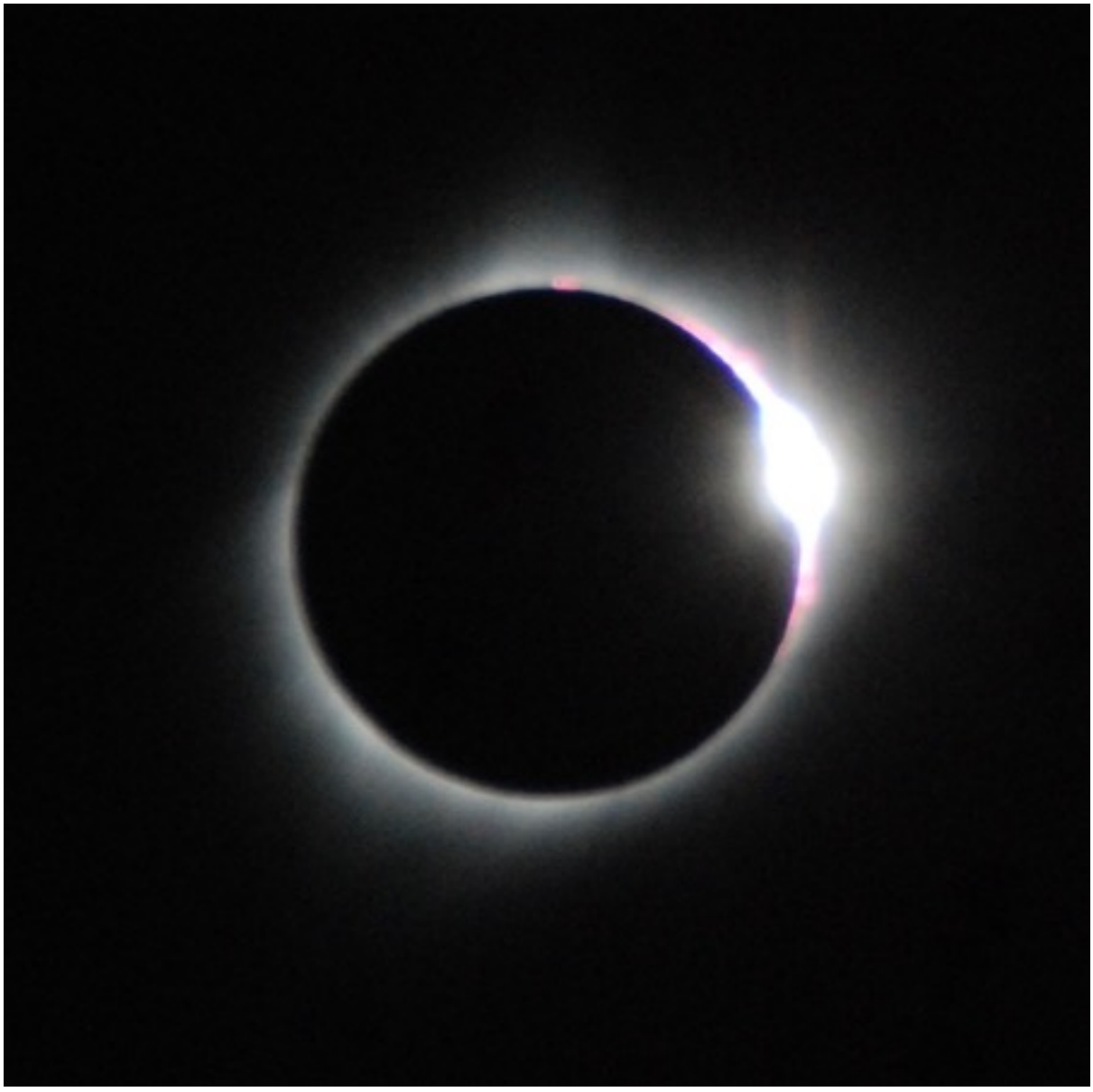
Member Meteor Sightings

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. I will post the most recent submissions here.



August 21, 2017 - Total Solar Eclipse - "Bailey's Beads" and the "Diamond Ring"
Taken by: Burness Ansell, Location: Guernsey, WY - More to come. I will be creating a special Solar Eclipse page to showcase subscriber contributions.

Planetary/Lunar Exploration Missions

(Excerpts from recent mission updates)

JPL Latest News

The Latest from Space

JPL Latest News

Voyager 1 Fires Up Thrusters After 37 Years
December 01, 2017

Full Article & Images

"If you tried to start a car that's been sitting in a garage for decades, you might not expect the engine to respond. But a set of thrusters aboard the Voyager 1 spacecraft successfully fired up Wednesday after 37 years without use.

Voyager 1, NASA's farthest and fastest spacecraft, is the only human-made object in interstellar space, the environment between the stars. The spacecraft, which has been flying for 40 years, relies on small devices called thrusters to orient itself so it can communicate with Earth. These thrusters fire in tiny pulses, or "puffs," lasting mere milliseconds, to subtly rotate the spacecraft so that its antenna points at our planet. Now, the Voyager team is able to use a set of four backup thrusters, dormant since 1980."

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.

Juno

November 02, 2017
Juno Aces Eighth Science Pass of Jupiter, Names New Project Manager

Full Article & Images

"Data returned Tuesday, Oct. 31, indicate that NASA's Juno spacecraft successfully completed its eighth science flyby over Jupiter's mysterious cloud tops on Tuesday, Oct. 24. The confirmation was delayed by several days due to solar conjunction at Jupiter, which affected communications during the days prior to and after the flyby."

NASA's JunoCam website can be visited at:

https://www.missionjuno.swri.edu/junocam

More information on the Juno mission is available at: http://www.nasa.gov/juno

The public can follow the mission on Facebook and Twitter at:
http://www.facebook.com/NASAJuno
http://www.twitter.com/NASAJuno

Cassini
October 30, 2017
The North

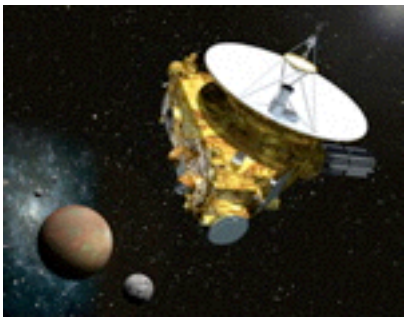
Full Article & Images
Photojournal: PIA21351

"Reflected sunlight is the source of the illumination for visible wavelength images such as the one above. However, at longer infrared wavelengths, direct thermal emission from objects dominates over reflected sunlight. This enabled instruments that can detect infrared radiation to observe the pole even in the dark days of winter when Cassini first arrived at Saturn and Saturn's northern hemisphere was shrouded in shadow.

Now, 13 years later, the north pole basks in full sunlight. Close to the northern summer solstice, sunlight illuminates the previously dark region, permitting Cassini scientists to study this area with the spacecraft's full suite of imagers."

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

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



New Horizons
September 7, 2017
First Official Pluto Feature Names

Full Article & Images

"The International Astronomical Union (IAU), the internationally recognized authority for naming celestial bodies and their surface features, approved names of 14 surface features on Pluto in August 2017. The names were

proposed by NASA's New Horizons team following the first reconnaissance of Pluto and its moons by the New Horizons spacecraft in 2015."

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

November 09, 2017
Dawn Explores Ceres' Interior Evolution

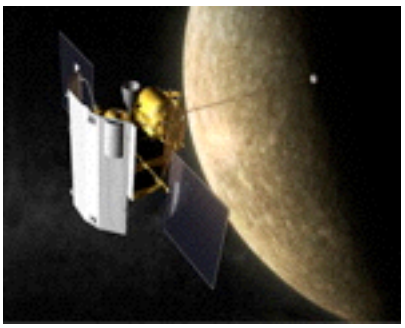
Full Article & Images

"Surface features on Ceres -- the largest world between Mars and Jupiter -- and its interior evolution have a closer relationship than one might think.

A recent study, published in Geophysical Research Letters, analyzed Ceres' surface features to reveal clues about the dwarf planet's interior evolution. Specifically, the study explored linear features -- the chains of pits and small, secondary craters common on Ceres.

The findings align with the idea that, hundreds of millions (up to a billion) years ago, materials beneath Ceres' surface pushed upward toward the exterior, creating fractures in the crust."

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



MESSENGER

The MESSENGER mission is officially ended but there is a lot to learn about the planet closest to our Sun. Visit the new, updated MESSENGER website:

UNLOCKING THE MYSTERIES OF PLANET MERCURY
for resources, to learn, and to explore.

(Click Link above for Full Article & Images)

TOP 10 SCIENCE RESULTS AND TECHNOLOGY INNOVATIONS

"After more than 10 years in operation, the MErcury Surface, Space ENvironment, GEochemistry, and Ranging (MESSENGER) spacecraft impacted the surface of Mercury on April 30, 2015, at a speed of more than 3.91 kilometers per second (8,750 miles per hour), marking the end of operations for the hugely successful Mercury orbiter. At the MESSENGER Nears End of Operations media and public event, scientists and engineers discussed the mission's accomplishments, providing the top 10 scientific discoveries, as well as the technological innovations that grew out of the mission."

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/.

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

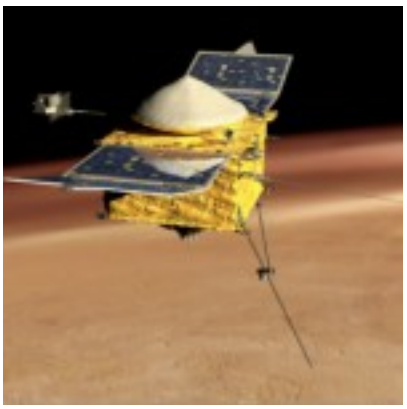
JMARS is an acronym that stands for Java Mission-planning and Analysis for Remote Sensing. It is a geospatial information system (GIS) developed by ASU's Mars Space Flight Facility to provide mission planning and data-analysis tools to NASA's orbiters, instrument team members, students of all ages, and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

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
October 19, 2017
MAVEN Finds Mars Has a Twisted Tail

Full Article & Images

"Mars has an invisible magnetic "tail" that is twisted by interaction with the solar wind, according to new research using data from MAVEN.

MAVEN is in orbit around Mars gathering data on how the Red Planet lost much of its atmosphere and water, transforming from a world that could have supported life billions of years ago into a cold and inhospitable place today. The process that creates the twisted tail could also allow some of Mars' already thin atmosphere to escape to space, according to the research team."

Visit LASP and MAVEN for more information.

Mars Science Laboratory - Curiosity
November 30, 2017
Sol 1891: Making Do With What You Got!

Full Article & Images

"Even before we started planning today's activities, we knew there would be a chance that we would be limited on the amount of data returned to Earth following the previous drive. This turned out to be true, as a data relay from the Mars Reconnaissance Orbiter did not make it down to JPL in time for us to have full Navcam imaging coverage of the area surrounding the rover and in the drive direction. Fortunately, the limited data availability did not significantly influence our capabilities for the day, which is a true testament to the science team, rover planners, and everyone involved in the daily operations!"

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 360 (requires Kinect)

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

Mars Exploration Rover Mission (Spirit and Opportunity)
November 28, 2017

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 Puts 28 Miles on the Odometer - *sols 4916 - 4923, Nov. 21, 2017 - Nov. 28, 2017:*

"Opportunity is continuing her winter exploration of Perseverance Valley on the west rim of the Noachian-aged Endeavour Crater.

Before moving to the next waypoint, the team commanded the rover on Sol 4916 (Nov. 21, 2017), to collect a Microscopic Image (MI) mosaic of a surface target, and then place the Alpha Particle X-ray Spectrometer (APXS) for a multi-sol integration. While the APXS was integrating, Opportunity continued to collect extensive color panoramas of the surrounding terrain. These image data are part of a complete digital model the rover is assembling of the entire Perseverance Valley.

With the in-situ (contact) science complete using the APXS, the rover drove on Sol 4922 (Nov. 27, 2017) about 46 feet (14 meters) to the next lily pad (energy favorable location) down the valley. Here Opportunity will continue the extensive image collection and take advantage of any surface targets under her feet.

As of Sol 4923 (Nov. 28, 2017), the solar array energy production was 390 watt-hours with an atmospheric opacity (Tau) of 0.416 and a solar array dust factor of 0.619.

Total odometry is 28.00 miles (45,067.60 kilometers)."

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

Visit the Mars Exploration Rover page at
https://mars.nasa.gov/mer/home/.

Mars Reconnaissance Orbiter Mission

November 20, 2017
Recurring Martian Streaks: Flowing Sand, Not Water?

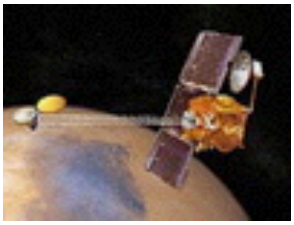
Full Article & Images

"Dark features on Mars previously considered evidence for subsurface flowing of water are interpreted by new research as granular flows, where grains of sand and dust slip downhill to make dark streaks, rather than the ground being darkened by seeping water.

Continuing examination of these still-perplexing seasonal dark streaks with a powerful camera on NASA's Mars Reconnaissance Orbiter (MRO) shows they exist only on slopes steep enough for dry grains to descend the way they do on faces of active dunes."

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
October 4, 2017
Examining Mars' Moon Phobos in a Different Light

Full Article & Images

"NASA's longest-lived mission to Mars has gained its first look at the Martian moon Phobos, pursuing a deeper understanding by examining it in infrared wavelengths.

The Thermal Emission Imaging System (THEMIS) camera on NASA's Mars Odyssey orbiter observed Phobos on Sept. 29, 2017. Researchers have combined visible-wavelength and infrared data to produce an image color-coded for surface temperatures of this moon, which has been considered for a potential future human-mission outpost."

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
October 3, 2017
Another Chance to Put Your Name on Mars

Full Article & Images

"When it lands on Mars in November of 2018, NASA's InSight lander will be carrying several science instruments -- along with hundreds of thousands of names from members of the public.

In 2015, nearly 827,000 people signed up to add their names to a silicon microchip onboard the robotic spacecraft. NASA is now adding a second microchip, giving the public another chance to send their names to Mars.

New submissions will be accepted through Nov. 1, 2017, at the following link:

https://mars.nasa.gov/syn/insight

"Mars continues to excite space enthusiasts of all ages," said Bruce Banerdt, the InSight mission's principal investigator at NASA's Jet Propulsion Laboratory in Pasadena, California. "This opportunity lets them become a part of the spacecraft that will study the inside of the Red Planet."

This fly-your-name opportunity comes with "frequent flier" points reflecting an individual's personal participation in NASA's exploration of Mars. These points span multiple missions and multiple decades. Participants who sent their names on the previous InSight opportunity in 2015 can download a "boarding pass" and see their "frequent flier" miles.

As part of this frequent flier program, a chip carrying the names of 1.38 million people also flew aboard the first flight of NASA's Orion spacecraft in 2014. NASA is building Orion to carry astronauts to deep space destinations that will enable future missions to Mars."

Learn more about the InSight mission at: http://www.jpl.nasa.gov/missions/insight/

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

Radio Astronomy Links

Other Astronomy Links

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!

Subscription Information

- 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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JPL Solar System Ambassador, Colorado
Last modified: November 01, 2017