IAAS Monthly Astronomy Newsletter December 2021

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 The Home of KIØAR - and is received nationally and internationally. Download the PDF formatted version of the newsletter.

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. Due to hardware issues, links with the Allstar node, Echolink and the Cripple Creek repeater are down until further notice. 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 9 a.m.

** Check the website for current info during these COVID-19 times. **

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!

"Venus reaches greatest brilliancy early this month as an evening star. The planet reached the same magnitude in this 2018 shot as a morning star." Astronomy Magazine, December 2021, P. 32.
Alan Dyer

In This Newsletter...

The Month At-A-Glance

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

The Moon

Phases:

- New Moon occurs on the 4th.
- First Quarter Moon occurs on the 10th.
- Full Moon occurs on the 18th.
- Last Quarter Moon occurs on the 26th.

- The Moon is at perigee on the 4th, 221,702 miles from Earth.
- The Moon is at apogee on the 17th, 252,475 miles from Earth.

Moon/Planet Pairs:

- The Moon passes 0.7° north of Mars on the 2nd.
- The Moon passes 1.9° south of Venus on the 6th.
- The Moon passes 4° south of Saturn on the 7th.
- The Moon passes 4° south of Jupiter on the 7th.
- The Moon passes 0.5° north of asteroid Pallas on the 10th.
- The Moon passes 4° south of Neptune on the 10th.
- The Moon passes 1.5° south of Uranus on the 15th.
- Mars passes 5° north of Antares on the 26th.
- Mercury passes 4° south of Venus on the 28th.
- The Moon passes 0.9° south of Mars on the 31st.

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

The Planets & Dwarf Planets

Planetary Reports are generated by "TheSkyX" 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

"December's early-evening sky offers a slew of planetary views, beginning with Venus, Saturn, and Jupiter — all on show soon after sunset. Capture the top features of the solar system in one evening by spotting the changing phase of Venus; the spectacular rings of Saturn; and the remarkably dynamic jovian atmosphere, its Great Red Spot, and Jupiter's four bright moons." Astronomy Magazine, December 2021, P. 32.

Mercury

Sets at 4:36 p.m. on the 1st and around 6:08 p.m. by month's end. Look for Mercury to the west about 30-45 minutes after sunset during the last week of December. Mercury lies about 6° below Venus on the 26th. By New Year's Eve, Mercury is 1° higher than Venus. Mercury moves from the constellation of Ophiuchus into Sagittarius shining at magnitude -0.8 on the 31st.

Venus

Sets at 7:23 p.m. on the 1st and about 5:49 p.m. by month's end. Venus is at greatest brilliancy (magnitude -4.9) on the 4th. Venus is stationary on the 18th. Look for Venus in the west soon after sunset. Venus is in the constellation of Sagittarius shining at magnitude -4.9 on the 15th.

Earth

The Winter solstice occurs at 10:59 a.m. EST on the 21st.

Mars

Rises at 5:34 a.m. on the 1st and about 5:20 a.m. by month's end. Even though Mars is rising an hour or two ahead of the Sun, mars is still difficult to spot until about mid-month. Look for Mars low to the southeast before sunrise. Mars moves from the constellation of Libra into Ophiuchus shining at magnitude 1.6 on the 15th.

Jupiter
Sets at 10:23 p.m. on the 1st and about 8:47 p.m. by month's end. Look for Jupiter in the southwest, soon after sunset. Jupiter moves from the constellation of Capricornus into Aquarius shining at magnitude -2.2.

Saturn
Sets at 9:00 p.m. on the 1st and about 7:13 p.m. by month's end. Saturn leads Jupiter by about an hour and a half all month. Look for Saturn in the southwest, soon after sunset. Saturn is in the constellation of Capricornus shining at magnitude 0.6.

Uranus
Rises at 3:00 p.m. on the 1st and around 12:55 p.m. by month's end. By the time the Sun sets, Uranus is high in the south. Look for Uranus to the south after the skies darken to spot Uranus. Uranus is in the constellation of Aries shining at magnitude 5.7.

Neptune
Sets at 12:32 a.m. on the 1st and about 10:27 p.m. by month's end. Neptune is stationary on the 1st. By the time the Sun sets, Neptune is high enough in the southwest preceding Uranus by about two and a half hours. Neptune is in the constellation of Aquarius shining at magnitude 7.9.

Dwarf Planets
Ceres
Rises at 4:26 p.m. on the 1st and about 1:56 p.m. by month's end. Look for Ceres in the late evening, when it is highest in the southern sky. Ceres is in the constellation of Taurus shining at magnitude 7.3.

Pluto
Sets at 7:45 p.m. on the 1st and about 5:48 p.m. by month's end. Pluto is definitely lost in the evening twilight and will not be visible this month. Pluto is in the constellation of Sagittarius shining at magnitude 15.2.

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.

Meteor Shower Radiant Report

Meteor Scatter (or 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.

Meteor Rx How-To by Terry Bullett (WØASP).

Comets

- Comet Leonard - "TAKE EVERY CHANCE you get to observe the brief appearance of Comet C/2021 A1 (Leonard). Visible to the unaided eye by the second week of December, it will rapidly fade to 8th magnitude by month's end. But what a show: An emerald blade shoots out on the 9th as its fan swishes in front of us! The gas part of a comet's tail flows straight out, away from the Sun. Almost certainly it will be green, but blue — like C/2020 F3 (NEOWISE) — is possible. The dust component spreads out into a relatively flat fan, which becomes edge-on to our line of sight when Earth passes through the comet's orbital

plane. The lightsaber likeness should be present for one night on either side of Dec. 9. It's not to be missed and worth a drive to darker skies.

Immediately after, the dust begins to blaze, peaking on the 14th. Dust forward-scatters light really well — best when the particles lie between us and the Sun – then fades night to night as the angles change. Don't be misled by thinking Gregory Leonard's comet will be best when it comes closest to the Sun (perihelion) in early January. More important is the increasing Earth-comet separation. Brightness drops by the square of the distance between two objects, meaning Leonard will fade to binocular brightness by the time we hit New Moon.

Beware of the confusing information on when to view Leonard. Technically, it is visible both after sunset and before sunrise in different parts of the sky. In a nutshell, here's when it's best: Up to Dec. 12, look southeast as dawn is breaking. From the 12th onward, switch to early evening and look low in the southwest. Find observing spots with as low a horizon and as minimal light pollution as possible." Astronomy Magazine, December 2021, P. 38.

For information, orbital elements and ephemerides on observable comets visit the Observable Comets page from the Harvard-Smithsonian Center for Astrophysics.

For more information about Comets, check out Gary Kronk's 6-volume series of books on Cometography.

Eclipses

- A solar eclipse occurs on the 4th but you'll have to travel to Antarctica to see it. https://www.timeanddate.com/eclipse/solar/2021-december-4

- No lunar eclipse activity this month.

Observational Opportunities

(from evening to morning)

- Look for Venus, Saturn and Jupiter in the early evening, just after sunset.
- Look for Mercury in the evening sky as well, but not until the last week of the month.
- Look for Neptune and Uranus in the evening as well, following Jupiter and Saturn.
- Look for Mars in the early morning before sunrise late in the month.

Asteroids

(From west to east)

- **Pallus** is in the constellation of Aquarius.
- **Nysa** is at opposition on the 10th in the constellation of Taurus.
- **Iris** is in the constellation of Cancer.
- **Massalia** is in the constellation of Leo.

Information about the Minor Planets can be found at the Minor Planet Observer web site.

Occultations

Information on various occultations can be found at the International Occultation Timing Association's (IOTA) web site.

Member Meteor Sightings

In this section 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
3871-2015	2015-11-13 01:55 MST	CO	Charles N	3871a
3587-2015	2015-11-22 17:38 MST	CO	Kevin S	3587aw
3829-2015	2015-12-05 18:06 MST	CO	Burness A	3829a
986-2020	2020-02-21 22:20 MST	CO	Lukas S	986
3716-2020	2020-07-24 23:22 MDT	CO	Lukas S	3716
4774-2021	2021-08-13 21:57 MDT	UT	Lukas S	4774
7044-2021	2021-10-28 20:37 MDT	CO	Burness A	249058

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.

Jupiter/Saturn Conjunction December 21, 2020

Several images from the recent conjunction.
Courtesy of Milton Omoto and Ed Hubbs

Planetary/Lunar Exploration Missions

(Excerpts from recent mission updates)

JPL Latest News

The Latest from Space

JPL Latest News

November 23, 2021
NASA's Curiosity Rover Sends a Picture Postcard From Mars

Full Article & Images

"An artistic interpretation of Curiosity's view high up on a Martian mountain was created by mission team members who were stunned by the sweeping landscape.

NASA's Curiosity rover captured a remarkable image from its most recent perch on the side of Mars' Mount Sharp. The mission team was so inspired by the beauty of the landscape, they combined two versions of the black-and-white images from different times of the day and added colors to create a rare postcard from the Red Planet."

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

For special JPL programs and presentations in your area visit the JPL Solar System Ambassador web site.

Juno

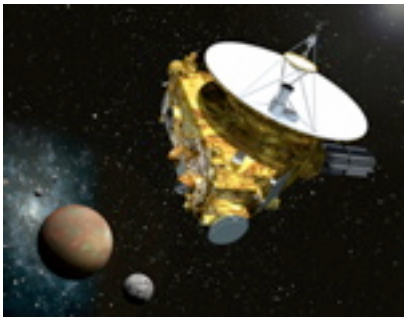
October 28, 2021
NASA's Juno: Science Results Offer First 3D View of Jupiter Atmosphere

Full Article & Images

"New findings from NASA's Juno probe orbiting Jupiter provide a fuller picture of how the planet's distinctive and colorful atmospheric features offer clues about the unseen processes below its clouds. The results highlight the inner workings of the belts and zones of clouds encircling Jupiter, as well as its polar cyclones and even the Great Red Spot.

Researchers published several papers on Juno's atmospheric discoveries today in the journal Science and the Journal of Geophysical Research: Planets. Additional papers appeared in two recent issues of Geophysical Research Letters."

Images from NASA's JunoCam.
More information on the Juno mission is available at Juno and Mission Juno.
The public can follow the mission on Facebook and Twitter.



New Horizons

October 27, 2021
Using "Charon-light," Researchers Capture Pluto's Dark Side

Full Article & Images

"NASA's New Horizons spacecraft made history by returning the first close-up images of Pluto and its moons. Now, through a series of clever methods, researchers led by Tod Lauer of the National Science Foundation's National Optical Infrared Astronomy Research Lab in Tucson, Arizona, on the New Horizons team have expanded that photo album to include the portion of Pluto's landscape that wasn't directly illuminated by sunlight — what the team calls Pluto's "dark side."

After flying within 7,800 miles (12,550 kilometers) of Pluto's icy surface on July 14, 2015, New Horizons continued at a rapid 9 miles per second (14.5 kilometers per second) on to the Kuiper Belt Object Arrokoth and beyond. But while departing Pluto, the spacecraft looked back at the dwarf planet and captured a series of images of its dark side."

New Horizons gallery

Find New Horizons in the iTunes App Store.

For more information on the New Horizons mission -- the first mission to the ninth planet -- visit the New Horizons home page.

TESS

August 4, 2021
NASA’s TESS Tunes into an All-sky ‘Symphony’ of Red Giant Stars

Full Article & Images

"Using observations from NASA’s Transiting Exoplanet Survey Satellite (TESS), astronomers have identified an

unprecedented collection of pulsating red giant stars all across the sky. These stars, whose rhythms arise from internal sound waves, provide the opening chords of a symphonic exploration of our galactic neighborhood.

TESS primarily hunts for worlds beyond our solar system, also known as exoplanets. But its sensitive measurements of stellar brightness make TESS ideal for studying stellar oscillations, an area of research called asteroseismology."

A paper describing the findings, led by Hedges, was published in The Astronomical Journal."

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

Past, Present, Future and Proposed JPL Missions.

Mars Missions

Be A Martian

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

MARS WEATHER
Mars Daily Weather Report

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

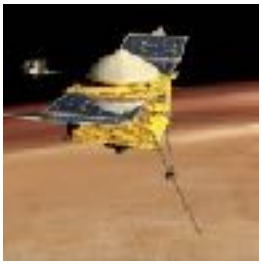
JMARS

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.

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."



LASP/MAVEN

November 8, 2021

Tiny grains, severe damage: LASP-led research shows how hypervelocity dust impacts can damage a spacecraft and disturb its operations

Full Article & Images

"The Parker Solar Probe spacecraft, NASA's newest and most ambitious effort to study the Sun, has broken a lot of records: it has gotten closer to the Sun than any other spacecraft to date, its instruments have operated at the hottest temperatures, and the probe is the fastest human-made object ever. But those records come at a cost: the spacecraft is moving so fast that running into even a tiny grain of dust can lead to serious damage."

Visit LASP and MAVEN for more information.

Mars 2020 - Perseverance

November 18, 2021
NASA's Perseverance Captures Challenging Flight by Mars Helicopter

Full Article & Images

"*Recently downlinked imagery of a September flight has allowed the rover imaging team to put together a video of rotorcraft performing to near-perfection.*

Video footage from NASA's Perseverance Mars rover of the Ingenuity Mars Helicopter's 13th flight on Sept. 4 provides the most detailed look yet of the rotorcraft in action.

Ingenuity is currently prepping for its 16th flight, scheduled to take place no earlier than Saturday, Nov. 20, but the 160.5-second Flight 13 stands out as one of Ingenuity's most complicated. It involved flying into varied terrain within the "Séítah" geological feature and taking images of an outcrop from multiple angles for the rover team. Acquired from an altitude of 26 feet (8 meters), the images complement those collected during Flight 12, providing valuable insight for Perseverance scientists and rover drivers."

Learn more about the Mars 2020 (Perseverance) mission.

Mars Science Laboratory - Curiosity

November 15, 2021
How NASA's Curiosity Rover Is Making Mars Safer for Astronauts

Full Article & Images

"*A radiation sensor aboard the spacecraft is providing new data on the health risks humans would face on the surface.*

Could lava tubes, caves, or subsurface habitats offer safe refuge for future astronauts on Mars? Scientists with NASA's Curiosity Mars rover team are helping explore questions like that with the Radiation Assessment Detector, or RAD.

Unlike Earth, Mars doesn't have a magnetic field to shield it from the high-energy particles whizzing around in space. That radiation can wreak havoc on human health, and it can seriously compromise the life support systems that Mars astronauts will depend on, as well."

Check out information about NASA's partnership with Foursquare.
Visit the Mars Science Laboratory page.

Mars Reconnaissance Orbiter Mission

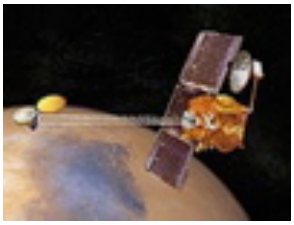
November 15, 2021
How's the Weather on Mars? (NASA Mars Report for November 15, 2021)

Full Article & Images

"Seasons change even on Mars and NASA's fleet of explorers are helping scientists learn more about the effects on the Red Planet. NASA's Perseverance and Curiosity rovers provide daily weather reports by measuring conditions such as humidity, temperature, and wind speed on the surface. Orbiters including Odyssey, Mars Atmosphere and Volatile EvolutioN (MAVEN), and the Mars Reconnaissance Orbiter (MRO) survey the scope and scale of storms from above. Changing weather conditions can be challenging for the spacecraft. The Ingenuity Mars Helicopter recently increased its rotor speed from 2,537 rpm to 2,700 rpm to fly in a thinner summer atmosphere. Meanwhile, NASA's InSight lander, which is studying Mars' interior, recently measured one of the biggest, longest-lasting marsquakes the mission has ever detected."

MARS RECONNAISSANCE ORBITER HIRISE IMAGES

View all of the archived HiRISE images.
More information about the MRO mission is available online.



Mars Odyssey Orbiter

April 7, 2021
NASA's Odyssey Orbiter Marks 20 Historic Years of Mapping Mars

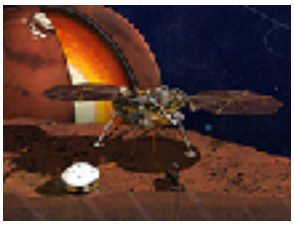
Full Article & Images

"NASA's 2001 Mars Odyssey spacecraft launched 20 years ago on April 7, making it the oldest spacecraft still working at the Red Planet. The orbiter, which takes its name from Arthur C. Clarke's classic sci-fi novel "2001: A Space Odyssey" (Clarke blessed its use before launch), was sent to map the composition of the Martian surface, providing a window to the past so scientists could piece together how the planet evolved."

DAILY MARS ODYSSEY THEMIS IMAGES
Thermal Emission Imaging System (THEMIS) web site.

The Odyssey data are available through a new online access system established by the Planetary Data System.

Visit the Mars Odyssey Mission page.



Mars InSight - Journey to Mars

InSight - Revealing the Heart of Mars
September 22, 2021
NASA's InSight Finds Three Big Marsquakes, Thanks to Solar-Panel Dusting

Full Article & Images

"*The lander cleared enough dust from one solar panel to keep its seismometer on through the summer, allowing scientists to study the three biggest quakes they've seen on Mars.*

On Sept. 18, NASA's InSight lander celebrated its 1,000th Martian day, or sol, by measuring one of the biggest, longest-lasting marsquakes the mission has ever detected. The temblor is estimated to be about a magnitude 4.2 and shook for nearly an hour-and-a-half.

This is the third major quake InSight has detected in a month: On Aug. 25, the mission's seismometer detected two quakes of magnitudes 4.2 and 4.1. For comparison, a magnitude 4.2 quake has five times the energy of the mission's previous record holder, a magnitude 3.7 quake detected in 2019."

Interactive selection of raw images taken by the cameras aboard InSight.

Learn more about the InSight mission.

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 and the Mars Exploration page.

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!

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Keep looking UP!

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JPL Solar System Ambassador, Colorado
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