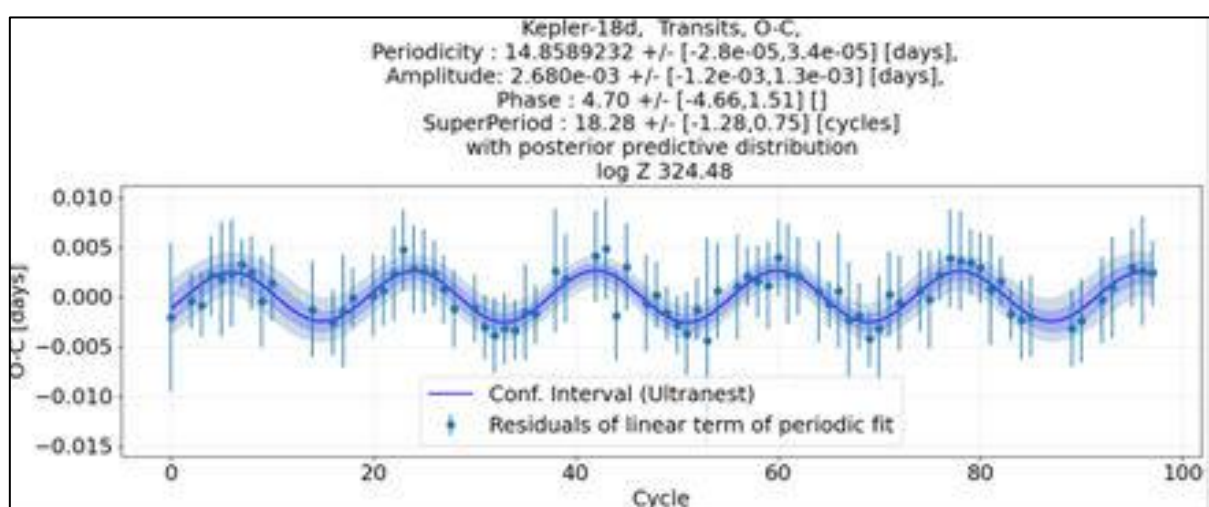




British Astronomical Association

Supporting amateur astronomers since 1890

Infinite Worlds



Transit timing Variations of Kepler 18d

Exoplanetpie

The e-magazine of the
Exoplanets Division of the
Asteroids and Remote Planets Section

Issue 28

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ARPS Section Director Dr Richard Miles

Assistant Director (Exoplanets) Roger Dymock

Assistant Director (Occultations) Tim Haymes

Assistant Director (Photometry) Wayne Hawley

Exoplanets Division [website](#)

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

Exoplanet Section

This project is still in its early stages so your ideas for its development will be most welcome. 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, Trifon Trifonov, Siegfried Vanaverbeke, Pieter Vuylsteke and Roger Dymock

Agenda

15:00 Introduction to project – Roger Dymock

15:30 AAVSO viewpoint – Dennis Conti

15:45 How we didn't discover an exoplanet – Roger Dymock

16:00 Q and A

16:15 Close

News

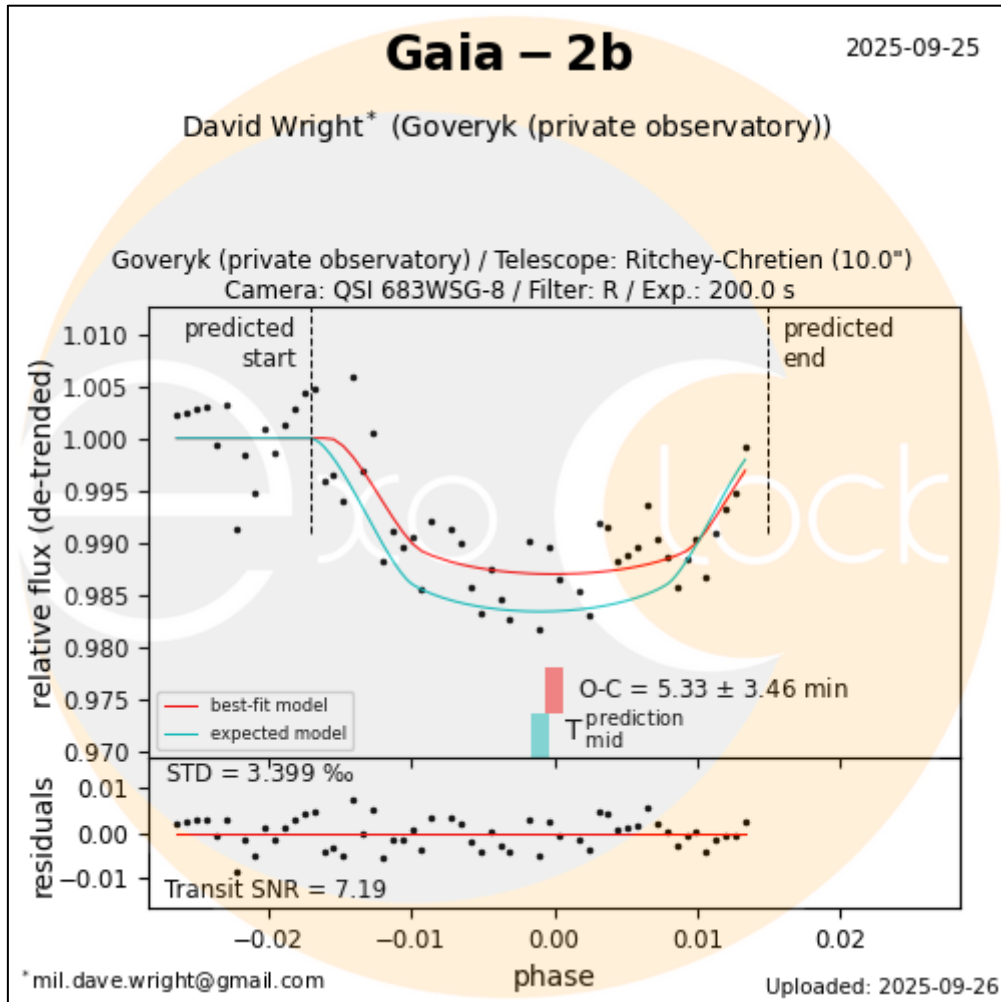
Today's score (2025 October 22) from the [NASA Exoplanet Archive](#), [Exoplanet and Candidate Statistics](#)

Total confirmed exoplanets;	6028
Kepler confirmed planets	2784
K2 confirmed planets	549
TESS Confirmed Planets;	705

[NASA Discoveries Dashboard](#)

ExoClock 50th

Dave Wright (aka Mil Dave), a member of Basingstoke Astro Society (& BAA member) has been participating in the project for some time. He has recently had his 50th exoplanet transit accepted by ExoClock – see below. Congratulations.



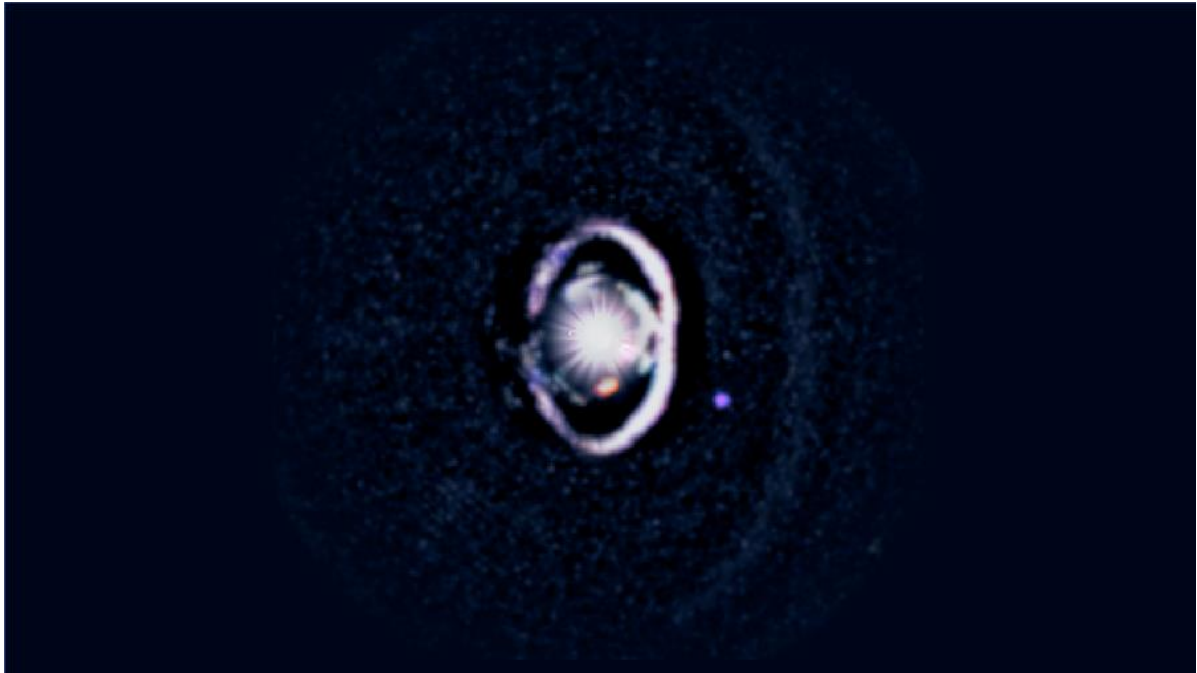
A hidden 'super-Earth' exoplanet is dipping in and out of its habitable zone

A huge "super-Earth" , [Kepler-725c](#), with an extreme climate that results in it being habitable for only part of its orbit has been discovered orbiting a star 2,472 light years away. And the most remarkable thing is, it was discovered without even being directly detected.

The discovery of the exoplanet, a super-Earth called Kepler-735c, is all down to something called transit timing variations, or TTVs for short.

Proto Planet Photographed in a Ring around a Star for the First Time

Researchers have discovered a young protoplanet called [WISPIT 2b](#) embedded in a ring-shaped gap in a disk encircling a young star. While theorists have thought that planets likely exist in these gaps (and possibly even create them), this is the first time that it has actually been observed.



The above image of the WISPIT 2 system was captured by the [Magellan Telescope](#) in Chile and the [Large Binocular Telescope](#) in Arizona. The protoplanet WISPIT 2b is a small purple dot to the right of a bright white ring of dust surrounding the system's star. A fainter white ring outside of WISPIT 2b can be seen.

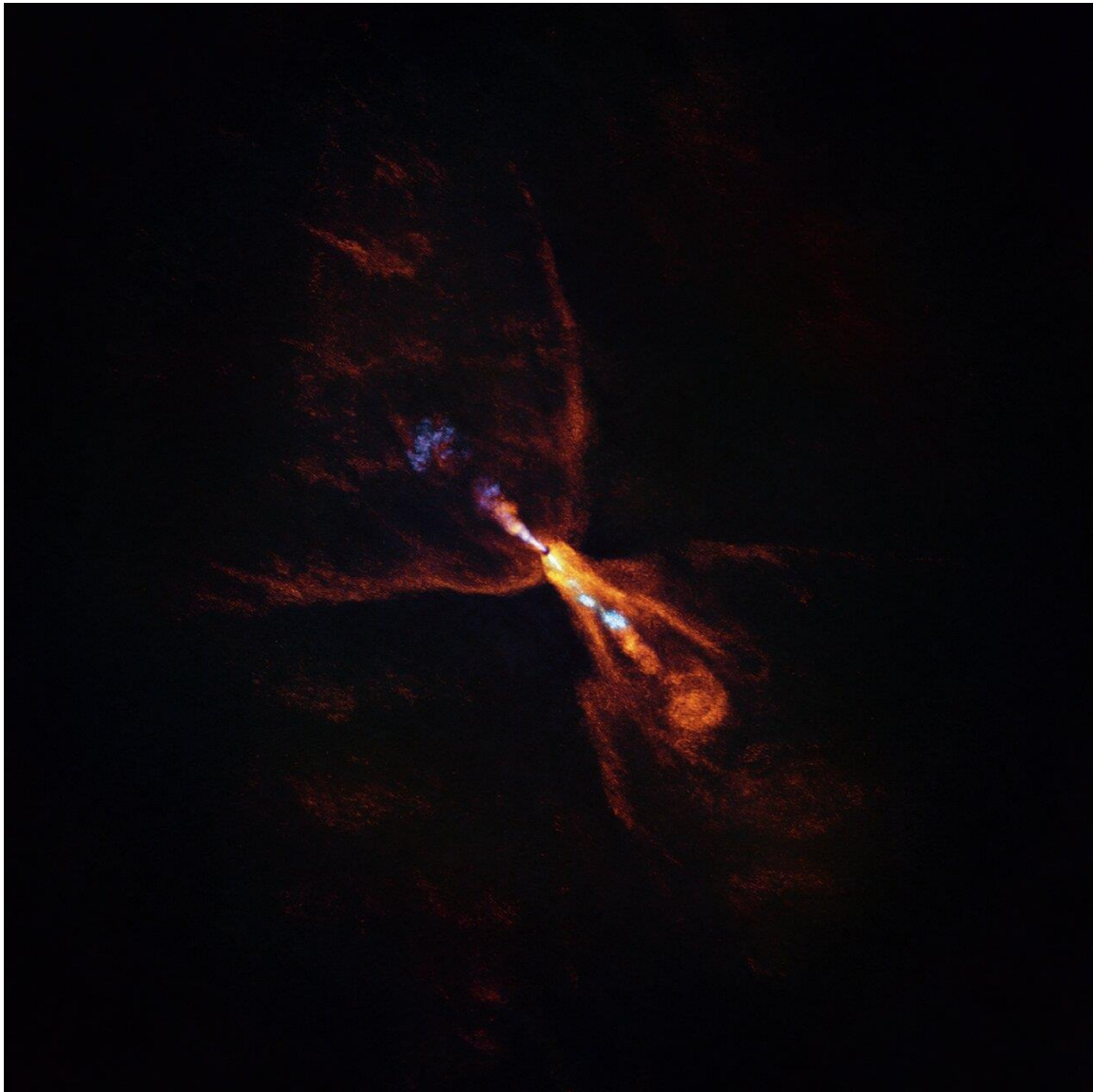
Laird Close, University of Arizona

Clingy planets can trigger own doom, suspect Cheops and TESS

Astronomers using the European Space Agency's [Cheops](#) mission have caught an exoplanet, HIP 67522, that seems to be triggering flares of radiation from the star it orbits. These tremendous explosions are blasting away the planet's wispy atmosphere, causing it to shrink every year. This is the first-ever evidence for a 'planet with a death wish'. Though it was theorised to be possible since the nineties, the flares seen in this research are around 100 times more energetic than expected.

For the first time, astronomers witness the dawn of a new solar system

International researchers have, for the first time, pinpointed the moment when planets began to form around a star beyond the Sun. Using the [ALMA telescope](#), in which the [European Southern Observatory \(ESO\)](#) is a partner, and the James Webb Space Telescope, they have observed the creation of the first specks of planet-forming material — hot minerals just beginning to solidify. This finding marks the first time a planetary system has been identified at such an early stage in its formation and opens a window to the past of our own Solar System.



HOPS 315 – a still-forming planetary system

Credit ALMA

First scientific results of the Near-Infrared Planet Searcher NIRPS

The first scientific results of the high-resolution near-infrared spectrograph NIRPS (Near Infra-Red Planet Searcher) are published in the journal *Astronomy & Astrophysics*. In operation at the ESO La Silla 3.6m telescope since April 2023, and working in tandem with HARPS, NIRPS is a new ESO facility that offers exceptional performance for the detection of exoplanets orbiting M dwarfs and for studying exoplanet atmospheres. It is the first spectrograph operating in the near infrared that reaches similar results to state-of-the-art spectrographs operating in the visible, such as HARPS. The NIRPS consortium brought together new technologies and advanced signal processing algorithms to push the instrument to an unprecedented level of performance. In its first semester of operation, NIRPS has already made major discoveries. These findings mark a new level of precision in the infrared observations, proving NIRPS's power to unveil small, potentially habitable worlds around nearby stars in our cosmic backyard.

BEBOP VII. SOPHIE discovery of BEBOP-3b, a circumbinary giant planet on an eccentric orbit

Planetary systems orbiting close binaries are valuable testing grounds for planet formation and migration models. More detections with good mass measurements are needed. This paper describes a new planet discovered during the BEBOP survey for circumbinary exoplanets using radial velocities. [Exoplanet.eu catalogue entry for BeBOP-3b](#)

The Hot-Neptune Initiative (HONEI) I. Two hot sub-Neptunes on a close-in, eccentric orbit (TOI-5800 b) and a farther-out, circular orbit (TOI-5817 b)

Neptune-sized exoplanets are key targets for atmospheric studies, yet their formation and evolution remain poorly understood due to their diverse characteristics and limited sample size. The so-called "Neptune desert", a region of parameter space with a dearth of short-period sub- to super-Neptunes, is a critical testbed for theories of atmospheric escape and migration. The HONEI program aims to confirm and characterize the best Neptune-sized candidates for composition, atmospheric and population studies. object in the system.

Exoplanet.eu entries for [TOI-5800 b](#) and [TOI-5817b](#)

NASA's Webb Finds New Evidence for Planet Around Closest Solar Twin

Astronomers using NASA's James Webb Space Telescope have found strong evidence of a giant planet orbiting a star in the stellar system closest to our own Sun. At just 4 light-years away from Earth, the Alpha Centauri triple star system has long been a compelling target in the search for worlds beyond our solar system. Alpha Centauri, located in the far southern sky, is made up of the binary Alpha Centauri A and Alpha Centauri B, both Sun-like stars, and the faint red dwarf star Proxima Centauri. Alpha Centauri A is the third brightest star in the night sky. While there are three confirmed planets orbiting Proxima Centauri, the presence of other worlds surrounding Alpha Centauri A and Alpha Centauri B has proved challenging to confirm.

Giant free-floating planets may form their own planetary systems

New research from the University of St Andrews has found that giant free-floating planets have the potential to form their own miniature planetary systems without the need for a star. In findings published using observations from the James Webb Space Telescope (JWST), researchers investigated young isolated objects with masses of 5-10 times the mass of Jupiter. These objects are comparable to giant planets in their properties, but in contrast to giant planets they are not in orbit around a star; instead, they are free-floating in space.



AI generated image of a young free floating planetary-mass object surrounded by a dusty disk

Credit University of St Andrews

Meetings

[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.

[UK Planetary Forum Early Career Meeting. Friday 9th January 2026, hosted by the Centre for Planetary Sciences at UCL/Birkbeck \(CPS\), in Bloomsbury, London.](#)

The Early Careers Meeting is an annual national meeting of early career planetary science researchers in the UK. The UKPF ECM is designed to bring together early career researchers from across the UK for a day of networking and knowledge sharing. This event provides a supportive environment for early career scientists to present their research to peers and receive constructive feedback, offering valuable preparation for larger, international conferences. Presentations will include both talks and posters, showcasing the diversity of work taking place in planetary science.

[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.

[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.

Rogue Worlds 2: Rogue Worlds Strike Back. Institut d'Astrophysique de Paris, Dec 15-17, 2025

Free-floating, or "rogue", planetary-mass objects have been discovered wandering through the Galaxy unbound to any star. The origins of these objects remain poorly understood, and likely involve a combination of many different processes relevant to star and planet formation. Direct imaging surveys of young star-forming regions have already found hundreds of high-mass rogue planets, though it remains an ongoing theoretical challenge to determine what fraction represent ejected planets as opposed to aborted stellar embryos. Meanwhile, upcoming microlensing missions such as the Nancy Grace Roman telescope are poised to vastly increase our sample of free-floating planets at masses extending to Earth-mass and below, opening a new window into their origin and demographics.

Astrobiology and the search for life elsewhere

Origins of Life: The Possible and the Actual

The questions of how life forms, whether life is an inevitable outcome, and how diverse its presentation could be remains some of the most profound in science. Investigations into the origin of life confront key issues such as uncovering key constraints and universal features of life, the plausibility of alternative biochemistries, and the transition from purely chemical systems to information-bearing, evolvable entities. Many of these issues can be associated with early cell formation and evolution. Thus, protocellular systems have emerged as a key focus of study.

NASA Says Mars Rover Discovered Potential Biosignature Last Year

A sample collected by NASA's Perseverance Mars rover from an ancient dry riverbed in Jezero Crater could preserve evidence of ancient microbial life. Taken from a rock named "Cheyava Falls" last year, the sample, called "Sapphire Canyon," contains potential biosignatures, according to [a paper](#) published Wednesday in the journal Nature. A potential biosignature is a substance or structure that might have a biological origin but requires more data or further study before a conclusion can be reached about the absence or presence of life.

Alien life on Mars or Europa could survive off cosmic rays instead of the sun, scientists suggest

Cosmic rays could be a vital source of energy for life on icy moons, on Mars, or even on rogue planets that wander alone between stars; its possible, scientists say, that the phenomenon could create a "radiolytic habitable zone" on what are otherwise some of the coldest, darkest worlds known. "For this mechanism to work, you just need a planetary surface with a thin or no atmosphere, irrespective of its distance from the [sun](#)," Dimitra Atri of New York University Abu Dhabi, told Space.com. "This would expand the possibilities of life existing on distant and [rogue planets](#)."

The Habitable Worlds Observatory

Observing wavelengths of light similar to those gathered by NASA's Hubble Space Telescope, the Habitable Worlds Observatory would have a mirror large enough to find and study at least 25 potentially habitable worlds around other stars. This "super-Hubble" would reveal whether Earth-like planets are common or rare. Beyond the search for life, the telescope will be the engine to transform our understanding of the universe in the coming decades. The Habitable Worlds Observatory will follow in the footsteps of the Hubble, Webb, and Roman space telescope flagship missions, building on their technological and scientific achievements.

Relevant papers

- [Prebiosignatures with the Habitable Worlds Observatory](#)
- [Testing Origin-of-Life Theories with the Habitable Worlds Observatory](#)

Ceres May Have Had Long-Standing Energy to Fuel Habitability

The dwarf planet is cold now, but new research paints a picture of Ceres hosting a deep, long-lived energy source that may have maintained habitable conditions in the past. New NASA research has found that Ceres may have had a lasting source of chemical energy: the right types of molecules needed to fuel some microbial metabolisms. Although there is no evidence that microorganisms ever existed on Ceres, the finding supports theories that this intriguing dwarf planet, which is the largest body in the main asteroid belt between Mars and Jupiter, may have once had conditions suitable to support single-celled lifeforms.

[Cassini proves complex chemistry in Enceladus ocean](#)

Scientists digging through data collected by the Cassini spacecraft have found new complex organic molecules spewing from Saturn's moon Enceladus. This is a clear sign that complex chemical reactions are taking place within its underground ocean. Some of these reactions could be part of chains that lead to even more complex, potentially biologically relevant molecules. Published in Nature Astronomy, this discovery further strengthens the case for a dedicated European Space Agency (ESA) mission to orbit and land on Enceladus.

Publications

Papers

[The Diversity of Exoplanetary Environments and the Search for Signs of Life Beyond Earth](#)

Thousands of exoplanets orbit nearby stars, showcasing a remarkable diversity in mass, size, and orbits. With the James Webb Space Telescope now operational, we are observing exoplanet atmospheres and aiming to reach down to small, habitable-zone exoplanets in search of signs of habitability and possibly even biosignature gases. Given the scarcity of targets, it is imperative to embrace the known diversity and consider the range of exoplanets that might host life. This paper reviews how Earth life interacts with various atmospheric gases, noting that bacteria can survive in high concentrations of gases such as H₂, He, CO₂, and CO

[The changing transit shape of TOI-3884 b](#)

TOI-3884 b is a sub-Saturn transiting a fully convective M-dwarf. Observations indicate that the transit shape is chromatic and asymmetric as a result of persistent star spot crossings. This, along with the lack of photometric variability of the host star, indicates that the rotational axis of the star is tilted along our line of sight and the planet-occulted star spot is located close to the stellar pole.

[A Search for Transiting Exocomets in TESS Sectors 1-26](#)

This paper presents a search for single photometric exocomet transits using a magnitude-limited sample of stars observed by the TESS primary mission. These events are asymmetric, with a sharp ingress and more gradual egress expected because the comet tail trails behind the coma. The goals are to estimate the occurrence rate of exocomet transits, and given sufficient numbers comment on whether the host stars are biased towards being A/F spectral types, as suggested by

a previous survey with Kepler data. The previously identified exocomet transit with TESS around β Pic (TIC 270577175) was recovered and three additional main sequence systems with exocomet-like transits (TIC 280832588, TIC 73149665, and TIC 143152957) were identified. One exocomet candidate around a giant star (TIC 229790952) and one around a probable supergiant (TIC 110969638) were also identified.

Detecting Extraterrestrial Civilizations That Employ an Earth-level Deep Space Network

A major aspect of the search for extraterrestrial intelligence (SETI) involves searching for electromagnetic transmissions from extraterrestrial sources, often using our own transmissions as a guide. Previous studies have suggested that humanity's most consistently detectable technosignatures were transmissions from our deep-space networks and interplanetary radar. This study, we analyses NASA Deep Space Network logs to explore what strategies for selecting SETI targets and scheduling observations would enhance the chances of detecting such networks.

Books

Are We Alone?

Is it possible that there is life beyond Earth? What is needed for Earth life, and what would alien life look like? How do scientists explore faraway worlds for signs of alien life? Discover the technology and research scientists are using to find answers.

Space – Stepping stones to other planetary systems

The Moon

NASA just funded a project to blow space structures out of glass by the California based [Skyeports](#) (not to be confused with Sky Sports!!!). [YouTube video](#).

Mars

NASA's Simulated Mars Habitat

[Crew Health and Performance Exploration Analog \(CHAPEA\)](#) is a series of missions that will simulate year-long stays on the surface of Mars. Each mission will consist of four crew members living in an isolated 1,700 square foot habitat. During the mission, the crew will conduct simulated spacewalks and provide data on a variety of factors, which may include physical and behavioral health and performance. Crew Health and Performance Exploration Analog.

Beyond

Project Hyperion Generation Ship Competition

On November 1st, 2024, Project Hyperion - an international, interdisciplinary team of architects, engineers, anthropologists, and urban planners - launched a design competition for crewed interstellar travel. The event was hosted by the Initiative for Interstellar Studies (i4is), a UK-based non-profit organization dedicated to the robotic and human exploration of exoplanets around nearby stars, and eventually settlement. With a prize purse of \$10,000, competitors were tasked with producing concepts for a Generation Ship (aka. Worldships) using current technologies and those that could be realized in the near future.

On July 23rd, 2025, the organization announced the top three competition winners, which were selected from hundreds of ideas submitted by teams worldwide. The winning entries were selected based on how they met all the competition criteria, provided a depth of detail, and integrated the design aspects of architecture, engineering, and social sciences. In short, the top three prizes were awarded to proposals that would allow a society to sustain itself and flourish in a highly resource-constrained environment as they made a centuries-long journey to another habitable planet.

Roger Dymock

[ARPS Assistant Director Exoplanets](#)