Celestial Observer

Volume 41 Issue 12 December 2021

CCAS Officer Lee Coombs took this photo of B33 (The Horsehead Nebula). Prominent in the Winter evening sky, it is located just to the South of the Easternmost star in Orion's Belt.
(8-inch f/4.6 Newtonion, 5 min. subs at ISO 1600, LPR filter, modified Canon T2i)

Next Star Gazing: ONLINE!
On Demand!

Did you know that CCAS has virtual stargazing tours for every month of the year, viewable anytime on YouTube? For your handouts and links to each video, visit:

CentralCoastAstronomy.org/stargaze

Geminid Meteor Shower!

The Geminid Meteor Shower will peak during the early morning hours of December 14th. These meteors will appear to originate from a position above Castor and Pollux, which will move East to West throughout the night.

EarthSky.org/astronomy-essentials/everything-you-need-to-know-geminid-meteor-shower/

Next Stargazing: ONLINE! Invite friends!!

Friday, December 3rd at 7pm PST

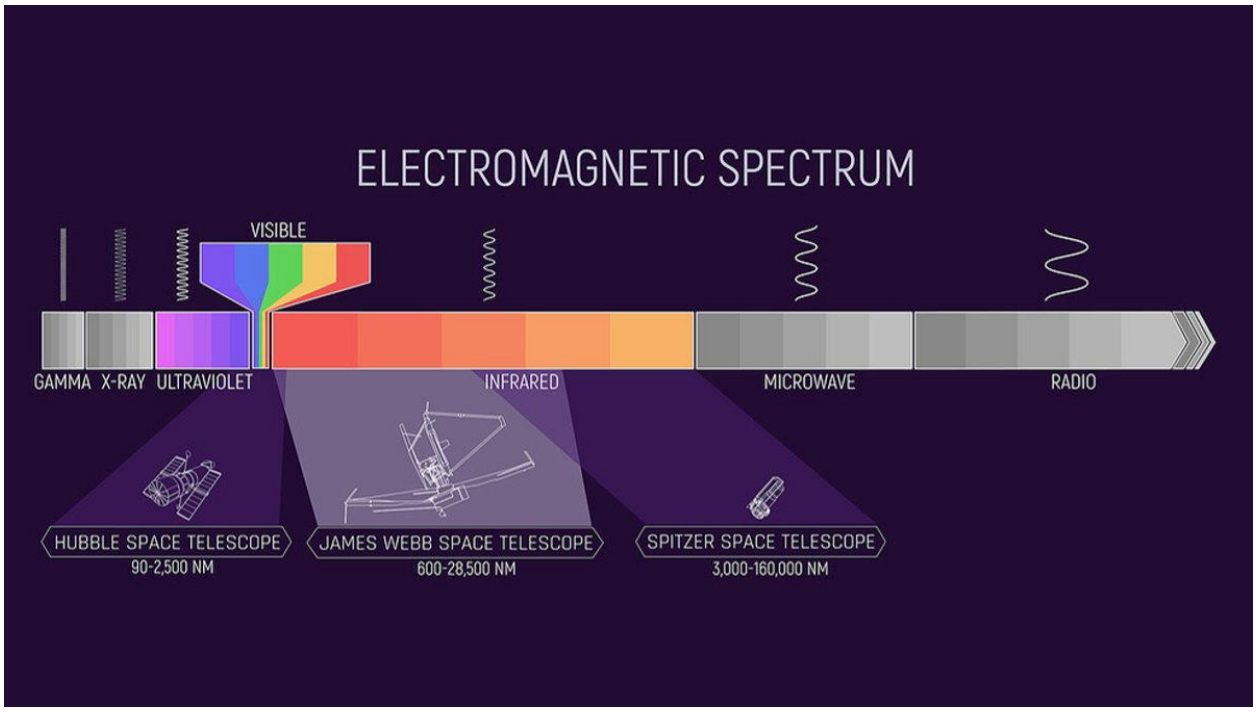
On December 3rd, CCAS President Aurora Lipper, along with amateur astronomer Brian Cox will present a live tour of the December sky. You'll learn about objects visible naked-eye, through binoculars, and through a telescope. Then, using the tools you learn during the video, you'll be able to stargaze from the comfort of your own home! Brian will also be presenting live views of some of the objects through his telescope at home (weather permitting)!

Invite all your friends! Anyone with the link can view our free online stargazing session. All that's needed is an internet connection. Join the stream using any tablet, personal computer, or YouTube enabled TV. After the presentation, the video will be available on demand on our YouTube channel. Check our website for all the details:

CentralCoastAstronomy.org/stargaze

The James Webb Space Telescope: Ready for Launch!

by David Prosper



Webb will observe a wide band of the infrared spectrum, including parts observed by the Hubble - which also observes in a bit of ultraviolet light as well as visible - and the recently retired Spitzer Space Telescope. Webb will even observe parts of the infrared spectrum not seen by either of these missions! Credits: NASA and J. Olmstead (STScI)

NASA's James Webb Space Telescope is ready for lift-off! As of this writing (November 15), the much-anticipated next-generation space telescope is being carefully prepared for launch on December 18, 2021, and will begin its mission to investigate some of the deepest mysteries of our universe.

The development of the Webb began earlier than you might expect – the concept that would develop into Webb was proposed even before the launch of the Hubble in the late 1980s! Since then, its design underwent many refinements, and the telescope experienced a series of delays during construction and testing. While frustrating, the team needs to ensure that this extremely complex and advanced scientific instrument is successfully launched and deployed. The Webb team can't take any chances; unlike the Hubble, orbiting at an astronaut-serviceable 340 miles (347 km) above Earth, the Webb will orbit about one million miles away (or 1.6 million km), at Lagrange Point 2. Lagrange Points are special positions

where the gravitational influence between two different bodies, like the Sun and Earth, “balance out,” allowing objects like space telescopes to be placed into stable long-term orbits, requiring only minor adjustments - saving Webb a good deal of fuel.

Since this position is also several times further than the Moon, Webb’s sunshield will safely cover the Moon, Earth, and Sun and block any potential interference from their own infrared radiation. Even the seemingly small amount of heat from the surfaces of the Earth and Moon would interfere with Webb’s extraordinarily sensitive infrared observations of our universe if left unblocked. More detailed information about Webb’s orbit can be found at bit.ly/webborbitinfo, and a video showing its movement at bit.ly/webborbitvideo.

Once in its final position, its sunshield and mirror fully deployed and instruments checked out, Webb will begin observing! Webb’s 21-foot segmented mirror will be trained on targets as fine and varied as planets, moons, and distant objects in our outer Solar System, active centers of galaxies, and some of the most distant stars and galaxies in our universe: objects that may be some of the first luminous objects formed after the Big Bang! Webb will join with other observatories to study black holes - including the one lurking in the center of our galaxy, and will study solar systems around other stars, including planetary atmospheres, to investigate their potential for hosting life.

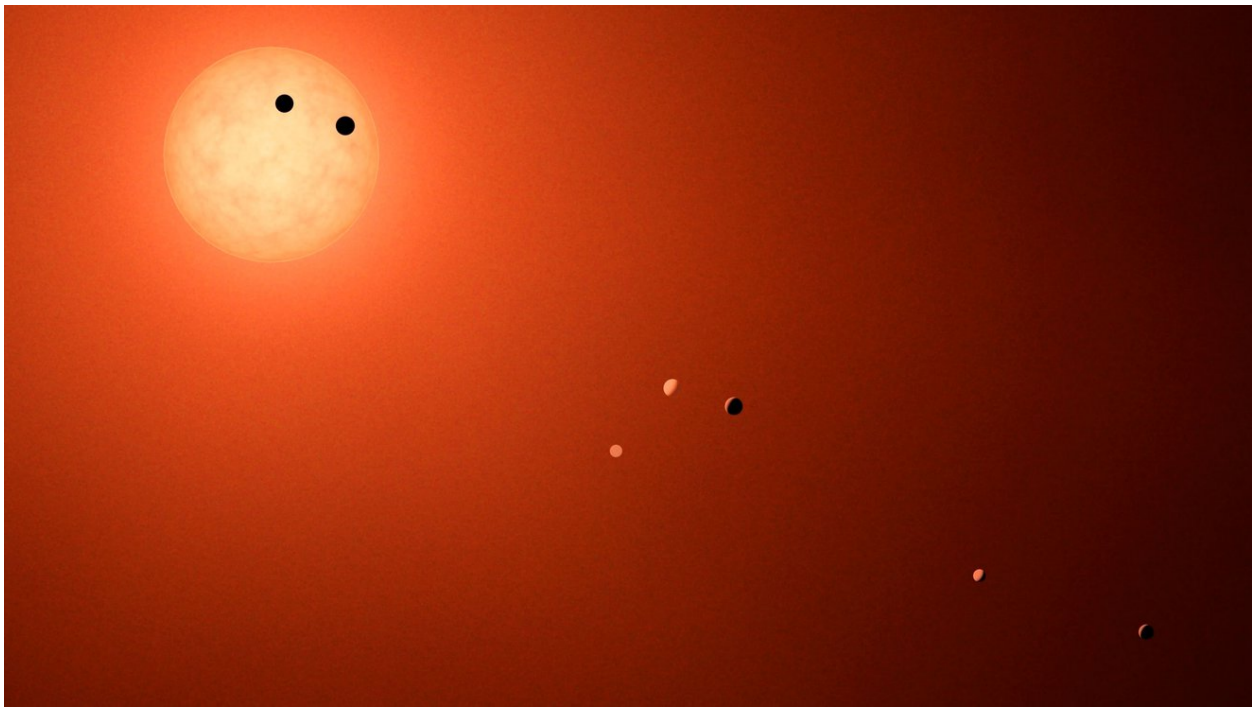
Wondering how Webb’s infrared observations can reveal what visible light cannot? The “Universe in a Different Light” Night Sky Network activity can help - find it at bit.ly/different-light-nsnbit.ly/different-light-nsn. Find the latest news from NASA and Webb team as it begins its mission by following #UnfoldTheUniverse on social media, and on the web at nasa.gov/webb.

This article is distributed by NASA Night Sky Network

The Night Sky Network program supports astronomy clubs across the USA dedicated to astronomy outreach. Visit nightsky.jpl.nasa.gov to find local clubs, events, and more!

New Deep Learning Method Adds 301 Planets to Kepler's Total Count

by NASA/JPL



Over 4,500 planets have been found around other stars, but scientists expect that our galaxy contains millions of planets. There are multiple methods for detecting these small, faint bodies around much larger, bright stars. Credit: NASA/JPL-Caltech

Scientists have added a whopping 301 newly confirmed exoplanets to the total exoplanet tally.

Scientists recently added a whopping 301 newly validated exoplanets to the total exoplanet tally. The throng of planets is the latest to join the 4,569 already validated planets orbiting a multitude of distant stars. How did scientists discover such a huge number of planets, seemingly all at once? The answer lies with a new deep neural network called ExoMiner.

Deep neural networks are machine learning methods that automatically learn a task when provided with enough data. ExoMiner is a new deep neural network that leverages NASA's Supercomputer, Pleiades, and can distinguish real exoplanets from different types of imposters, or "false positives." Its design is inspired by various tests and properties human experts use to confirm new exoplanets. And it learns by using past confirmed exoplanets and false positive cases.

ExoMiner supplements people who are pros at combing through data and deciphering what is and isn't a planet. Specifically, data gathered by NASA's Kepler spacecraft and K2, its follow-on mission. For missions like Kepler, with thousands of stars in its field of view, each holding the possibility to host multiple potential exoplanets, it's a hugely time-consuming task to pore over massive datasets. ExoMiner solves this dilemma.

“Unlike other exoplanet-detecting machine learning programs, ExoMiner isn't a black box – there is no mystery as to why it decides something is a planet or not,” said Jon Jenkins, exoplanet scientist at NASA's Ames Research Center in California's Silicon Valley. “We can easily explain which features in the data lead ExoMiner to reject or confirm a planet.”

What is the difference between a confirmed and validated exoplanet? A planet is “confirmed,” when different observation techniques reveal features that can only be explained by a planet. A planet is “validated” using statistics – meaning how likely or unlikely it is to be a planet based on the data.

In a paper published in the Astrophysical Journal, the team at Ames shows how ExoMiner discovered the 301 planets using data from the remaining set of possible planets – or candidates – in the Kepler Archive. All 301 machine-validated planets were originally detected by the Kepler Science Operations Center pipeline and promoted to planet candidate status by the Kepler Science Office. But until ExoMiner, no one was able to validate them as planets.

The paper also demonstrates how ExoMiner is more precise and consistent in ruling out false positives and better able to reveal the genuine signatures of planets orbiting their parent stars – all while giving scientists the ability to see in detail what led ExoMiner to its conclusion.

“When ExoMiner says something is a planet, you can be sure it's a planet,” added Hamed Valizadegan, ExoMiner project lead and machine learning manager with the Universities Space Research Association at Ames. “ExoMiner is highly accurate and in some ways more reliable than both existing machine classifiers and the human experts it's meant to emulate because of the biases that come with human labeling.”

None of the newly confirmed planets are believed to be Earth-like or in the habitable zone of their parent stars. But they do share similar characteristics to the overall population of confirmed exoplanets in our galactic neighborhood.

“These 301 discoveries help us better understand planets and solar systems beyond our own, and what makes ours so unique,” said Jenkins.

As the search for more exoplanets continues – with missions using transit photometry such as NASA’s Transiting Exoplanet Survey Satellite, or TESS,

and the European Space Agency's upcoming PLAnetary Transits and Oscillations of stars, or PLATO, mission – ExoMiner will have more opportunities to prove it's up to the task.

“Now that we've trained ExoMiner using Kepler data, with a little fine-tuning, we can transfer that learning to other missions, including TESS, which we're currently working on,” said Valizadegan. “There's room to grow.”

NASA Ames managed the Kepler and K2 missions for NASA's Science Mission Directorate. JPL managed Kepler mission development. Ball Aerospace & Technologies Corporation operates the flight system with support from the Laboratory for Atmospheric and Space Physics at the University of Colorado in Boulder.

CCAS Contacts

President	Aurora Lipper
Vice President	Tom Frey
Treasurer	Lee Coombs
Secretary	Linnea Fritch
Outreach	Scott McMillian
Communication	Brian P. Cox

CCAS Information

Founded in 1979, the Central Coast Astronomical Society (CCAS) is an association of people who share a common interest in astronomy and related sciences.

Central Coast Astronomical Society
PO Box 1415
San Luis Obispo, CA 93406
Website: CentralCoastAstronomy.org
Facebook: facebook.com/CentralCoastAstronomicalSociety

CCAS Officer Lee Coombs took this photo of M42 (The Orion Nebula). Visible with the naked eye this time of year, this nebula is seen as the middle "star" in the "sword" of Orion.
(80mm f/6 Apo Refractor, 5 min. subs at ISO 1600, 2 min. + 20 sec. subs at ISO 800, modified Canon T2i)