IAAS Monthly Astronomy Newsletter October 2018

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 KIØAR - 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 WØWYX **146.94 MHz** and **449.825 MHz** repeaters. The RMRL **146.94** repeater is also linked with the WBØWDF Cripple Creek **447.400 MHz** repeater and Allstar nodes **28298**, **28299**, **29436**. We are also linked via Echolink, links are **k0jsc-r** and **canoncty** courtesy of KØJSC and KØGUR. More information on the WBØWDF repeater links, Allstar nodes and Echolinks can be found at k0jsc.com. We are also linked with Allstar nodes in Florida as well, courtesy of KA4EPS. The net meets on Tuesday nights at 7 P.M. Mountain Time (US).

Obtain 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 at 9am.

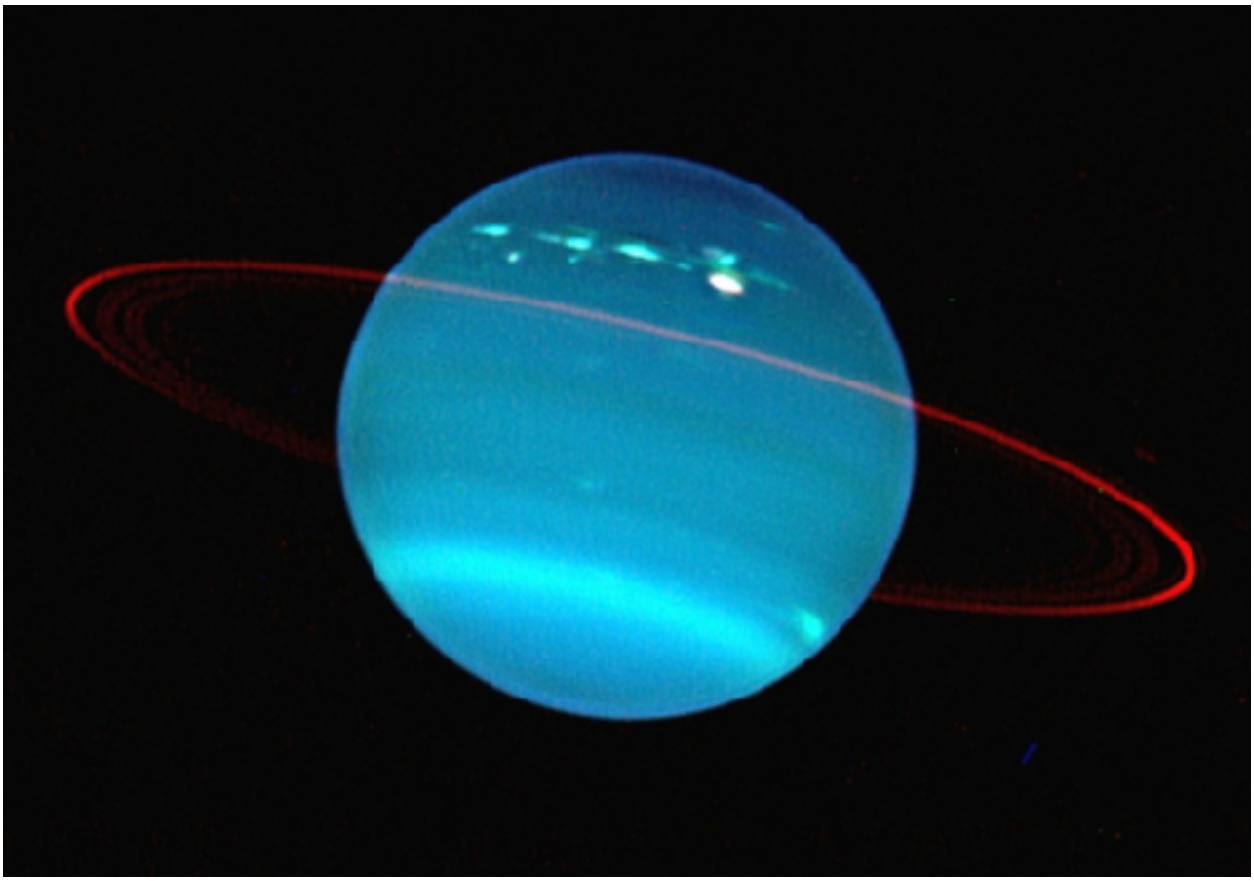
The Colorado Astronomy Net and the IAAS are on Facebook page. Be sure to "Like" us.

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!

Shop Smile.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...



"Amateur telescopes show Uranus' tiny disk and distinct blue-green color. This view through the Keck II Telescope also reveals delicate cloud structures and the planet's dark rings." ***Astronomy Magazine, October 2018, p.36.***
Lawrence Sromovsky (UW-Madison)/W.M. Keck Observatory

The Month At-A-Glance

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

The Moon

Phases:

- Last Quarter Moon occurs on the 2nd.
- New Moon occurs on the 8th.
- First Quarter Moon occurs on the 16th.
- Full Moon occurs on the 24th.

- The Moon is at Perigee on the 5th, 227,666 miles from Earth.
- The Moon is at Apogee on the 17th, 251,578 miles from Earth.
- The Moon is at Perigee on the 31st, 230,034 miles from Earth.

Moon/Planet Pairs:

- Mercury passes 2° north of Spica on the 5th.
- The Moon passes 13° north of Venus on the 10th.
- The Moon passes 4° north of Jupiter on the 11th.
- Mercury passes 7° north of Venus on the 14th.
- The Moon passes 1.8° north of Saturn on the 14th.
- The Moon passes 1.8° north of Mars on the 18th.
- The Moon passes 3° south of Neptune on the 20th.
- The Moon passes 5° south of Uranus on the 24th.
- Mercury passes 3° south of Jupiter on the 29th.

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 October

"The planetary bonanza we enjoyed this summer has started to slip away. The Sun's relentless march to the east gradually overtakes each of the planets. Venus succumbs first, disappearing into evening twilight after October's first week. And though Jupiter manages to hang on all month, it dips lower with each passing day.

Still, Saturn and Mars remain standouts. The ringed planet lies high in the south as darkness falls, offering superb views to anyone with a telescope. And the Red Planet remains a beacon. Although it has lost some of its summer luster, Mars shines brightly and looms large through telescopes." Astronomy Magazine, October 2018, p.36.

Mercury

Is visible in the evening sky this month, setting at 7:03 p.m. on the 1st and about 6:54 p.m. by month's end. Look for Mercury low to the west about 30 minutes after sunset. Mercury moves from the constellation of Virgo into Scorpius this month shining at magnitude -0.2 on the 31st.

Venus

Is stationary on the 4th. Venus is in inferior conjunction with the Sun on the 26th. Venus sets at 7:28 p.m. on the 1st and about 5:06 p.m. by month's end. Venus is descending rapidly towards the western horizon as the month progresses and disappears into the evening twilight glow by the third week of October. Venus will return to the morning sky early next month. Venus moves from the constellation of Libra into Virgo this month shining at magnitude -4.8 on the 1st.

Earth

N/A.

Mars

Sets at 1:41 a.m. on the 1st and about 1:02 a.m. by month's end. Look to the south soon after sunset to spot Mars. Mars is in the constellation of Capricornus shining at magnitude -1.0.

Jupiter
Sets at 8:39 p.m. on the 1st and about 6:57 p.m. by month's end. Jupiter is also rapidly descending toward the western horizon this month but remains easy to spot to the southwest. Jupiter is in the constellation of Libra shining at magnitude -1.8.

Saturn
Sets at 11:12 p.m. on the 1st and about 9:18 p.m. by month's end. Look for Saturn towards the southwest. The best views of Saturn will still be through a telescope, and since the rings are at a greater angle, viewers may be able to spot Cassini's division quite well. Saturn is in the constellation of Sagittarius shining at magnitude 0.5.

Uranus
Is at opposition on the 23rd, rising as the Sun sets. Uranus rises at 7:33 p.m. on the 1st and about 5:28 p.m. by month's end. Uranus is well placed for viewing all night long. Uranus is in the constellation of Aries shining at magnitude 5.7.

Neptune
Rises 5:42 p.m. on the 1st and about 3:39 p.m. by month's end. Neptune is well placed for evening viewing as well. By the time the skies darken enough, Neptune will be high enough to observe easily through a telescope. Neptune is in the constellation of Aquarius shining at magnitude 7.8.

Dwarf Planets
Ceres
Is in conjunction with the Sun on the 7th. Ceres returns to the morning sky after the 7th but remains lost in the Sun's glow all month. Ceres is in the constellation of Virgo shining at magnitude 8.5.

Pluto
Sets at 12:25 a.m. on the 1st and about 10:20 p.m. by months end. Pluto lies about halfway between Saturn and Mars. 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 Draconids - This shower is associated with periodic comet Giacobini-Zinner. The duration may extend from October 6 to 10, though the point of maximum is very sharply defined within a 4-hour interval on October 9, but the annual maximum hourly rates are not consistent. The radiant rarely produces any recognizable shower except during years especially close to the parent comet's perihelion passage. The meteors are slow and tend to be relatively faint. They are generally yellow.

- The Orionids - The duration of this meteor shower extends from October 15 to 29, with maximum occurring on (the morning of) October 21. The maximum hourly rate is usually about 20 and the meteors are described as fast.

- The Southern Taurids - This meteor shower is active from September 10 to November 20. Maximum occurs on the morning of October 10. Maximum hourly rate is 5 meteors per hour. The meteors are described as bright and move more slowly than typical meteors, making them prime subjects for imaging and viewing.

"Will the Hunter slay the Dragon?

The Orionids are usually October's top meteor shower. And that may well be the case in 2018. Although the shower peaks under a waxing gibbous Moon on October 21, our satellite sets around 4 a.m. local daylight time. That leaves two hours of darkness until twilight begins. Observers could see up to 20 meteors per hour radiating from Orion the Hunter.

But the Draconids could give the Orionids a run for their money. This typically minor shower might erupt the night of October 8/9 because its parent comet — 21P/Giacobini-Zinner — passed closest to the Sun last month. (See "Catch a comet crossing the Milky Way" on p. 42.) Previous outbursts have followed the comet's return. Viewers could see 10 or more meteors per hour coming from Draco the Dragon in the hours before midnight." Astronomy Magazine, October 2018, p.37

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 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. Try other frequencies as well... 6m FT8 digital - 50.313 Mhz & 50.276 Mhz, JP-65 digital mode and the carrier frequencies of the lower VHF bands for TV channels 2, 3 & 4.

Comets

"Observers don't often get a chance to see a reasonably bright comet and a meteor shower at the same time, but it's truly rare to set eyes on the very body producing those streaks of light. Such an opportunity presents itself during October's first half, when Comet 21P/Giacobini-Zinner graces the morning sky while the Draconid meteor shower reaches its peak. (See "Will the Hunter slay the Dragon?" on p. 37 for details on the Draconids.)

Comet Giacobini-Zinner should glow at 8th magnitude in early October. Observers can then find it plunging southward through the winter Milky Way, passing from Monoceros into Canis Major. Because this is only a few weeks after the comet made its closest approach to both the Sun and Earth, astronomers expect it to sport a nice gas tail about 1° long." Astronomy Magazine, October 2018, p.37.

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 eclipse activity this month.

Observational Opportunities

(from evening to morning)

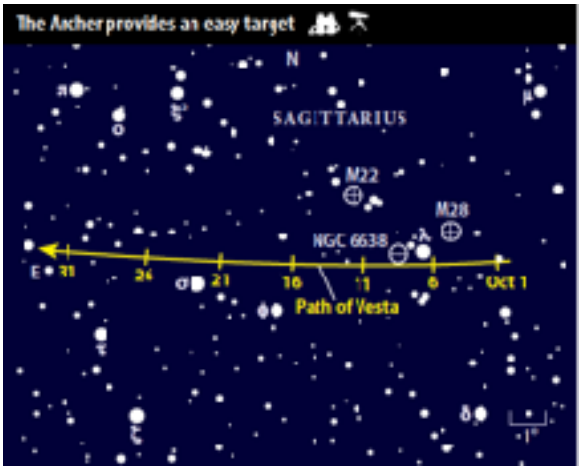
- Observe Venus, Jupiter, Saturn and Mars in the early evening sky after sunset.

- Watch for the Draconid and Orionid meteors.
- Try to spot Comet 21P/Giacobini-Zinner passing through Monoceros and Canis Major.

Asteroids

(From west to east)

- **Vesta** is in the constellation of Sagittarius.
- **Juno** is in the constellation of Taurus.
- **Hebe** is in the constellation of Monoceros.
- **Pallas** 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. 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

September 26, 2018
JPL Airborne Mission Is One of Five New Earth Ventures

Full Article & Images

"Five new NASA Earth science campaigns, including one from NASA's Jet Propulsion Laboratory in Pasadena, California, will take to the field starting in 2020 to investigate a range of pressing research questions, from what drives intense East Coast snowfall events to the impact of small-scale ocean currents on global climate."

Read the latest news and discoveries from JPL's dozens of active space missions exploring Earth, the solar system and worlds beyond.

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

August 29, 2018
How a NASA Scientist Looks in the Depths of the Great Red Spot to Find Water on Jupiter

Full Article & Images

"For centuries, scientists have worked to understand the makeup of Jupiter. It's no wonder: this mysterious planet is the biggest one in our solar system by far, and chemically, the closest relative to the Sun. Understanding Jupiter is key to learning more about how our solar system formed, and even about how other solar systems develop.

But one critical question has bedeviled astronomers for generations: Is there water deep in Jupiter's atmosphere, and if so, how much?"

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

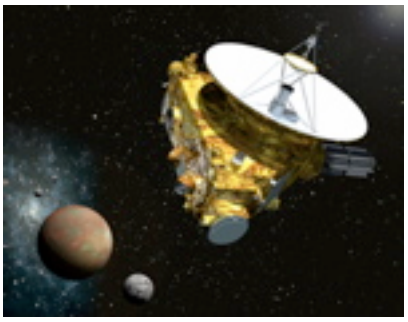
Cassini Legacy
July 30, 2018
Group Portrait

Full Article & Images

"On July 29, 2011, Cassini captured five of Saturn's moons in a single frame with its narrow-angle camera. This is a full-color look at a view that was originally published in September 2011 (see PIA14573)."

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
August 28, 2018
Ultima in View
New Horizons Makes First Detection of Kuiper Belt Flyby Target

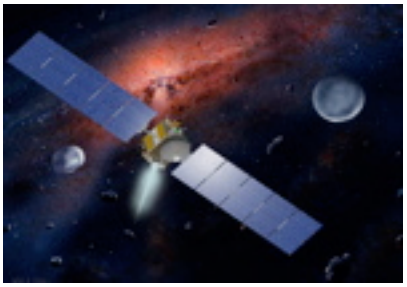
Full Article & Images

"NASA's New Horizons spacecraft has made its first detection of its next flyby target, the Kuiper Belt object nicknamed Ultima Thule, more than four months ahead of its New Year's 2019 close encounter.

Mission team members were thrilled -- if not a little surprised -- that New Horizons' telescopic Long Range Reconnaissance Imager (LORRI) was able to see the small, dim object while still more than 100 million miles away, and against a dense background of stars. Taken Aug. 16 and transmitted home through NASA's Deep Space Network over the following days, the set of 48 images marked the team's first attempt to find Ultima with the spacecraft's own cameras."

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

September 06, 2018
The Legacy of NASA's Dawn, Near End of Mission

Full Article & Images

"NASA's Dawn mission is drawing to a close after 11 years of breaking new ground in planetary science, gathering breathtaking imagery, and performing unprecedented feats of spacecraft engineering.

Dawn's mission was extended several times as it explored Ceres and Vesta, which when combined, make up 45 percent of the mass of the main asteroid belt. Now, the spacecraft is about to run out of a key fuel, hydrazine. When that happens, most likely between September and October, Dawn will lose its ability to communicate with Earth. It will remain in a silent orbit around Ceres for decades."

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

TESS

September 25, 2018
NASA Is Taking a New Look at Searching for Life Beyond Earth

Full Article & Images

"Since the beginning of civilization, humanity has wondered whether we are alone in the universe. As NASA has explored our solar system and beyond, it has developed increasingly sophisticated tools to address this fundamental question. Within our solar system, NASA's missions have searched for signs of both ancient and current life, especially on Mars and soon, Jupiter's moon Europa. Beyond our solar system, missions, such as Kepler and TESS, are revealing thousands of planets orbiting other stars."

For more news and information on the TESS mission, visit the Latest Tess Stories page.

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

September 20, 2018
MAVEN Selfie Marks Four Years in Orbit at Mars

Full Article & Images

"Today, NASA's MAVEN spacecraft celebrates four years in orbit studying the upper atmosphere of the Red Planet and how it interacts with the Sun and the solar wind. To mark the occasion, the team has released a selfie image of the spacecraft at Mars."

Visit LASP and MAVEN for more information.

Mars Science Laboratory - Curiosity
September 19, 2018
Sols 2175-2176: Tell Us More, We Want to Help!

Full Article & Images

"Over the past few days, engineers here at JPL have been working to address an issue on Curiosity that is preventing it from sending much of the science and engineering data stored in its memory. The rover remains in its normal mode and is otherwise healthy and responsive.

The issue first appeared Saturday night while Curiosity was running through the weekend plan. Besides transmitting data recorded in its memory, the rover can transmit "real-time" data when it links to a relay orbiter or Deep Space Network antenna. These real-time data are transmitting normally, and include various details about the rover's status. Engineers are expanding the details the rover transmits in these real-time data to better diagnose the issue. Because the amount of data coming down is limited, it might take some time for the engineering team to diagnose the problem."

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)
September 25, 2018

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 Remains Silent For Over Three Months - ***sols 5210 to 5216, Sept. 19, 2018 - Sept. 25, 2018:***

"No signal from Opportunity has been heard in over 115 sols, since Sol 5111 (June 10, 2018).

It is expected that Opportunity has experienced a low-power fault. Perhaps, a mission clock fault and an up-loss timer fault, as well. The dust storm on Mars continues to subside with atmospheric opacity (tau) over the rover site at around 1.3.

The science team has been listening for the rover over a broad range of times using the Deep Space Network (DSN) Radio Science Receiver. In addition, commanding "sweep and beeps" throughout our daily DSN pass to address a possible complexity with certain conditions within the mission clock fault.

Total odometry is 28.06 miles (45.16 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

September 25, 2018
Opportunity Emerges in a Dusty Picture

Full Article & Images

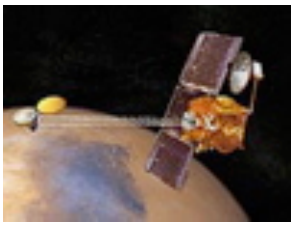
"NASA still hasn't heard from the Opportunity rover, but at least we can see it again.

A new image produced by HiRISE, a high-resolution camera aboard NASA's Mars Reconnaissance Orbiter (MRO), shows a small object on the slopes of the Red Planet's Perseverance Valley. That object is Opportunity, which was descending into the Martian valley when a dust storm swept over the region a little more than 100 days ago.

The storm was one of several that stirred up enough dust to enshroud most of the Red Planet and block sunlight from reaching the surface. The lack of sunlight caused the solar-powered Opportunity to go into hibernation."

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
July 27, 2018
Mars in our Night Sky

Full Article & Images

"Mars Close Approach to Earth

See Mars in the Night Sky!

Simply go outside and look up, contact your local planetarium, or look for a star party near you.

In 2018, Mars will appear brightest from July 27 to July 30

Mars Close Approach is July 31, 2018

That is the point in Mars' orbit when it comes closest to Earth. Mars will be at a distance of 35.8 million miles (57.6 million kilometers). Mars reaches its highest point around midnight -- about 35 degrees above the southern horizon, or one-third of the distance between the horizon and overhead. Mars will be visible for much of the night.

By mid-August, Mars will become fainter as Mars and Earth travel farther away from each other in their orbits around the Sun.

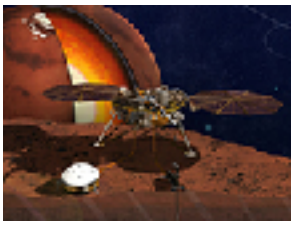
Miss seeing Mars Close Approach in 2018? The next Mars Close Approach is Oct. 6, 2020."

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
August 28, 2018
NASA's InSight Has a Thermometer for Mars

Full Article & Images

"Ambitious climbers, forget Mt. Everest. Dream about Mars.

The Red Planet has some of the tallest mountains in the solar system. They include Olympus Mons, a volcano nearly three times the height of Everest. It borders a region called the Tharsis plateau, where three equally awe-inspiring volcanoes dominate the landscape.

But what geologic processes created these features on the Martian surface? Scientists have long wondered -- and may soon know more.

NASA and DLR (German Aerospace Center) plan to take the planet's temperature for the first time ever, measuring how heat flows out of the planet and drives this inspiring geology. Detecting this escaping heat will be a crucial part of a mission called InSight (Interior Exploration using Seismic Investigations, Geodesy and Heat Transport), managed by NASA's Jet Propulsion Laboratory in Pasadena, California.

InSight will be the first mission to study Mars' deep interior, using its Heat Flow and Physical Properties Package (HP3) instrument to measure heat as it is conducted from the interior to the planet's surface. This energy was in part captured when Mars formed more than 4 billion years ago, preserving a record of its creation. That energy is also due to the decay of radioactive elements in the rocky interior."

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
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