IAAS Monthly Astronomy Newsletter November 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.

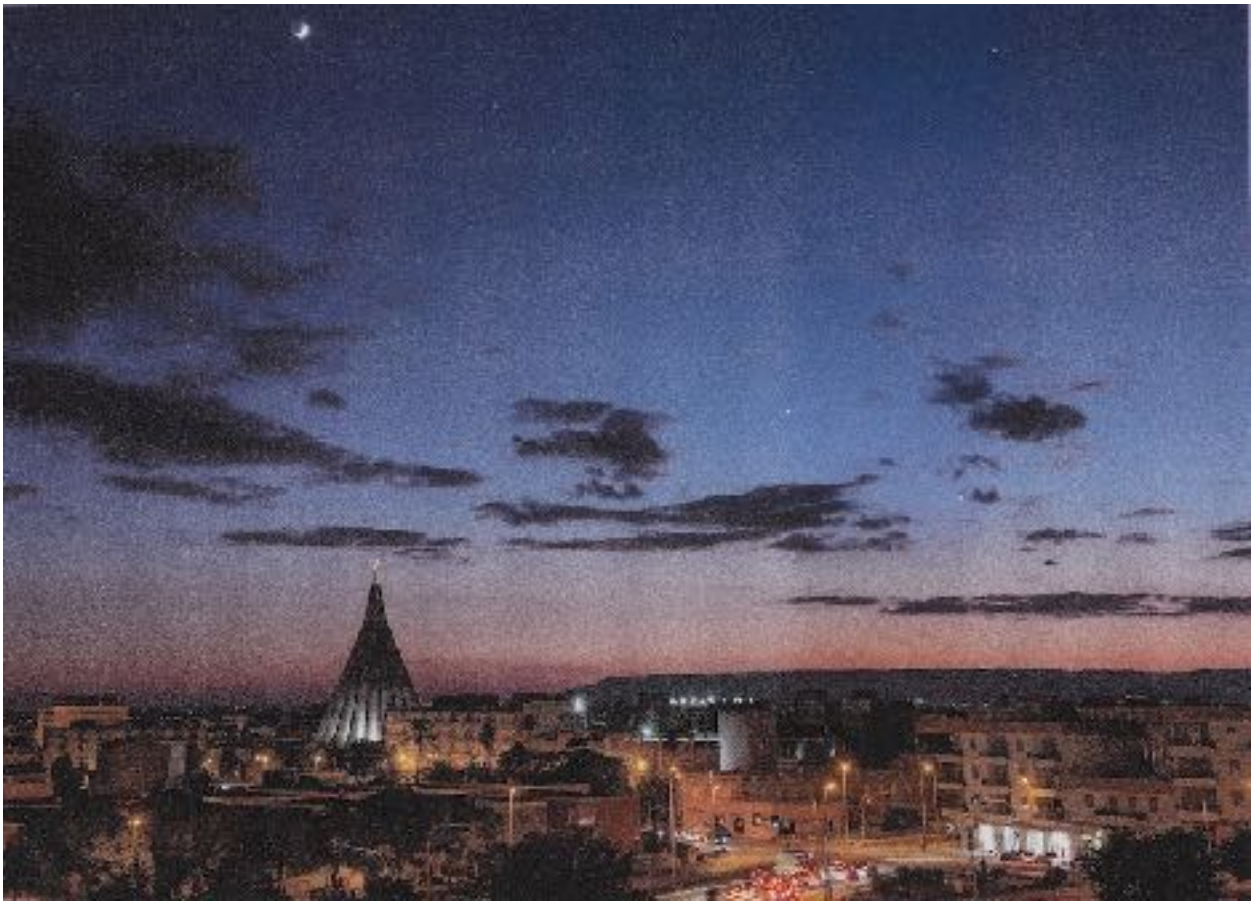
** Check the website for current info during these COVID-19 times. **

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!



"From left to right, Saturn, Venus, and Jupiter trail the Moon above the Basilica Sanctuary of Our Lady of Tears in Syracuse, Italy. This month, the same planets will similarly stretch along the ecliptic." Astronomy Magazine, November 2021, P. 32.
Kevin Saragozza

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 11th.
- Full Moon occurs on the 19th.
- Last Quarter Moon occurs on the 27th.

- The Moon is at perigee on the 5th, 222,975 miles from Earth.
- The Moon is at apogee on the 20th, 252,450 miles from Earth.

Moon/Planet Pairs:

- The Moon passes 1.2° north of Mercury on the 5th.
- The Moon passes 1.1º north of Venus on the 7th.
- The Moon passes 4° south of Saturn on the 10th.
- The Moon passes 4° south of Jupiter on the 11th.
- The Moon passes 4° south of Neptune on the 13th.
- The Moon passes 1.5° south of Uranus on the 17th.

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 November

"Venus, Jupiter, and Saturn dominate the evening sky with lots of planetary action in November. Highlights include Venus' quickly changing phase; Jupiter's atmosphere, Great Red Spot, and Galilean moon transits; and Saturn's stunning rings. Uranus reaches opposition and is on view all night, and for a bigger challenge, hunt down distant Neptune." Astronomy Magazine, November 2021, P. 32.

Mercury

Is in superior conjunction on the 28th. Mercury rises at 6:05 a.m. on the 1st and around 7:13 a.m. by month's end. Look for Mercury to the east about 30 minutes before sunrise during the first two weeks of October. Mercury moves from the constellation of Virgo into Ophiuchus shining at magnitude -0.9 on the 1st.

Venus

Sets at 8:23 p.m. on the 1st and about 7:23 p.m. by month's end. Look for Venus in the west soon after sunset. Venus moves from the constellation of Ophiuchus into Sagittarius shining at magnitude -4.7 on the 15th.

Earth

Daylight Saving Time ends in the U.S. at 2 a.m. local time on the 7th.

Mars

Is still too close to the Sun to be visible for most of this month. Mars rises at 6:49 a.m. on the 1st and about 5:34 a.m. by month's end. Mars moves from the constellation of Virgo into Libra shining at magnitude 1.6.

Jupiter

Sets at 1:10 a.m. on the 1st and about 10:23 p.m. by month's end. Look for Jupiter in the southwest, soon after sunset. Jupiter is in the constellation of Capricornus shining at magnitude -2.4.

Saturn

Sets at 11:49 p.m. on the 1st and about 9:00 p.m. by month's end. Look for Saturn in the southwest, soon after sunset. Saturn is in the constellation of Capricornus shining at magnitude 0.6.

Uranus

Is at opposition, rising as the Sun sets, on the 4th. Uranus rises at 6:01 p.m. on the 1st and around 3:00 p.m. by month's end. Look for Uranus to the southeast after the skies darken to spot Uranus with binoculars or a small telescope. Uranus is in the constellation of Aries shining at magnitude 5.7.

Neptune

Sets at 3:31 a.m. on the 1st and about 12:32 a.m. by month's end. By the time the Sun sets, Neptune is high enough in the south to be spotted once the skies are very dark. Neptune is in the constellation of Aquarius shining at magnitude 7.7.

Dwarf Planets

Ceres

Is at opposition, rising as the Sun sets, on the 26th. Ceres rises at 7:52 p.m. on the 1st and about 4:26 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 10:40 p.m. on the 1st and about 7:45 p.m. by month's end. Pluto is visible in the evening sky, to the southwest. 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 Leonids - The duration of this shower covers the period of Nov. 14-20. Maximum occurs on Nov. 17. The maximum hourly rate typically reaches 10-15, but most notable are periods of enhanced activity that occur every 33 years - events that are directly associated with the periodic return of comet Tempel-Tuttle. During these exceptional returns, the Leonids have produced rates of up to several thousand meteors per hour. The Leonids are swift meteors, which are best known for leaving a high percentage of persistent trains.

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

- "NEXT MONTH'S Comet C/2021 A1 (Leonard) is set to thrill. To get the most out of it, first hone your skills on 67P/Churyumov-Gerasimenko.

  Experienced observers see more detail than beginners because they've trained their brains to pick up subtle features. Similarly for imagers, whether you're new or just rusty, you'll make more mistakes without practice.

  Looping in from Jupiter's realm, Churyumov-Gerasimenko should glow between 8th and 9th magnitude. By midnight, it is more than 20° high in the east. Use the Crab Nebula (M1) as a brightness benchmark. Under country skies, a 4-inch scope will easily catch the Crab and the comet at low

power. Both are a tough go from the city." Astronomy Magazine, November 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

- No solar eclipse activity this month.

- A partial lunar eclipse occurs on the 19th.
  https://www.timeanddate.com/eclipse/lunar/2021-november-19

Event	UTC Time	Time in Denver*	Visible in Denver
Penumbral Eclipse begins	Nov 19 at 06:02:09	Nov 18 at 11:02:09 pm	Yes
Partial Eclipse begins	Nov 19 at 07:18:42	Nov 19 at 12:18:42 am	Yes
Maximum Eclipse	Nov 19 at 09:02:55	Nov 19 at 2:02:55 am	Yes
Partial Eclipse ends	Nov 19 at 10:47:04	Nov 19 at 3:47:04 am	Yes
Penumbral Eclipse ends	Nov 19 at 12:03:40	Nov 19 at 5:03:40 am	Yes

Observational Opportunities

(from evening to morning)

- Look for Venus, Saturn and Jupiter in the early evening, just after sunset.
- Look for Neptune and Uranus in the late evening and early morning.
- Look for Mercury in the early morning before sunrise early in the month.

Asteroids

(From west to east)

- **Hebe** is in the constellation of Capricornus.
- **Pallus** is in the constellation of Aquarius.
- **Nysa** is in the constellation of Taurus.
- **Iris** is in the constellation of Gemini.

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
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
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

October 27, 2021
Getting NASA Data to the Ground With Lasers

Full Article & Images

"Two optical ground stations, including one managed by JPL, will support NASA's Laser Communications Relay Demonstration mission when it launches this fall.

NASA launches satellites, rovers, and orbiters to investigate humanity's place in the Milky Way. When these missions reach their destinations, their science instruments capture images, videos, and valuable insights about the cosmos. Communications infrastructure in space and on the ground enables the data collected by these missions to reach Earth. Without ground stations to receive it, the extraordinary data captured by these missions would be stuck in space, unable to reach scientists and researchers on Earth."

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

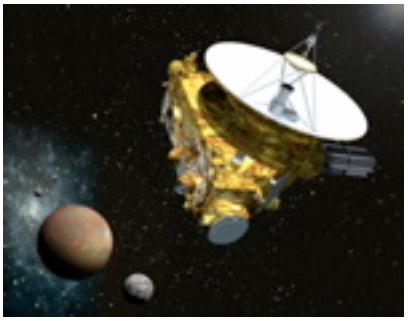
October 28, 2021
NASA's Juno: Science Results Offer First 3D View of Jupiter Atmosphere

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

July 14, 2021
Great Exploration Revisited: New Horizons at Pluto and Charon

Full Article & Images

"Six years ago today, NASA's New Horizons spacecraft made history with the first up-close exploration of the Pluto system – providing breathtaking views and detailed data on Pluto and its largest moon, Charon, revealing the surfaces of these distant, mysterious worlds at the outer reaches of our solar system.

These simulated flights over Pluto and Charon include some of the sharpest images and topographic data that New Horizons gathered during its historic flyby on July 14, 2015. These are the first "movies" of Pluto and Charon made from the highest-resolution black-and-white image strips, taken by New Horizons' Long Range Reconnaissance Imager (LORRI), as the spacecraft zipped by at more than 30,000 miles per hour."

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

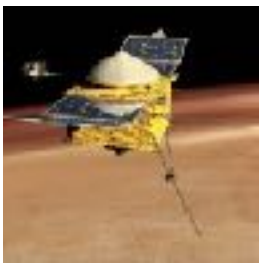
JMARS

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

October 18, 2021
NASA selects UC Berkeley – Compton Spectrometer and Imager for next Explorers Program mission

Full Article & Images

"NASA announced today that the next mission in its Explorers Program will be a spacecraft that studies cosmic explosions and their elemental debris. The space agency selected the Compton Spectrometer and Imager (COSI), to be built at the University of California Berkeley, in place of the University of Colorado's Laboratory for Atmospheric and Space Physics (LASP) concept. Known as ESCAPE: the Extreme-ultraviolet Stellar Characterization for Atmospheric Physics and Evolution mission, whose aim was to identify the types of star-planet systems with atmospheres that are thick enough to support life."

Visit LASP and MAVEN for more information.

Mars 2020 - Perseverance

October 26, 2021
You Can Help Train NASA's Rovers to Better Explore Mars

Full Article & Images

"*Members of the public can now help teach an artificial intelligence algorithm to recognize scientific features in images taken by NASA's Perseverance rover.*

Artificial intelligence, or AI, has enormous potential to change the way NASA's spacecraft study the universe. But because all machine learning algorithms require training from humans, a recent project asks members of the public to label features of scientific interest in imagery taken by NASA's Perseverance Mars rover."

Learn more about the Mars 2020 (Perseverance) mission.

Mars Science Laboratory - Curiosity

September 27, 2021
MISSION UPDATES - Sols 3251-3253: Celebrating Another Go Around

Full Article & Images

"Solar conjunction is once again upon us - the time when the Sun comes between Mars and Earth in their orbital dances and precludes reliable communication between us and our robotic friends. This is the fifth conjunction Curiosity has experienced, and such a regular, cosmic event like conjunction provides the perfect time to reflect - where were we the last time Mars, Earth and the Sun aligned like this? Looking back over what we were up to around each conjunction is very much like looking through a scrapbook of memories.

We headed into our first conjunction, starting on Sol 236 (April 2013), fresh off the excitement of finding evidence of a habitable environment in our first drill sample "John Klein," and still feeling the relief of having survived a major fault with the A side computer. Curiosity runs on the B side computer to this day."

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

Mars Reconnaissance Orbiter Mission

September 15, 2021
NASA Confirms Thousands of Massive, Ancient Volcanic Eruptions on Mars

Full Article & Images

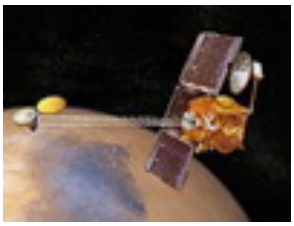
"*Scientists found evidence that a region of northern Mars called Arabia Terra experienced thousands of "super eruptions," the biggest volcanic eruptions known, over a 500-million-year period.*

Some volcanoes can produce eruptions so powerful they release oceans of dust and toxic gases into the air, blocking out sunlight and changing a planet's climate for decades. By studying the topography and mineral composition of a portion of the Arabia Terra region in northern Mars, scientists recently found evidence for thousands of such eruptions, or "super eruptions," which are the most violent volcanic explosions known.

Spewing water vapor, carbon dioxide, and sulfur dioxide into the air, these explosions tore through the Martian surface over a 500-million-year period about 4 billion years ago. Scientists reported this estimate in a paper published in the journal Geophysical Research Letters in July 2021."

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

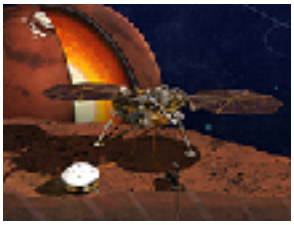
Full Article & Images

"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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