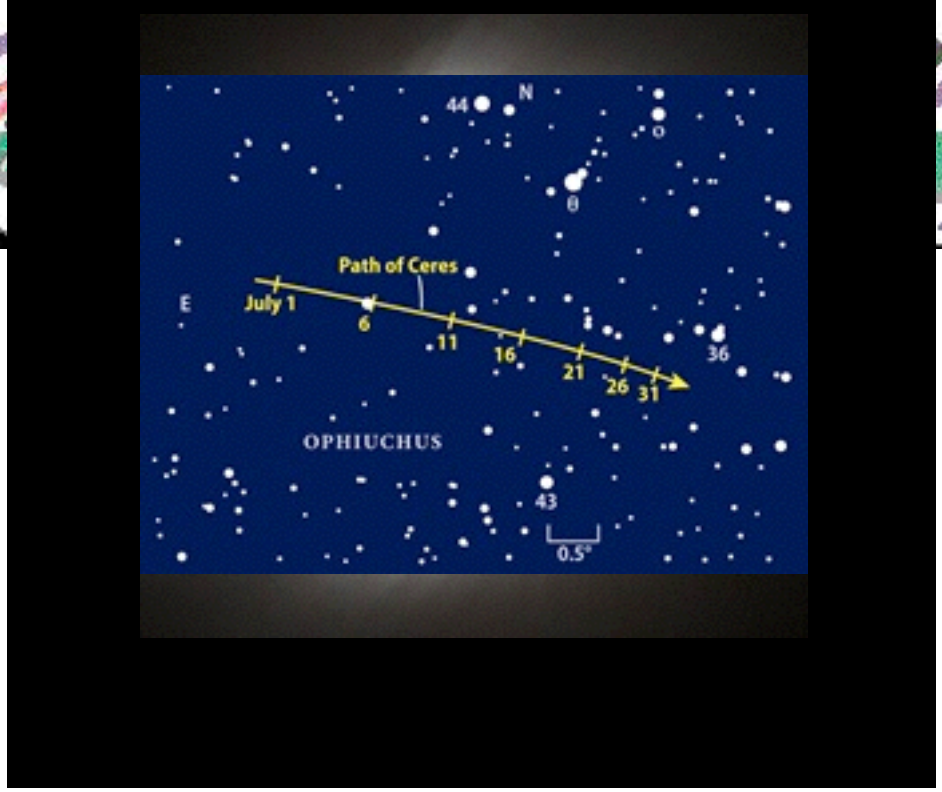
IAAS Monthly Astronomy Newsletter December 2015



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).

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

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.

In This Newsletter... The Month At-A-Glance 4

On June 18, 2007, Earth's satellite passed in front of Venus during daylight hours. North American observers can witness a similar event December 7.
Credit - Anthony Ayiomamitis

The Month At-A-Glance

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

The Moon

Phases:

- Last Quarter Moon occurs on the 3rd.
- New Moon occurs on the 11th.
- First Quarter Moon occurs on the 18th.
- Full Moon occurs on the 25th.

- The Moon is at Apogee on the 5th, 251,531 miles from Earth.
- The Moon is at Perigee on the 21st, 228,924 miles from Earth.

Moon/Planet Pairs:

- The Moon passes 1.8° south of Jupiter on the 4th.
- The Moon passes 0.1° south of Mars on the 5th.
- The Moon passes 0.7° north of Venus on the 7th.
- The Moon passes 3° north of Neptune on the 17th.
- The Moon passes 1.2° south of Uranus on the 19th.
- Mars passes 4° north of Spica on the 21st.
- The Moon passes 0.7° north of Aldebaran on the 23rd.
- The Moon passes 1.5° south of Jupiter on the 31st.

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

"The morning sky sees most of the planetary action in December, with Venus, Mars, and Jupiter all prominently displayed. A highlight of the month occurs during daylight on the 7th when the Moon passes directly in front of Venus and hides it from view.

The evening sky possesses more subtle attractions. Uranus and Neptune remain binocular targets all month, while Mercury climbs into view during twilight after mid-December. But perhaps the month's biggest event comes on the 14th when the annual Geminid meteor shower peaks under a Moon-free sky." Astronomy Magazine, December 2015, p. 36.

Mercury
Has returned to the evening sky, but remains lost in the evening twilight glow until about midmonth. Mercury lies about 4° above the western horizon for northern hemisphere observers just 30 minutes after sunset on the 15th. Mercury is at greatest eastern elongation (20° above the western horizon) on the 28th. Mercury moves from the constellation of Ophiuchus into Capricornus shining at magnitude -0.5 on the 31st.

Venus
Rises at 3:22 a.m. on the 1st and about 4:23 a.m. by month's end. Look for Venus in the early morning skies before sunrise. On the morning of the 7th, after sunrise, a waning crescent Moon occults Venus. (See Occultations for details.) Venus moves from the constellation of Virgo into Scorpius shining at magnitude -4.1.

Earth
The Winter Solstice occurs at 11:48 p.m. EST on the 21st.

Mars
Rises at 2:10 a.m. on the 1st and about 1:36 a.m. by month's end. Mars is visible to the east in the morning before dawn. Mars is in the constellation of Virgo this month shining at magnitude 1.4.

Jupiter
Rises at 12:32 a.m. on the 1st and about 10:36 p.m. by month's end. Jupiter is visible in the late evening and early morning sky before sunrise. Look for Jupiter in the east after midnight. Jupiter is in the constellation of Leo shining at magnitude -2.1.

Saturn
Rises at 6:51 a.m. on the 1st and about 5:06 a.m. by month's end. Look to the southeast before sunrise to spot Saturn. Saturn is in the constellation of Ophiuchus shining at magnitude 0.5.

Uranus
Is stationary on the 26th. Uranus sets at 2:46 a.m. on the 1st and about 12:43 a.m. by month's end. Uranus is visible in the evening sky. Look to the south soon after sunset to spot Uranus. Uranus is in the constellation of Pisces shining at magnitude 5.8.

Neptune
Sets at 11:24 p.m. on the 1st and about 9:24 p.m. by month's end. Neptune can be spotted to the southwest once the skies darken, though observers will need binoculars or a telescope to see it. Neptune is in the constellation of Aquarius shining at magnitude 7.9.

Dwarf Planets
Ceres
Sets at 8:42 p.m. on the 1st and about 7:39 p.m. by month's end. Ceres will be difficult to spot for those living in the more northerly latitudes due to its lower altitude just above the south-western horizon. Ceres is in the constellation of Capricornus shining at magnitude 9.3.

Pluto
Sets at 7:06 p.m. on the 1st and about 5:09 p.m. by month's end. Pluto is too low to the western horizon to be spotted easily and will rapidly be lost in the twilight glow by the end of the month. Pluto is in the constellation of Sagittarius shining at magnitude 14.2.

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

Astronomical Events

Meteor Showers

The 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.

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 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 55.25 MHz SSB and see if you can hear any pings.

Comets

Comet Catalina (C/2013 US10) could reach magnitude 4 in early December in the pre-dawn sky passing through the constellation of Virgo approaching the bright star Arcturus by the end of the month.

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)*
- Look for Jupiter, Mars, Venus and Saturn before sunrise.
- Try to spot Neptune and Uranus later in the evening.
- Enjoy the Geminid meteor shower peaking mid-month.

Asteroids
(From west to east)
- **Vesta** is in the constellation of Cetus.
- **Eunomia** is in the constellation of Pegasus.
- **Laetitia** is in the constellation of Cetus.
- **Psyche** is at opposition on the 9th in the constellation of Taurus.
- **Nausikaa** is in the constellation of Perseus.
- **Euterpe** is at opposition on the 24th/25th in the constellation of Gemini.

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

Occultations
A waning crescent Moon occults Venus on the morning of December 7th. Observers across North America can follow this occultation with binoculars or a telescope. Here are the times for cities across the U.S. It is recommended that observers set up about 30 minutes before the event if viewing through a telescope.

City	Time
Seattle	7:54 a.m. PST
Los Angeles	8:04 a.m. PST
Denver	9:36 a.m. MST
Houston	11:12 a.m. CST
Chicago	11:18 a.m. CST
New York	12:42 p.m. EST
Boston	12:43 p.m. EST
Miami	12:52 p.m. EST

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

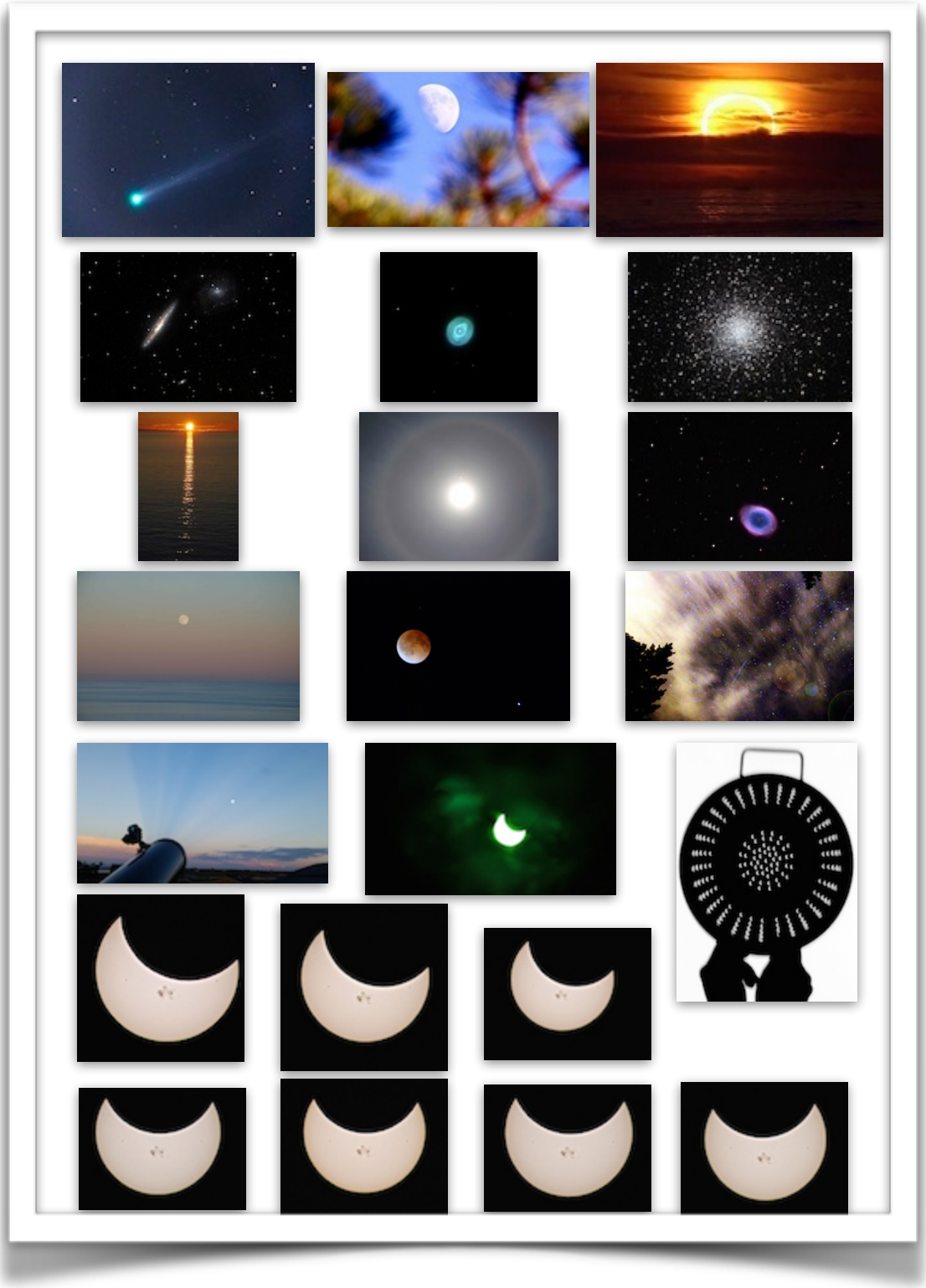
Member Meteor Sightings
This is a new section where I will post meteor, fireball, etc sightings that have been published on the American Meteor Society's web site. I want to make this an active section of the web pages and newsletter and would like to publish the links to member

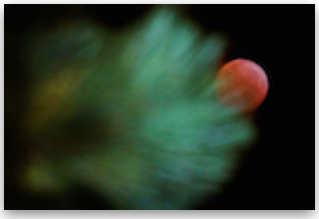
sightings. If you have any published sightings, please provide me with the links and I will post them here for all to enjoy.

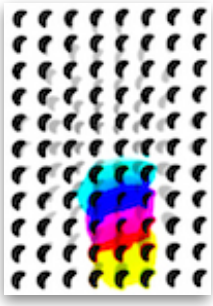
Event ID	UT Date/Time	Location	Observer	Link
3587-2015	2015-11-22 17:38 MST	CO	Kevin S	3587aw

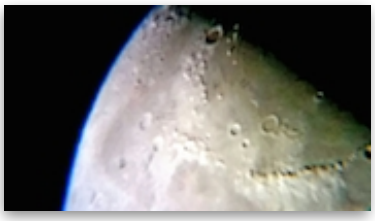
Subscriber Gallery

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.







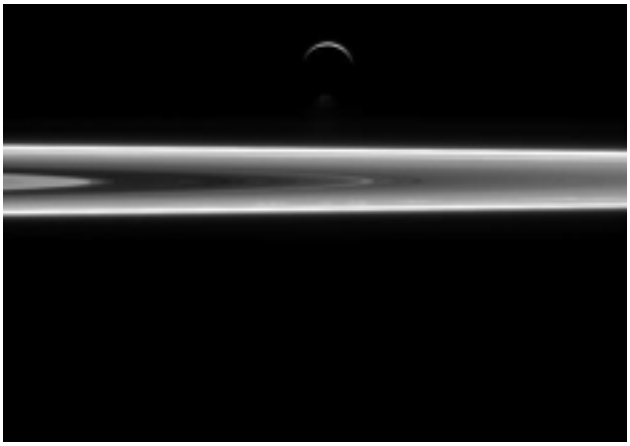


Planetary/Lunar Exploration Missions

(Excerpts from recent mission updates)

Cassini

November 30, 2015
Water World
Full-Res: PIA18343



"Although Enceladus and Saturn's rings are largely made up of water ice, they show very different characteristics. The small ring particles are too tiny to retain internal heat and have no way to get warm, so they are frozen and geologically dead. Enceladus, on the other hand, is subject to forces that heat its interior to this very day. This results in its famous south polar water jets, which are just visible above the moon's dark, southern limb, along with a sub-surface ocean.

Recent work by Cassini scientists suggests that Enceladus (313 miles or 504 kilometers across) has a global ocean of liquid water under its surface. This discovery increases scientists' interest in Enceladus and the quest to understand the role of water in the development of life in the solar system. (For more on the sub-surface ocean, see Cassini Finds Global Ocean in Saturn's Moon Enceladus).

This view looks toward the unilluminated side of the rings from about 0.3 degrees below the ring plane. The image was taken in visible light with the Cassini spacecraft narrow-angle camera on July 29, 2015. "

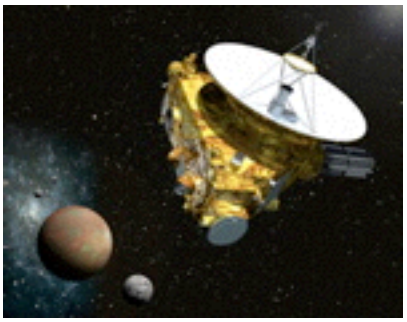
The Cassini-Huygens mission is a cooperative project of NASA, the European Space Agency and the Italian Space Agency. JPL, a division of the California Institute of Technology, Pasadena, manages the mission for NASA's Science Mission Directorate in Washington.

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

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

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

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

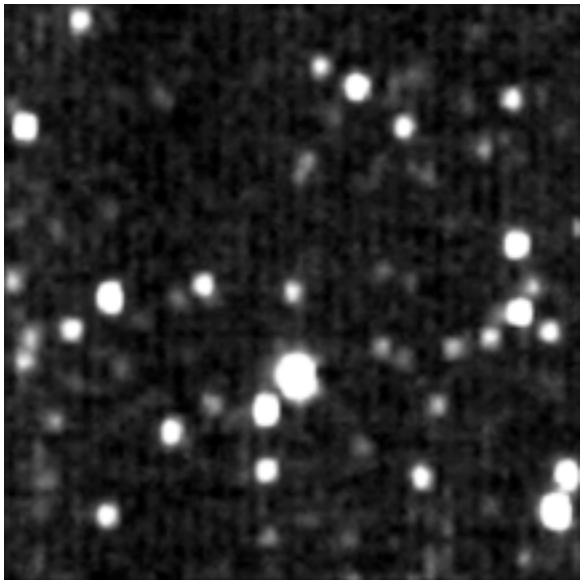


New Horizons

December 4, 2015

A Distant Close-up: New Horizons' Camera Captures a Wandering Kuiper Belt Object

Full Image



"NASA's New Horizons spacecraft recently took the closest images ever of a distant Kuiper Belt object - demonstrating its ability to observe numerous such bodies over the next several years if NASA approves an extended mission into the Kuiper Belt.

In a short animation, consisting of four frames taken by the spacecraft's Long Range Reconnaissance Imager (LORRI) on Nov. 2, 2015, and spaced an hour apart, one can see this 90-mile (150-kilometer)-wide ancient body, officially called 1994 JR1, moving against a background of stars. When these images were made, 1994 JR1 was 3.3 billion miles (5.3 billion miles) from the sun, but only 170 million miles (280 million kilometers) away from New Horizons - setting a record, by a factor of at least 15, for the closest-ever picture of a small body in the Kuiper Belt, the solar system's "third zone" beyond the inner, rocky planets and outer, icy gas giants.

Mission scientists plan to use images like these to study many more ancient Kuiper Belt objects from New Horizons if an extended mission is approved. New Horizons flew through the Pluto system on July 14, 2015, making the first close-up observations of Pluto and its family of five moons. The spacecraft is on course for a close flyby of another Kuiper Belt object, 2014 MU69, on Jan. 1, 2019."

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

What is Pluto? -Video

Follow New Horizons on its journey to Pluto and beyond.

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

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

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

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

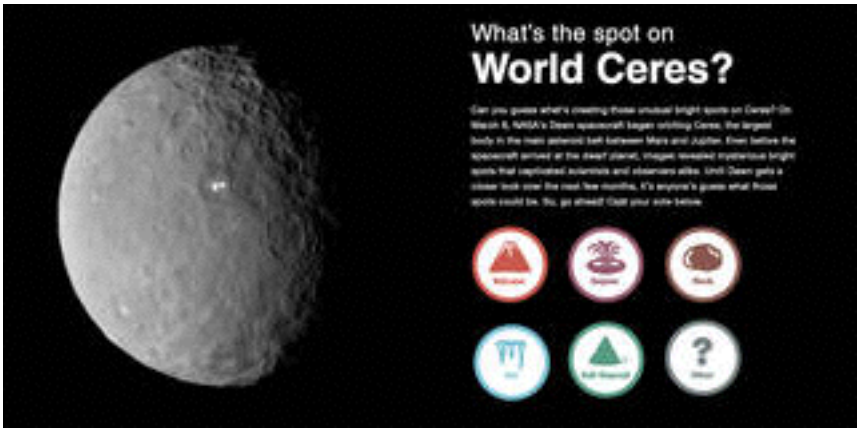
New Horizons gallery

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

Dawn
November 6, 2015

Take a tour of weird Ceres!

"Visit a 2-mile-deep crater and a 4-mile-tall mountain in the video narrated by mission director Marc Rayman. Get your red/blue glasses ready for the finale - a global view of the dwarf planet in 3D."



Can you guess what's creating those unusual bright spots on Ceres?

Ceres Topographic Globe Animation

Ion Propulsion Dawn Video

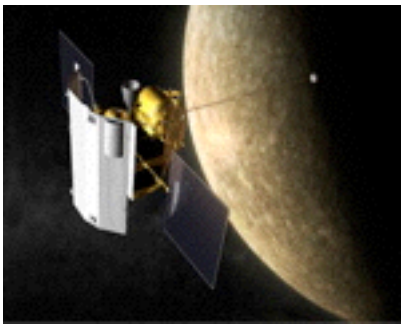
Ion propulsion isn't something found only in science fiction. Ion engines are a real deal and drive NASA's Dawn spacecraft, en route to dwarf planet Ceres. Big things do come in small packages.

Dawn's Virtual Flight over Vesta

Ceres Fly By

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

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



MESSENGER

November 24, 2015

MESSENGER's Brett Denevi Awarded Top Scientist Honor from Maryland Academy

"The Maryland Academy of Sciences presented MESSENGER Team Member Brett Denevi with their Outstanding Young Scientist award during a ceremony on November 18 at the Maryland Science Center in Baltimore.

The Outstanding Young Scientist award program was established in 1959 to recognize and celebrate extraordinary contributions of young Maryland scientists.

Denevi, the Deputy Instrument Scientist for the Mercury Dual Imaging System (MDIS) on the MESSENGER spacecraft, is "an unusually accomplished young scientist who has helped to solve multiple difficult problems, the solutions to which have contributed to our basic understanding of how the solar system has evolved and the processes that drove its evolution," stated MESSENGER Co-Investigator Scott Murchie."

The MESSENGER app is available for download on iTunes.

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

Pack Your Backpack

Calling all explorers! Tour JPL with our new Virtual Field Trip site. Stops include Mission Control and the Rover Lab. Your guided tour starts when you select a "face" that will be yours throughout the visit. Cool space images and souvenirs are all included in your visit.
+ http://virtualfieldtrip.jpl.nasa.gov/
Past, Present, Future and Proposed JPL Missions - http://www.jpl.nasa.gov/missions.

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

Mars Missions

Be A Martian

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

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

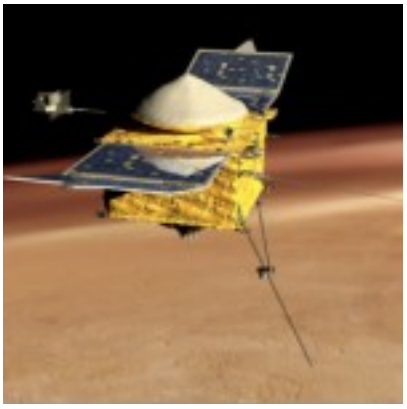
JMARS
https://jmars.mars.asu.edu/
JMARS is an acronym that stands for Java Mission-planning and Analysis for Remote Sensing. It is a geospatial information system (GIS) developed by ASU's Mars Space Flight Facility to provide mission planning and data-analysis tools to NASA's orbiters, instrument team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

Laboratory for Atmospheric and Space Physics

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

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

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



MAVEN

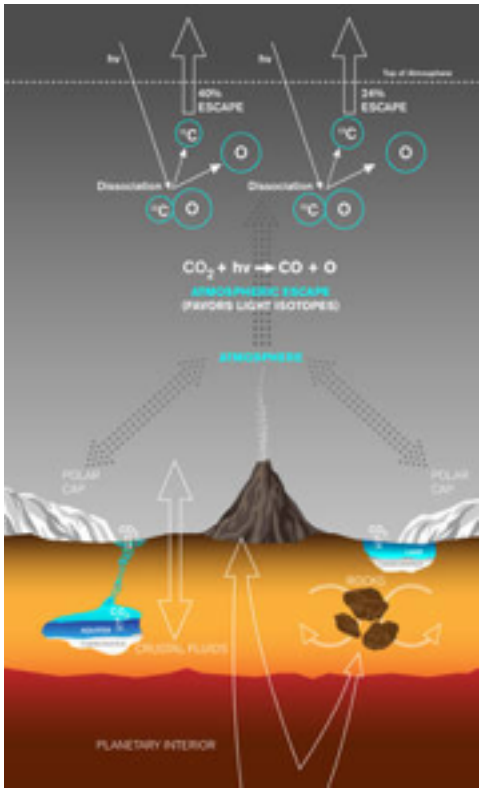
November 5, 2015
MAVEN Reveals Speed of Solar Wind Stripping Martian Atmosphere

"The MAVEN mission has identified the process that appears to have played a key role in the transition of the Martian climate from an early, warm and wet environment that might have supported surface life to the cold, arid planet Mars is today.

MAVEN data have enabled researchers to determine the rate at which the Martian atmosphere currently is losing gas to space via stripping by the solar wind. The findings reveal that the erosion of Mars' atmosphere increases significantly during solar storms. The scientific results from the mission appear in the Nov. 5 issues of the journals Science and Geophysical Research Letters."

Visit LASP and MAVEN for more information.

Mars Science Laboratory - Curiosity
November 24, 2015
Loss of Carbon in Martian Atmosphere Explained



"Mars is blanketed by a thin, mostly carbon dioxide atmosphere -- one that is far too thin to keep water from freezing or quickly evaporating. However, geological evidence has led scientists to conclude that ancient Mars was once a warmer, wetter place than it is today. To produce a more temperate climate, several researchers have suggested that the planet was once shrouded in a much thicker carbon dioxide atmosphere. For decades that left the question, "Where did all the carbon go?"
The solar wind stripped away much of Mars' ancient atmosphere and is still removing tons of it every day. But scientists have been puzzled by why they haven't found more carbon -- in the form of carbonate -- captured into Martian rocks. They have also sought to explain the ratio of heavier and lighter carbons in the modern Martian atmosphere.

Now a team of scientists from the California Institute of Technology and NASA's Jet Propulsion Laboratory, both in Pasadena, offer an explanation of the "missing" carbon, in a paper published today by the journal Nature Communications.

They suggest that 3.8 billion years ago, Mars might have had a moderately dense atmosphere. Such an atmosphere -- with a surface pressure equal to or less than that found on Earth -- could have evolved into the current thin one, not only minus the "missing" carbon problem, but also in a way consistent with the observed ratio of carbon-13 to carbon-12, which differ only by how many neutrons are in each nucleus."

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)
November 3, 2015

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: Just In Time For Halloween, A Network Problem And An Amnesia Event Slows Down Robotic Arm Work - *sols 4181-4187, October 28, 2015-November 03, 2015*:

"Opportunity is within 'Marathon Valley' on the west rim of Endeavour Crater.

The plan ahead was for Opportunity to use the robotic arm to place the Alpha Particle X-ray spectrometer down on a target for a week while the project conducted a weeklong test and readout of Flash memory. However, a Deep Space Network problem prevented the rover's plan from being radiated, so the rover executed run out plans on Sols 4184 and 4185 (Oct. 31 and Nov. 1, 2015).

On Sol 4186 (Nov. 2, 2015), commands were sent to the rover to enable the use of Flash memory and to spend the week returning science data already in Flash memory. Although those commands were successful, the rover experienced an amnesia event on Sol 4186 (Nov. 2, 2015). As contingency, Flash Bank 7 readouts were performed instead. On Sol 4187 (Nov. 3, 2015), the rover successfully mounted Flash and began the return of the science data. The plan for the balance of the week is to continue with the return of science data from Flash.

As of Sol 4187 (Nov. 3, 2015), the solar array energy production was 344 watt-hours with an atmospheric opacity (Tau) of 0.472 and a solar array dust factor of 0.574.

Total odometry is 26.48 miles (42.62 kilometers), more than a marathon."

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

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

Mars Reconnaissance Orbiter Mission

October 29, 2015

Rewrite of Onboard Memory Planned for NASA Mars Orbiter

Mission Status Report

"Tables stored in flash memory aboard NASA's Mars Reconnaissance Orbiter (MRO) tell locations of Earth and the sun for the past 10 years, but not their locations next year. That needs to be changed. Carefully.

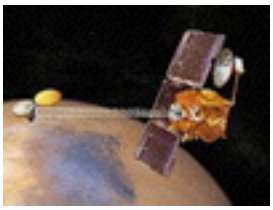
The long-lived orbiter relies on these tables to recover in the event of an unplanned computer shutdown. When the spacecraft computer reboots, it checks to see where it should position the antenna for communication and, even more critically, where it should position the solar arrays for power. Flash memory is "nonvolatile" -- meaning that it retains information even while the power is off -- so it works well for this backup role."

Video

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

MARS RECONNAISSANCE ORBITER HIRISE IMAGES

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



Mars Odyssey Orbiter

September 2, 2015

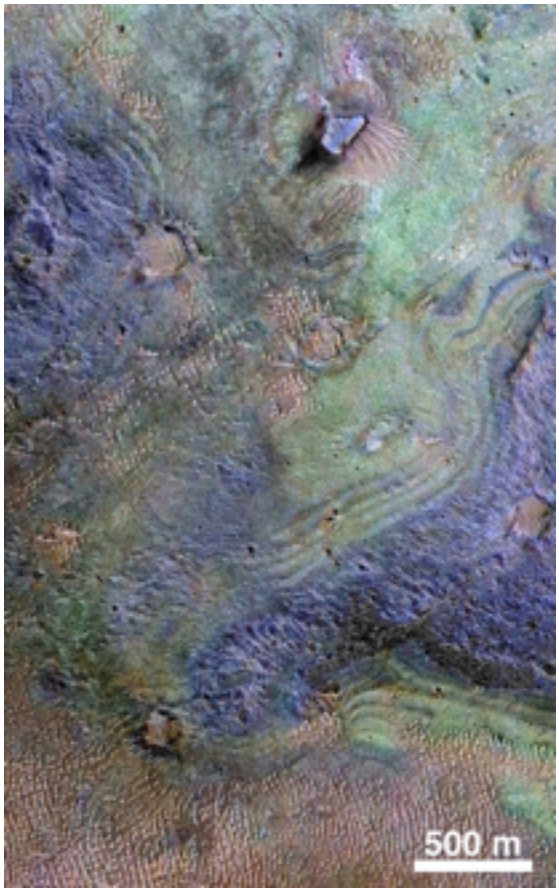
What Happened to Early Mars' Atmosphere? New Study Eliminates One Theory

Rocks Here Sequester Some of Mars' Early Atmosphere

This view combines information from two instruments on NASA's Mars Reconnaissance Orbiter to map color-coded composition over the shape of the ground in a small portion of the Nili Fossae plains region of Mars' northern hemisphere. Credit: NASA/JPL-Caltech/JHUAPL/Univ. of Arizona

"Scientists may be closer to solving the mystery of how Mars changed from a world with surface water billions of years ago to the arid Red Planet of today.

A new analysis of the largest known deposit of carbonate minerals on Mars suggests that the original Martian atmosphere may have already lost most of its carbon dioxide by the era of valley network formation.



"The biggest carbonate deposit on Mars has, at most, twice as much carbon in it as the current Mars atmosphere," said Bethany Ehlmann of the California Institute of Technology and NASA Jet Propulsion Laboratory, both in Pasadena. "Even if you combined all known carbon reservoirs together, it is still nowhere near enough to sequester the thick atmosphere that has been proposed for the time when there were rivers flowing on the Martian surface."

Carbon dioxide makes up most of the Martian atmosphere. That gas can be pulled out of the air and sequestered or pulled into the ground by chemical reactions with rocks to form carbonate minerals. Years before the series of successful Mars missions, many scientists expected to find large Martian deposits of carbonates holding much of the carbon from the planet's original atmosphere. Instead, these missions have found low concentrations of carbonate distributed widely, and only a few concentrated deposits. By far the largest known carbonate-rich deposit on Mars covers an area at least the size of Delaware, and maybe as large as Arizona, in a region called Nili Fossae."

See the Mars As Art Gallery

Dulles Airport Full News Release

Global Martian Map

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

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

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

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

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

Journey to Mars
InSight - Revealing the Heart of Mars
August 18, 2015
Send Your Name to Mars on NASA's Next Red Planet Mission

Mars enthusiasts around the world can participate in NASA's journey to Mars by adding their names to a silicon microchip headed to the Red Planet aboard NASA's InSight Mars lander, scheduled to launch next year.

"Our next step in the journey to Mars is another fantastic mission to the surface," said Jim Green, director of planetary science at NASA Headquarters in Washington. "By participating in this opportunity to send your name aboard InSight to the Red Planet, you're showing that you're part of that journey and the future of space exploration."

Submissions will be accepted until Sept. 8. To send your name to Mars aboard InSight, go to:

http://go.usa.gov/3Aj3G

The fly-your-name opportunity comes with "frequent-flier" points to reflect an individual's personal participation in NASA's journey to Mars, which will span multiple missions and multiple decades. The InSight mission offers the second such opportunity for space exploration fans to collect points by flying their names aboard a NASA mission, with more opportunities to follow.

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

Mars Missions Status

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

Astronomy Links and Other Space News

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

Colorado Astronomy Links

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

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

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

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

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

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

Mike Coletta's SatWatch - http://www.kg0ufo.com - Orbiting object and satellite watching. ORBITING OBJECT TRACKING ... It's the thrill of the chase. Promoting and supporting the hobby of amateur radio, Mike - KG0UFO, along with many other radio hobbyists around the globe use the reflected signals of the AF Space Fence to detect orbiting objects as they make their way over the US. - The AF Space Fence was shut down in Sept. 2013. These are recordings of Mike's many observations.

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

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

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

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

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

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

Radio Astronomy Links

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

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

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

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

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

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

Other Astronomy Links

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

SpaceLinks/Space Careers - http://www.spacelinks.com/SpaceCareers/ - SPACELINKS is a specialist staffing consultancy sourcing and supplying high caliber

professionals for a wide range of world class organizations in the Space and Defense industry.

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

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

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

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

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

Acknowledgments and References

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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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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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