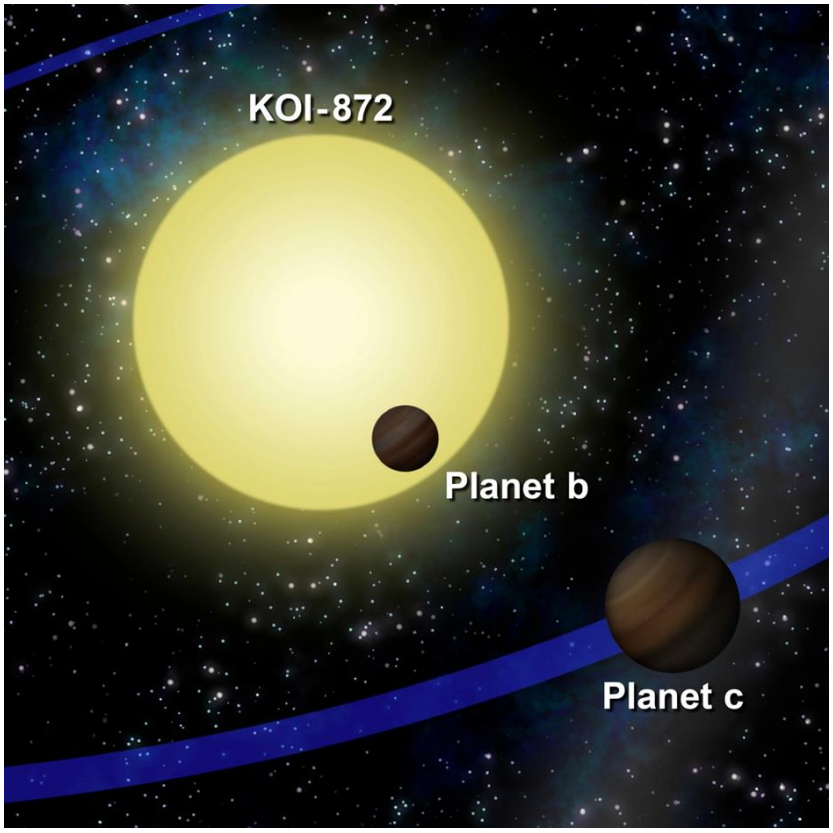
British Astronomical Association
Supporting amateur astronomers since 1890

Infinite Worlds



KOI-872. Image credit: Southwest Research Institute

The e-magazine of the

Exoplanets Division of the Asteroids and Remote Planets Section

Issue 27 2025 July

Contents

Section officers

ARPS Section Director	Dr Richard Miles
Assistant Director (Exoplanets)	Roger Dymock
Assistant Director (Occultations)	Tim Haymes
Assistant Director (Photometry)	Wayne Hawley

Exoplanets Division website

Cover image - Using Kepler Telescope transit data of planet “b,” scientists predicted that a second planet “c,” about the mass of Saturn, orbits the distant star KOI-872.

EXoPLanet Orbit REsearch (EXPLORE 2000) – a collaboration with the AAVSO Exoplanet Section

This project is still in its development stage and yet to be formally announced. All information, target lists, tutorials, etc will appear on, or be linked to, from this page. The objective of this project is to obtain and analyse observations of exoplanet transits by participation in ExoClock with the aim of better understanding the characteristics of exoplanetary systems i.e.

- detection of additional planets
- ascertaining eccentricity of planetary orbits
- causes of orbital decay e.g. tidal interaction with the host star

Accurate Transit Timing, Duration and Depth measurements all help to achieve this aim. In addition, adding radial velocity measurements is a possibility.

The project is being formulated by a small team consisting of Rodney Buckland, Dennis Conti, Roger Dymock and Siegfried Vanaverbeke.

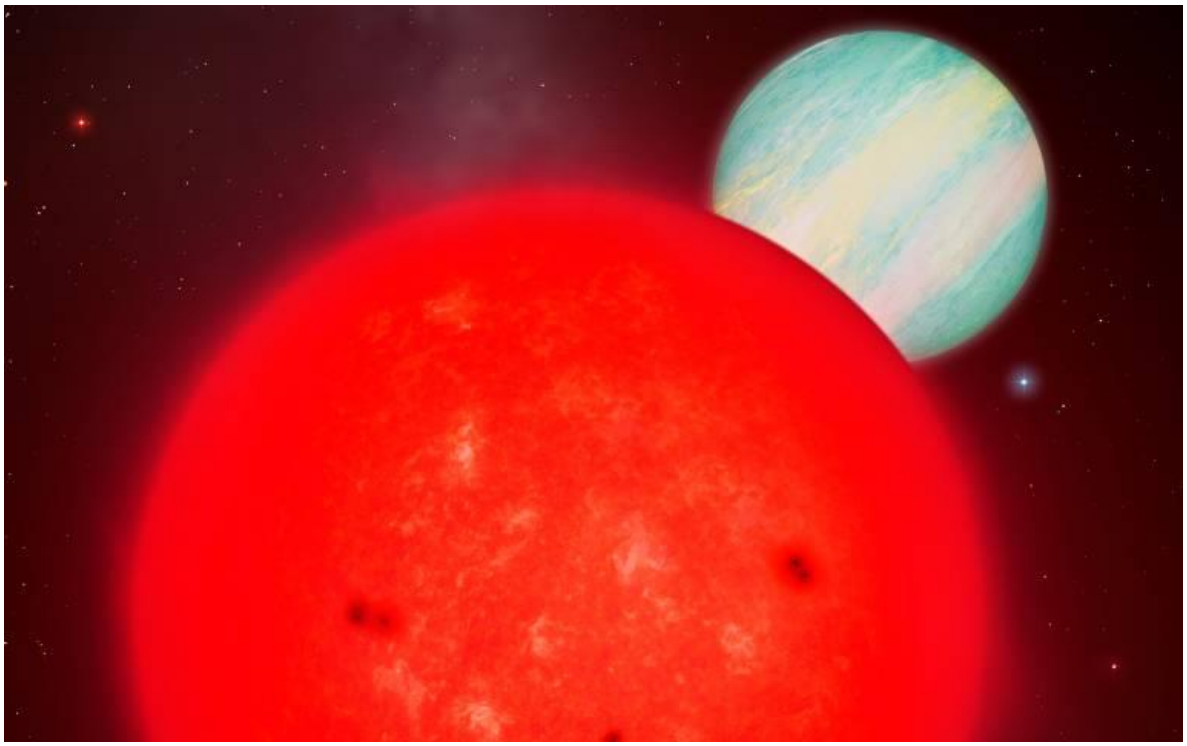
News

Today's score (2025 July 7) from the NASA Exoplanet Archive, Exoplanet and Candidate Statistics

Total confirmed exoplanets;	5926
Kepler confirmed planets	2782
K2 confirmed planets	547
TESS Confirmed Planets;	638

Giant planet discovered orbiting tiny star

Astronomers at UCL and the University of Warwick, as part of a global collaboration including partners in Chile, USA and Europe, have discovered the smallest known star to host a transiting giant planet, which should not exist under leading planet formation theories.



Artist's illustration of planet TOI-6894b behind its host star. Credit: University of Warwick/Mark Garlick

Star TOI-6894 is just like many in our galaxy, a small red dwarf, and only ~20% of the mass of our Sun. Like many small stars, it is not expected to provide suitable conditions for the formation and hosting of a large planet. However, as published today in Nature Astronomy, an international team of astronomers have found the unmistakable signature of a giant planet, called TOI-6894b, orbiting this tiny star.

Strongest hints yet of biological activity outside the solar system

Astronomers have detected the most promising signs yet of a possible biosignature outside the solar system, although they remain cautious. Using data from the James Webb Space Telescope (JWST), the astronomers, led by the University of Cambridge, have detected the chemical fingerprints of dimethyl sulfide (DMS) and/or dimethyl disulfide (DMDS), in the atmosphere of the exoplanet K2-18b, which orbits

its star in the habitable zone. On Earth, DMS and DMDS are only produced by life, primarily microbial life such as marine phytoplankton. While an unknown chemical process may be the source of these molecules in K2-18b's atmosphere, the results are the strongest evidence yet that life may exist on a planet outside our solar system.

BBC News item - Scientists find 'strongest evidence yet' of life on distant planet

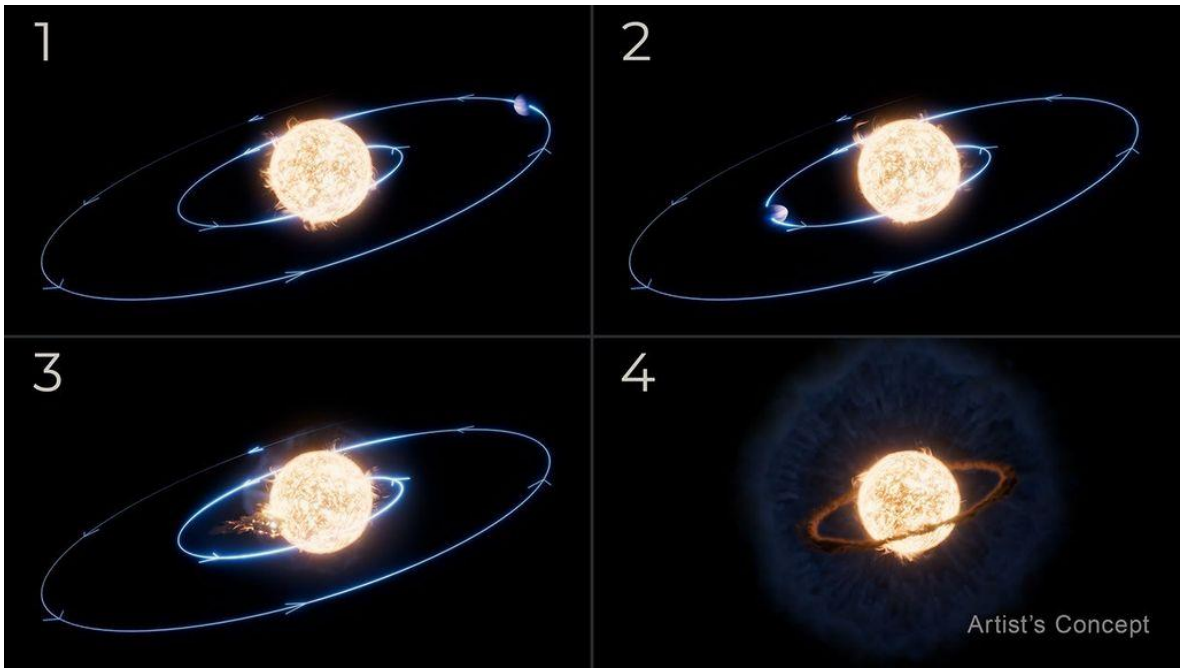
Thanks to Steve Knight (HAG) for the above link

Hold the front page!!! New analysis suggests K2-18b may not be home to biosignatures.

NASA Webb's Autopsy of Planet Swallowed by Star Yields Surprise

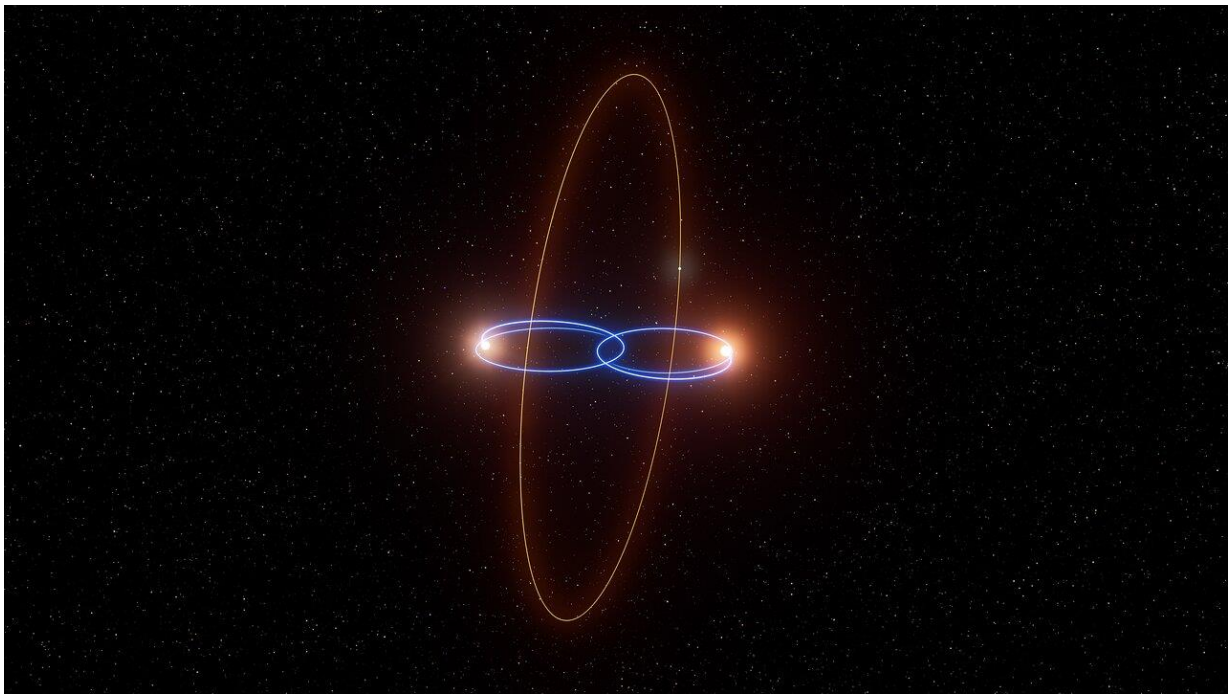
Observations from NASA's James Webb Space Telescope have provided a surprising twist in the narrative surrounding what is believed to be the first star observed in the act of swallowing a planet. The new findings suggest that the star actually did not swell to envelop a planet as previously hypothesized. Instead, Webb's observations show the planet's orbit shrank over time, slowly bringing the planet closer to its demise until it was engulfed in full.

Decaying orbits are not uncommon. A new study led by researchers at Durham University has uncovered a novel mechanism that could solve a long-standing mystery about decaying planetary orbits around stars like our sun.



Decaying orbit of exoplanet. Credit NASA, ESA, CSA, R. Crawford (STScI)

2M1510 (AB) b, a planet in a perpendicular orbit around two brown dwarfs

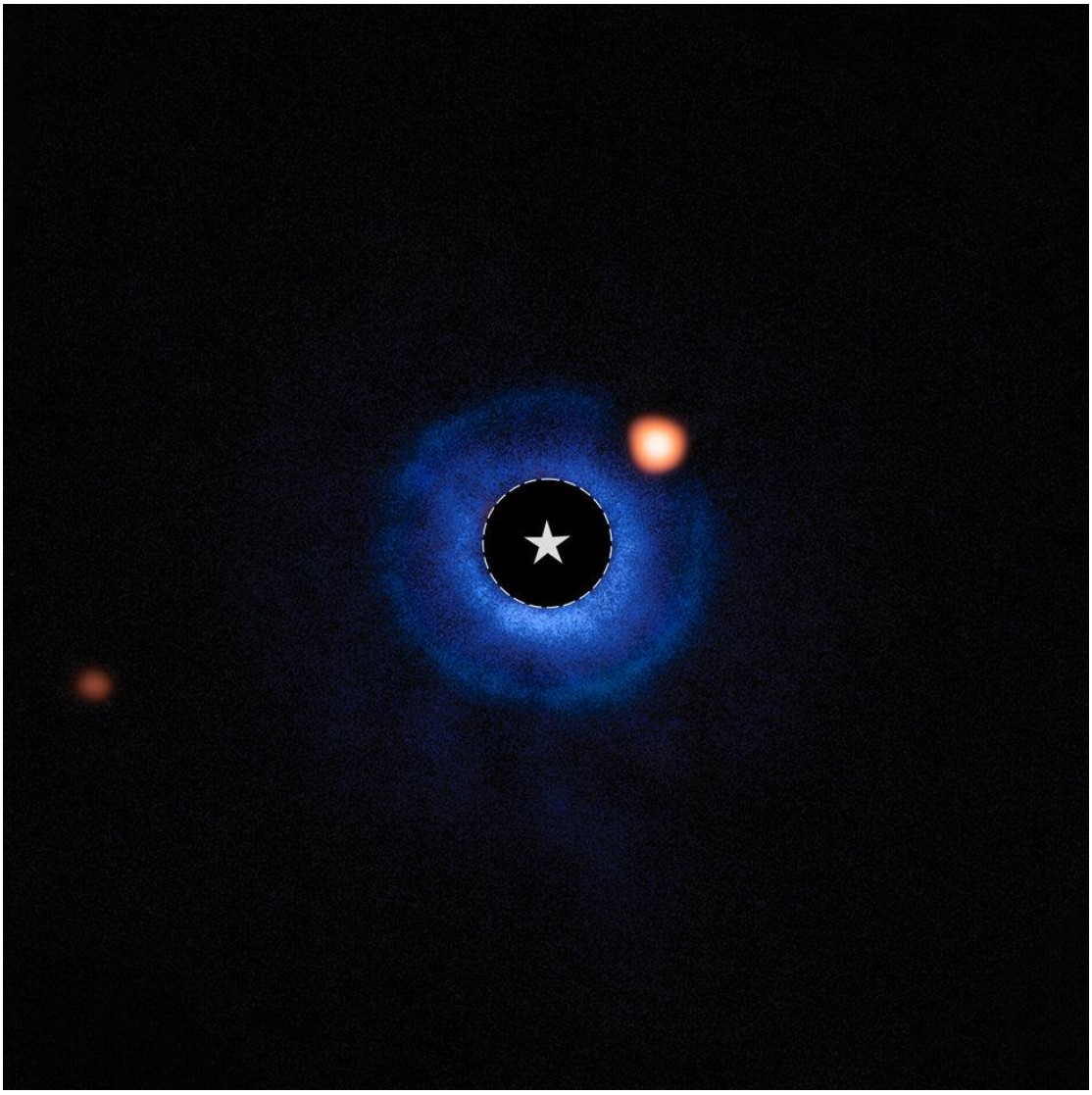


This is an artist's impression of the exoplanet 2M1510 (AB) b's unusual orbit around its host stars, a pair of brown dwarfs. The newly discovered planet has a polar orbit, which is perpendicular to the plane in which the two stars are travelling. Polar planets around single stars had been found before, as well as polar discs of gas and dust capable of forming planets around binary stars. But thanks to ESO's Very Large Telescope (VLT) this is the first time we have strong evidence that such a planet actually exists in a polar orbit around two stars. The two brown dwarfs appear as a single source in the sky, but astronomers know there are two of them because they periodically eclipse each other. Using the UVES spectrograph on the VLT they measured their orbital speed, and noticed that their orbits change over time. After carefully ruling out other explanations, they concluded that the gravitational tug of a planet in a polar orbit was the only way to explain the motion of the brown dwarfs. Credit ESO/L. Calçada

JWST finds evidence of a lightweight planet around TWA 7

Astronomers using the NASA/ESA/CSA James Webb Space Telescope have captured compelling evidence of a planet, TWA 7 b, with a mass similar to Saturn orbiting the young nearby star TWA 7. The international team, led by Dr. Anne-Marie Lagrange, CNRS researcher at the Observatoire de Paris-PSL and Université

Grenoble Alpes in France, detected a faint infrared source in the disc of debris surrounding TWA 7 using Webb's Mid-Infrared Instrument (MIRI) and its coronagraph. If confirmed, this would represent Webb's first direct image discovery of a planet, and the lightest planet ever seen with this technique.



JWST image of TWA 7

Other JWST exoplanet related news can be found at; Eridani 51 b, and HR 8799

Square Kilometer Array

At a recent Hampshire Astronomical Group public meeting Dr Chris Pearson of UKRI RAL STFC Space gave a talk titled "The Square Kilometre Array." The array has two telescope sites in South Africa and Australia all controlled from Jodrell Bank.

The Cradle of Life Working Group (CoL)aims to understand how the SKA can be used to uncover the 'Cradle of Life' across the formation and evolution of stars & planets. The higher frequencies covered by SKA will enable observations of the earliest stages of the raw material for planet formation, and also allow deep searches for prebiotic molecules (such as amino acids) both within and beyond our solar system. The lowest frequencies can be used to detect and characterise magnetic fields around exoplanets via auroral radio emission. Across the full frequency range, SKA will also carry out systematic, volume-limited searches of exoplanet systems for signals from technologically advanced civilisations. These high impact research areas will answer some of the most fundamental questions in modern astronomy.

Recordings of CoL webinars can be accessed from the CoL Working Group webpage

Meetings

EPSC-DPS—EXOA13: Bridging geosciences and astronomy to interpret rocky (exo)planet observations. Finland Hall, Helsinki, Finland, 7-12 September 2025

The coming years will be revolutionary for rocky planet research, with JWST, ELT, ARIEL, and PLATO providing unprecedented observations of rocky exoplanets in our galaxy. At the same time, BepiColombo, the Mars sample return mission, and the Decade of Venus missions will greatly enhance our understanding of the rocky bodies within the Solar System. These missions will offer valuable new observations of the atmospheres and surfaces of these rocky bodies, while Solar System missions will also probe magnetic fields. Interpreting these observations, and leveraging them to constrain the body's interior properties, requires a deeper understanding of how a planet's surface, atmosphere, and interior interact.

EPSC-DPS—EXOA18: Investigating Habitability and Biosignatures within Exoplanet Atmospheres. Finland, 7-12 September 2025

JWST has enabled researchers across the globe to probe the atmospheric composition of exoplanets and investigate the properties of distant planetary systems. Future confirmed and conceptual campaigns such as the ELT, HWO

and LIFE aim to pay greater attention to Earth-mass planets orbiting within the habitable zones of their host stars. In anticipation of these missions, this session focuses on the current and future search for biosignatures within the atmospheres of exoplanets, the identification of habitable worlds and the exploration of planetary conditions that support habitability. It solicits contributions from both observers using data collected by past and present instrumentation, as well as atmospheric, stellar activity, and interior modellers looking towards future observations. The session aims to foster new collaborations with observers, modellers, and instrument team members to assess how markers of life and habitability in distant systems may present themselves to us, and the requirements that future observing campaigns need to reliably identify them within planetary parameter space.

International Conference on Exoplanets and Planet Formation (EPF)
Shanghai, China, December 8-12, 2025

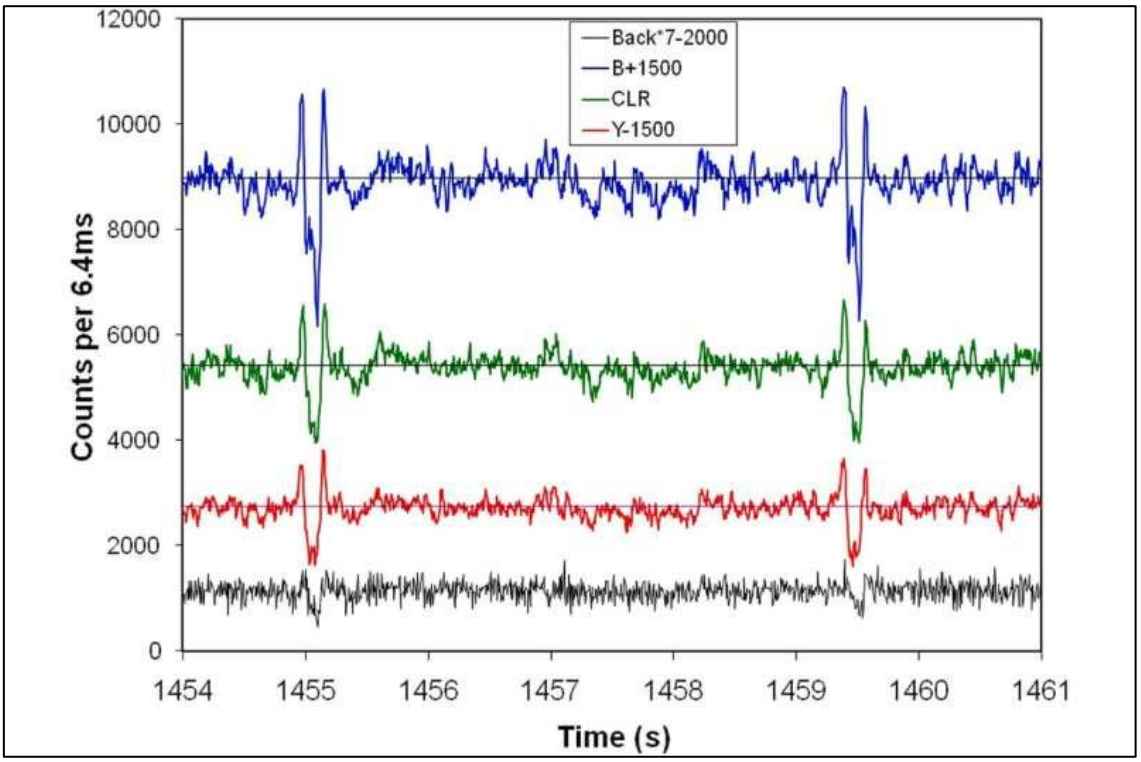
This event will cover all aspects of exoplanetary astrophysics, including: Exoplanet detection and characterization (mass-radius relations, atmospheres, demographics and statistics, etc), Planet formation and dynamical evolution, Related topics such as star formation, binaries and multiples, and Solar System formation.

Rocky Worlds 4, 19–23 January 2026, Groningen, Netherlands

The planets that are best understood are the four terrestrial planets of our own solar system. Applying the detailed understanding gleaned from these bodies is crucial in our interpretation of exoplanetary systems. With the ongoing programs to search for planets around nearby stars, as well as upcoming ground- and space-based surveys, we can anticipate huge growth in the number and information on detected rocky exoplanets in the coming decades. As the characterisation of these new planetary systems proceeds it will in turn improve understanding of our own solar system, and in particular of how potentially habitable Earth-like planets may form, evolve, and are distributed throughout the galaxy.

Astrobiology and the search for life elsewhere

Unexplained starlight pulses found in optical SETI searches explained starlight pulses found in optical SETI searches (Acta Astronautica Vol.233, August 2025) Years spent searching more than 1300 sun-like stars for optical SETI signals have finally yielded unexpected results. A “signal” of two fast identical pulses, separated by 4.4s, was discovered in the light of HD89389. No single pulses, even remotely resembling these, have been found in these searches. Close examination of this signal reveals that several unique features of the first pulse are repeated almost exactly in the second. Comparison of this signal with those of airplanes, satellites, meteors, lightning, atmospheric scintillation and system noise, emphasizes their uniqueness.



Strange pulses in the light of HD89389 on May 14 2023 Credit R. H. Stanton

Exploring Tatooine and beyond: Circumbinary planets with ESA missions, December 10-12 2025, ESAC, Madrid, Spain

This event will bring together experts in the field to discuss the latest advancements, share insights, and foster collaborations with a focus on observations of circumbinary planets. The workshop will feature short talks, updates on observing efforts, hands

on sessions, and ample opportunities for discussion and networking. The aim is to address observing and data analysis challenges in the field.

Publications

Papers

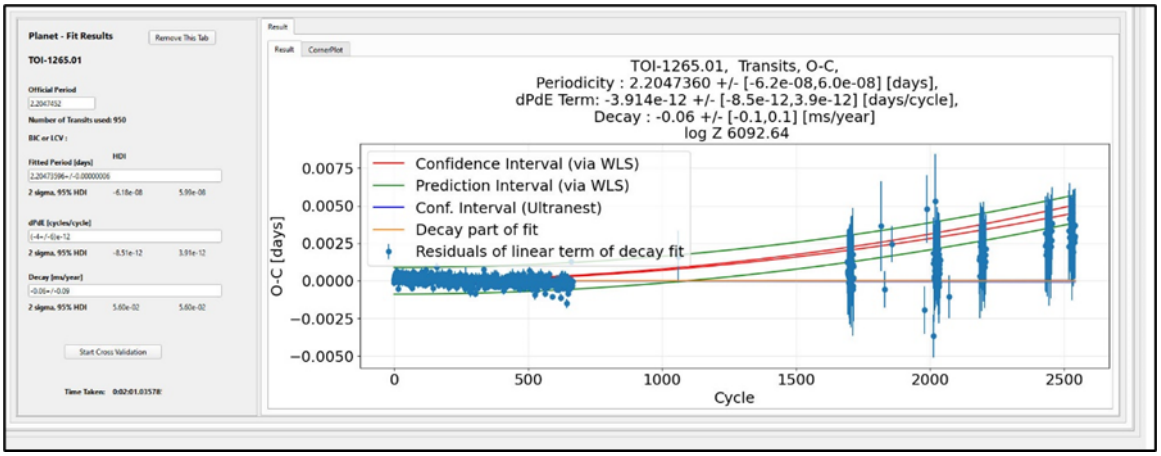
Observations and Studies on the Transiting Systems HAT-P-36, XO-2 and WASP-76

Analysis shows that all of these planetary systems exhibit certain transit-timing variations (TTVs). The results demonstrate that, under the condition of mean motion resonances, these systems may harbour perturbing planets with masses from a few tenths to more than one hundred Earth mass.

A third star in the HAT-P-7 system, and a new dynamical pathway to misaligned hot Jupiters

The retrograde orbit of the hot Jupiter HAT-P-7b is suggestive of high-eccentricity migration caused by dynamical interactions with a massive companion. However, the only other known body in the system is an M dwarf located ∼103 AU away, too distant to cause high-eccentricity migration without fine tuning. Here we present transit-timing and radial-velocity evidence for an additional stellar companion with semi-major axis 32+16 −11 AU, eccentricity 0.76+0.12 −0.26, and minimum mass 0.19+0.11 −0.06 M⊙.

Note; HAT-P-7b is on the provisional EXPLORE 200 target list. Analysis using Exoplanetpie shows an increasing orbital period, plot below, as depicted in the above mentioned paper.



A Disintegrating Rocky Planet with Prominent Comet-like Tails around a Bright Star

This paper reports the discovery of BD+05 4868 Ab, a transiting exoplanet orbiting a bright (V = 10.16) K-dwarf (TIC 466376085) with a period of 1.27 days. Observations from NASA's Transiting Exoplanet Survey Satellite reveal variable transit depths and asymmetric transit profiles that are characteristic of comet-like tails formed by dusty effluents emanating from a disintegrating planet. Unique to BD+05 4868 Ab is the presence of prominent dust tails in both the trailing and leading directions that contribute to the extinction of starlight from the host star.

Earth-like planet predictor: A machine learning approach

Searching for planets analogous to Earth in terms of mass and equilibrium temperature is currently the first step in the quest for habitable conditions outside our Solar System and, ultimately, the search for life in the universe. Future missions such as PLAnetary Transits and Oscillations of stars or Large Interferometer For Exoplanets will begin to detect and characterise these small, cold planets, dedicating significant observation time to them. Aims. The aim of this work is to predict which stars are most likely to host an Earth-like planet (ELP) to avoid blind searches, minimises detection times, and thus maximises the number of detections. Using a previous study on correlations between the presence of an ELP and the properties of its system, we trained a Random Forest to recognise and classify systems as 'hosting an ELP' or 'not hosting an ELP'. The Random Forest was trained and tested on populations of synthetic planetary systems derived from the Bern model, and then applied to real observed systems

The CARMENES search for exoplanets around M dwarfs

Occurrence rates of Earth-like planets around very low-mass stars

Previous estimates of planet occurrence rates in the CARMENES survey indicated increased numbers of planets on short orbits for M dwarfs with masses below 0.34 M⊙. Here we focused on the lowest-mass stars in the survey, comprising 15 inactive targets with masses under 0.16 M⊙. To correct for detection biases, we determined detection sensitivity maps for individual targets and the entire sample. Using Monte Carlo simulations, we estimated planet occurrence rates for orbital

periods of 1 d to 100 d and minimum masses from 0.5 M⊕ to 10 M⊕. We also compared the actual sample of known planets to model predictions.

Roger Dymock
ARPS Assistant Director Exoplanets

If you have any comments, articles, etc which you would like included please let me know.