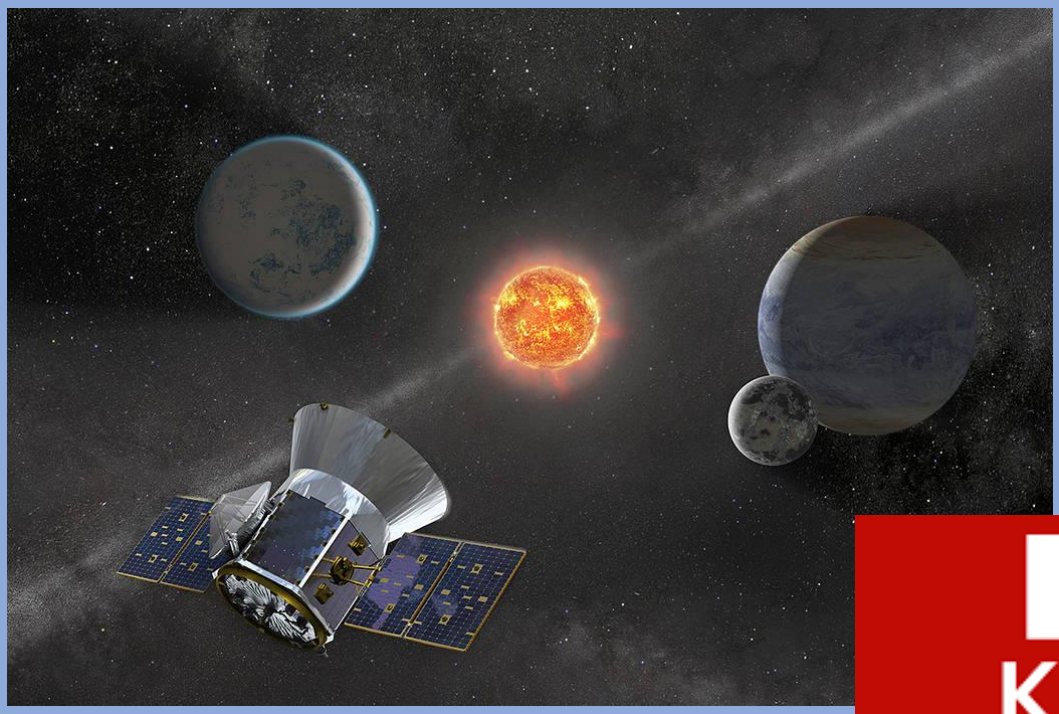
British Astronomical Association
Supporting amateur astronomers since 1890

Infinite Worlds



NASA's Transiting Exoplanet Survey Satellite - TESS

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

Issue 14 2022 April

Contents

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Exoplanets Division website

Transiting Exoplanet Survey Satellite Follow-up Observing Program – (TFOP)

The Exoplanet Division would like to become involved in this program and I am seeking a volunteer to coordinate this activity. The presentation given to the Local Group by Dennis M. Conti explains all -

Amateur Astronomer Participation in the TESS Exoplanet Mission

The objective of the ground-based, follow-up observations is to distinguish between true exoplanet transits and false positives caused by the blending of multiple stars in the TESS images. Ground based telescope photometric apertures are smaller than the TESS apertures thus allowing true observations to be confirmed.

There are several AAVSO and other citizen scientists that contribute to the TESS Follow-up Observing Program (TFOP) To join directly – we would join Sub-group 1 independently of other participants- each person in a group that would need direct access to the web-based tools would need to apply by answering the bullet questions here. Answers should be emailed to Karen Collins at karenacollins@outlook.com.

Applicants have to be individuals rather than an organization. However, if all using the same facility, a main person – that would be the Exoplanet Division Coordinator - can join by answering all of the questions, and the rest can join by copying the main applicant and noting that they are part of the main applicant's group, and then they only need to state that they have read and agree to abide by the TFOP Charter and Publication Policy linked on the above webpage.

Related link;

TFOP SG1 Observation Guidelines, Revision 6.4

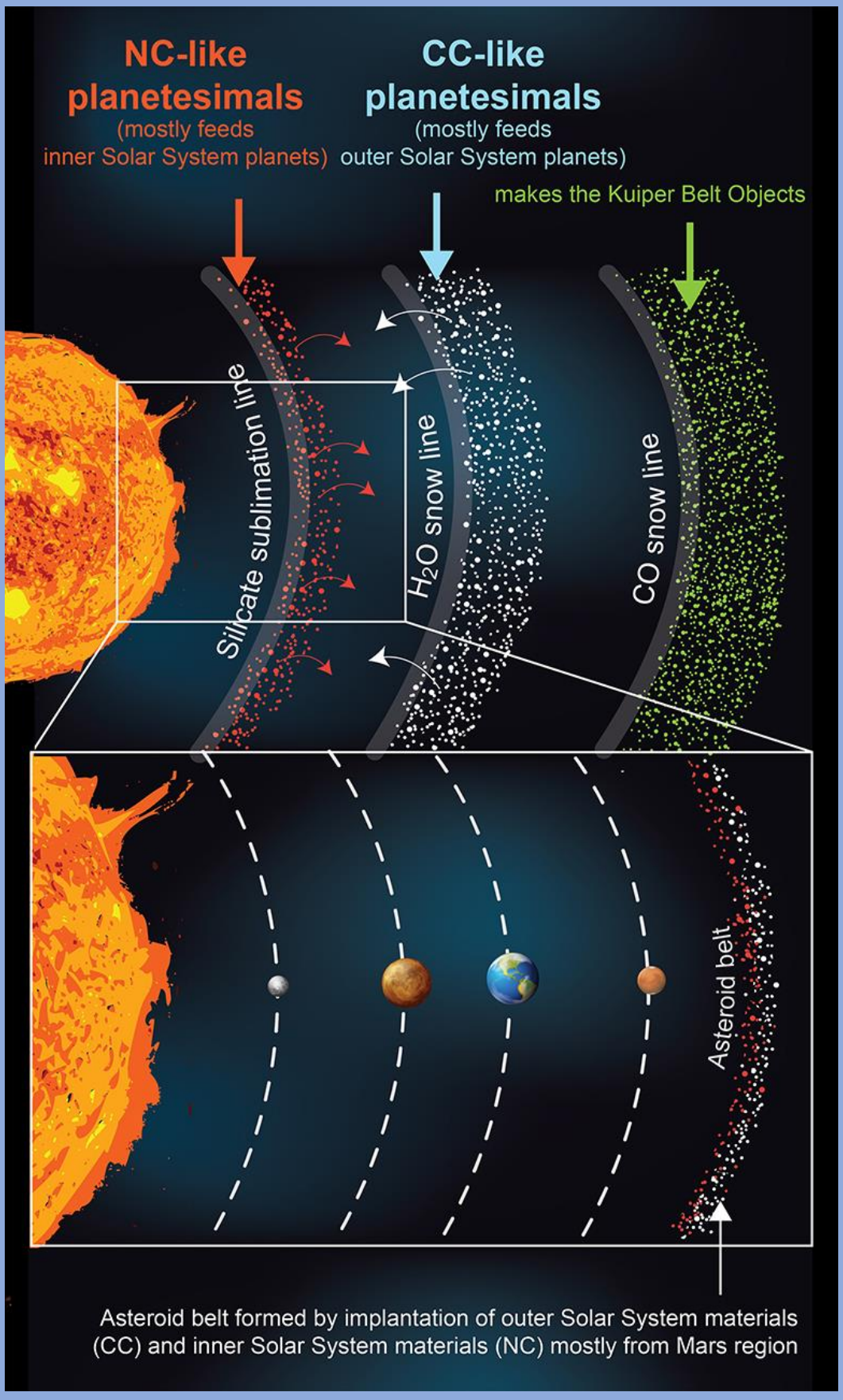
PLEASE CONTACT ME IF YOU ARE INTERESTED.

News

The Sun had rings before planets

Super-Earth size planets, up to 5 Earth masses/1.5 Earth radii, are common in exoplanetary systems but the Solar System does not include one. Perhaps the mystery has been solved by research at Rice University. Before the solar system had planets, the sun had rings — bands of dust and gas similar to Saturn's rings — that likely played a role in Earth's formation, according to a new study. "In the solar system, something happened to prevent the Earth from growing to become a much larger type of terrestrial planet called a super-Earth ," said Rice University astrophysicist André Izidoro, referring to the massive rocky planets seen around at least 30% of sun-like stars in our galaxy.

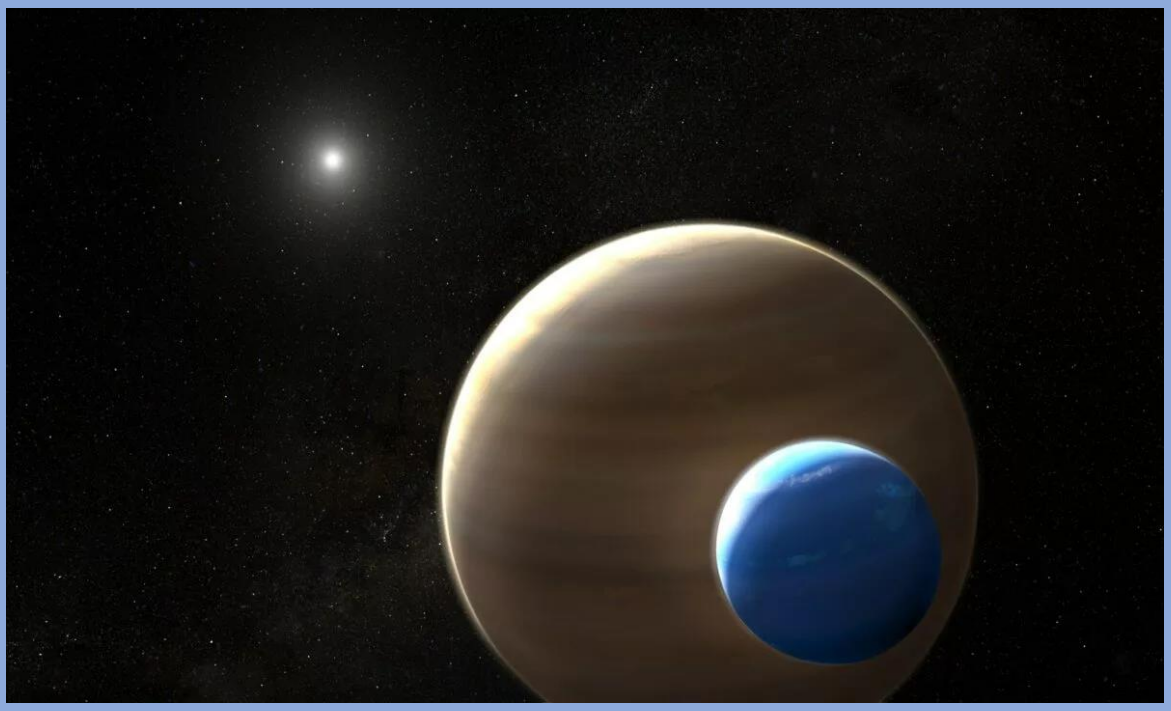
In the Rice simulations, pressure bumps at the sublimation lines of silicate, water and carbon monoxide produced three distinct rings. At the silicate line, the basic ingredient of sand and glass, silicon dioxide, became vapor. This produced the sun's nearest ring, where Mercury, Venus, Earth and Mars would later form. The middle ring appeared at the snow line and the farthest ring at the carbon monoxide line.



Solar system rings and planet formation Credit Rice University

Where are the moons that orbit exoplanets?

Astronomers are searching for exomoons, or moons orbiting exoplanets. Although this idea has been around for a while, astronomers have only recently started having success in finding these elusive worlds.

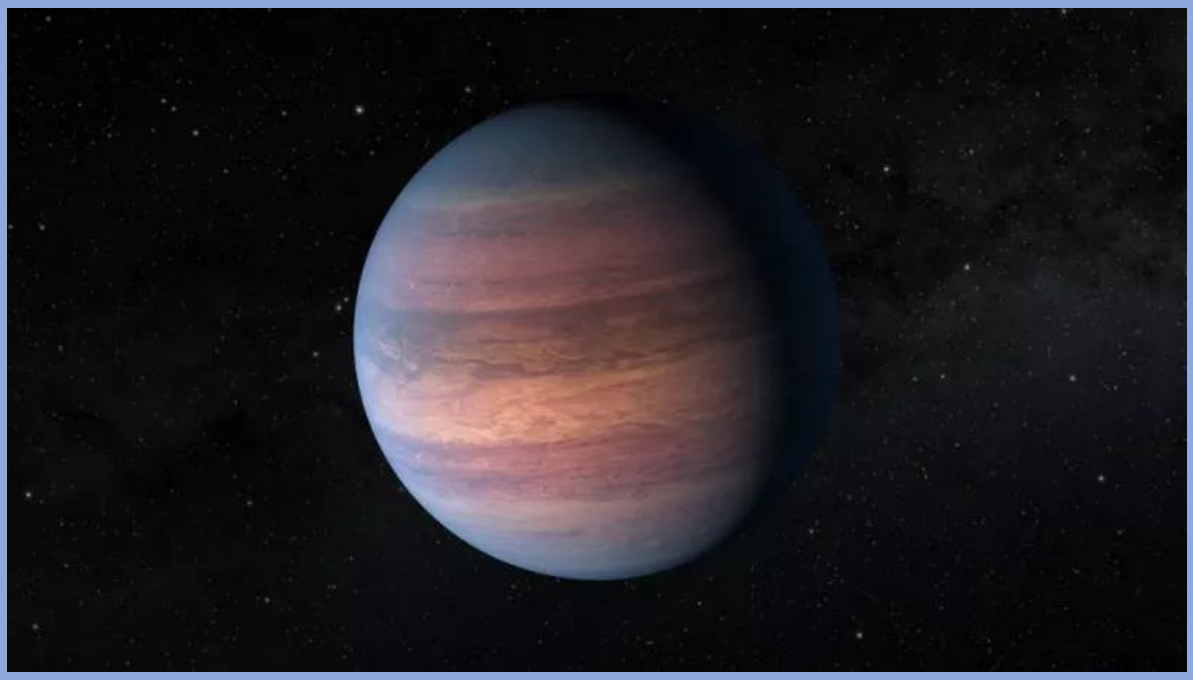


This artist's impression shows exomoon candidate Kepler-1625b-i, its planet, Kepler-1625b as well as its star, Kepler-1625.Image: NASA, ESA, and L. Hustak (STScI)

Recent discoveries

TOI-2180-b

A group of astronomers and citizen scientists has uncovered a hidden planet the size of Jupiter in a distant solar system. The planet, designated TOI-2180 b, is relatively close to Earth, at only 379 light-years away. But what makes this world special among the sample of known giant exoplanets is that it takes 261 days to orbit its host star, much longer than most gas giants exoplanets discovered so far. The team spotted the world using data gathered by NASA's Transiting Exoplanet Survey Satellite, or TESS. While TOI-2180-b's orbital period is not quite confirmed, scientists predict TESS will see the planet again in February.



Artist's impression of the exoplanet TOI-2180 b. (Image credit: NASA/JPL-Caltech/R. Hurt

Planetary bodies observed for first time in habitable zone of dead star

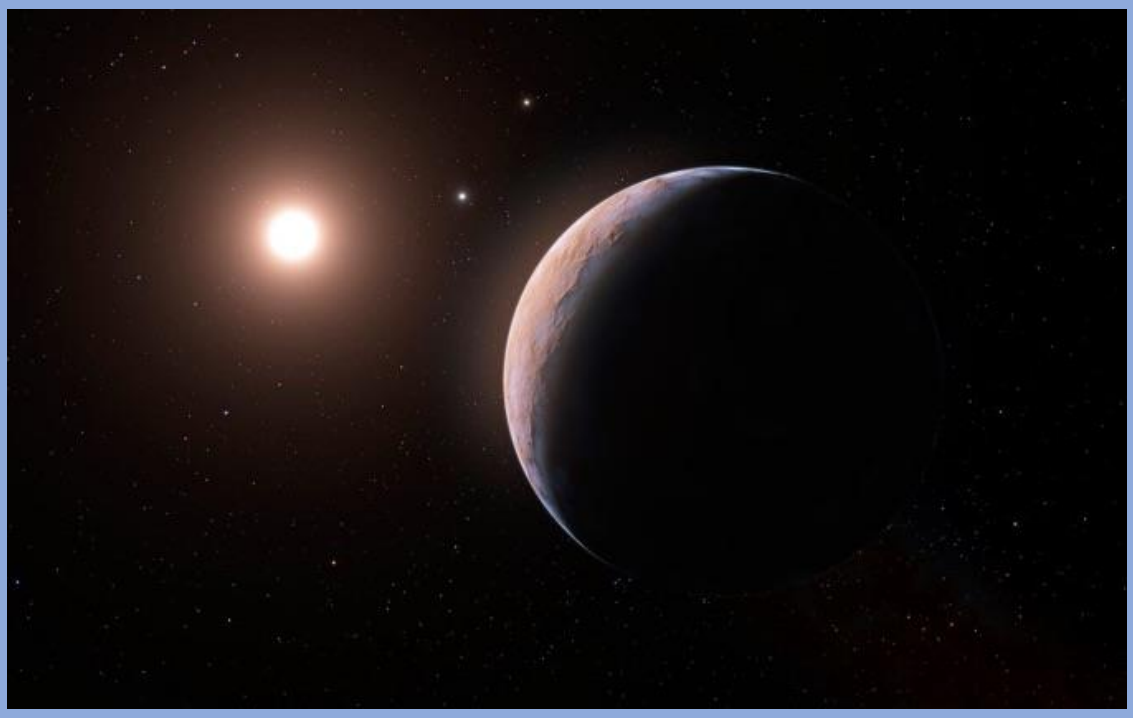
A ring of planetary debris studded with moon-sized structures has been observed orbiting close to a white dwarf star, hinting at a nearby planet in the “habitable zone” where water and life could exist, according to a new study led by UCL researchers.

For the, researchers observed WD1054–226, a white dwarf 117 light years away, recording changes in its light over 18 nights using the ULTRACAM high-speed camera fixed on to the ESO 3.5m New Technology Telescope (NTT) at the La Silla Observatory in Chile. In order

to better interpret the changes in light, the researchers also looked at data from the NASA Transiting Exoplanet Survey Satellite (TESS), which allowed the researchers to confirm the planetary structures had a 25-hour orbit.

New planet detected around star closest to the Sun

A team of astronomers using the European Southern Observatory's Very Large Telescope (ESO's VLT) in Chile have found evidence of another planet orbiting Proxima Centauri, the closest star to our Solar System. This candidate planet is the third detected in the system and the lightest yet discovered orbiting this star. At just a quarter of Earth's mass, the planet is also one of the lightest exoplanets ever found.



An artist's impression of a newly discovered, lightweight exoplanet around Proxima Centauri, the third planet now thought to be orbiting the nearest star to the Sun. Credit ESO

Mapping of the atmosphere of WASP-189b

The exoplanet was first observed in 2020 by the CHEOPS satellite. Researchers utilised high-resolution spectroscopy to successfully map the atmosphere of the exoplanet. This allowed scientists to gain valuable knowledge regarding the hot gas surrounding the Jupiter-like planet and demonstrated that WASP-189b has a layered type of atmosphere.

NASA Confirms 5,000 Exoplanets

Not so long ago, we lived in a universe with only a small number of known planets, all of them orbiting our Sun. More than 5,000 planets are now confirmed to exist beyond our solar system. This milestone was reached on 2022 March 21, with the latest batch of 65 exoplanets added to the NASA Exoplanet Archive. The archive records exoplanet discoveries that appear in peer-reviewed, scientific papers, and that have been confirmed using multiple detection methods or by analytical techniques.

Hubble finds a planet forming in an unconventional way

The NASA/ESA Hubble Space Telescope has directly photographed evidence of a Jupiter-like protoplanet forming through what researchers describe as an "intense and violent process." This discovery supports a long-debated theory for how planets like Jupiter form, called "disk instability."

Conferences/Meetings/Seminars/Webinars/Videos

Worldwide Astrofest: The search for life (reply)

Please note that there is a £5:00 purchase fee.

The question of whether there is other life in the Universe is one of the most tantalising we can ask. For centuries we have looked to the stars and wondered about the possibilities of life on other worlds. But where that has mostly been speculation in the past, now science is being brought to bear on the problem. This special Worldwide AstroFest event welcomes three eminent speakers who have all looked at the possibility of life elsewhere; Dr Emily Drabek-Maunder, Professor Michael Garrett and Dr Natalie Starkey.

Exoplanets IV

Exoplanets IV continues the Exoplanets conference series that began in 2016 in Davos, Switzerland. The conference will run from 1 May through 6 May 2022 and will cover all areas of exoplanet science. It will take place in the M Resort at the south end of the world-famous Las Vegas Boulevard.

COSPAR 2022 Scientific Assembly Exoplanet Event B6.1: exoplanet detection and characterisation: current research, future opportunities and the search for life outside the solar system. 2022 July 16-24

IAU Symposium 370: Winds of stars and exoplanets

IAU General Assembly 2022, August 2-11, Busan, Republic of Korea. Winds form an integral part of astronomy - from regulating rotation of stars through enriching galaxies with fresh materials, winds persist during the entire lives of stars and play a key role in shaping the observed exoplanet demographics.

Latsis Symposium: The Origin and Prevalence of Life, 2022 August 30 – September 2

What is life? Where, when and how did life arise on Earth? What ingredients were likely present and how were they delivered to Earth? Why and how did life increase in complexity after a period of ~2 billion years of apparently slow evolution? How did the development of life depend on the surface and interior evolution of the (young) Earth? Under what conditions is life possible and is life likely to exist on other planets or celestial bodies?"

The "Origin and Prevalence of Life" Latsis symposium will – from the perspective of modern natural sciences - discuss our current understanding of possible answers to these questions, highlight controversial viewpoints and discuss how they could be reconciled, and help prioritize and coordinate future research activities at the national and international level.

Forming and Exploring Habitable Worlds, 2022 November 7-13

Forming and Exploring Habitable Worlds is a multi-discipline four to five day international scientific meeting taking place in Edinburgh, UK, in November 2022. This event is to accommodate up to 120 in-person delegates of all career stages based in a range of relevant employment sectors. A hybrid model is envisaged to be delivered so as to broaden participation by accommodating virtual attendance of additional delegates.

Publications

Observing transiting exoplanets with the MicroObservatory: 43 new transit light curves of the hot Jupiter HAT-P-32b. Martin J F Fowler, Frank F. Sienkiewicz, Robert T. Zellem, Mary E. Dussault

This paper appeared on the 2021 December issue of the Journal of the British Astronomical Association. Observations of 43 complete transits of the hot Jupiter exoplanet HAT-P-32b using the MicroObservatory 0.15-m robotic telescope network covering a period of 7 years are presented.

SERIES: ASTROBIOLOGY PERSPECTIVES ON LIFE OF THE UNIVERSE

Series Editor: Richard Gordon and Joseph Seckbach

A great race is on to discover real extra-terrestrial life and to understand our origins whether on Earth or elsewhere. Astrobiology Perspectives on Life of the Universe volumes will each delve into an aspect of this adventure, with chapters by those who are involved in it, and careful observers and assessors of our progress.

Astrobiology

3D-printed bone

This artificial bone sample, below, is an early step towards making 3D bioprinting a practical tool for emergency medicine in space. An ESA R&D effort aims to develop bioprinting techniques capable of giving astronauts on an extended mission ready access to the ‘spare parts’ needed for bone or skin grafts, and even complete internal organs.

When will we explore Enceladus to find alien life?

Enceladus is part of a class of icy worlds in the outer solar system which likely have underground oceans. These worlds — including Jupiter's moon Europa and Neptune's moon Triton — suggest that sunlight, a surface and an atmosphere aren't necessary to make a world habitable.

The Search for Life Elsewhere

A Beacon in the Galaxy: Updated Arecibo Message for Potential FAST and SETI Projects

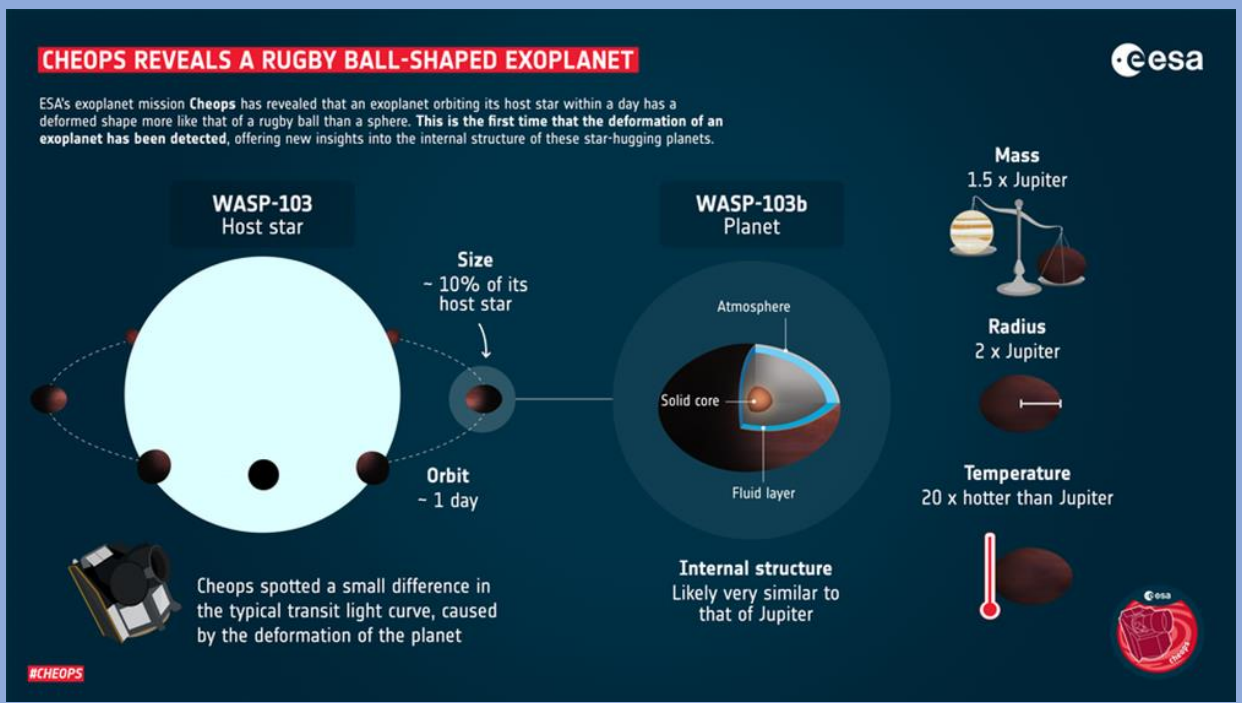
An updated, binary-coded message has been developed for transmission to extra-terrestrial intelligences in the Milky Way galaxy. The proposed message includes basic mathematical and physical concepts to establish a universal means of communication followed by information on the biochemical composition of life on Earth, the Solar System's time-stamped position in the Milky Way relative to known globular clusters, as well as digitized depictions of the Solar System, and Earth's surface. The message concludes with digitized images of the human form, along with an invitation for any receiving intelligences to respond.

Not all scientists think this is a good idea, warning that sharing such information with intelligent life presents a risk that must be considered.

Space missions

CHEOPS reveals a rugby ball-shaped exoplanet

ESA's exoplanet mission Cheops has revealed that an exoplanet orbiting its host star has a deformed shape more like that of a rugby ball than a sphere. The planet, known as WASP-103b has been deformed by the strong tidal forces between the planet and its host star.



WASP-103 system Credit ESA

PLATO

ESA's next-generation planet hunting mission, has been given the green light to continue with its development after the critical milestone review concluded successfully on 11 January 2022. Plato will use the 26 cameras to discover and characterise exoplanets that orbit stars similar to our Sun. See also https://sci.esa.int/web/plato/ and https://www.esa.int/Space_in_Member_States/United_Kingdom/UK-backed_planet_hunting_mission_moves_forward

This is a project with which the Exoplanet Division hopes to be involved – watch this space.

Space – stepping stones to other star systems

Moon

'How we will build the first Moon base', 15 mins video (sorry about the ads), thanks to Steve Knight, Hampshire Astronomical Group. Referred to in this video are;

- The Artemis Accords – a NASA document subtitled 'Principles for cooperation in the civil exploration and use of the Moon, Mars, Comets and Asteroids for peaceful purposes'
- United Nations Treaties and Principles on Outer Space

Lunar scientists and engineers design Moon cave explorer

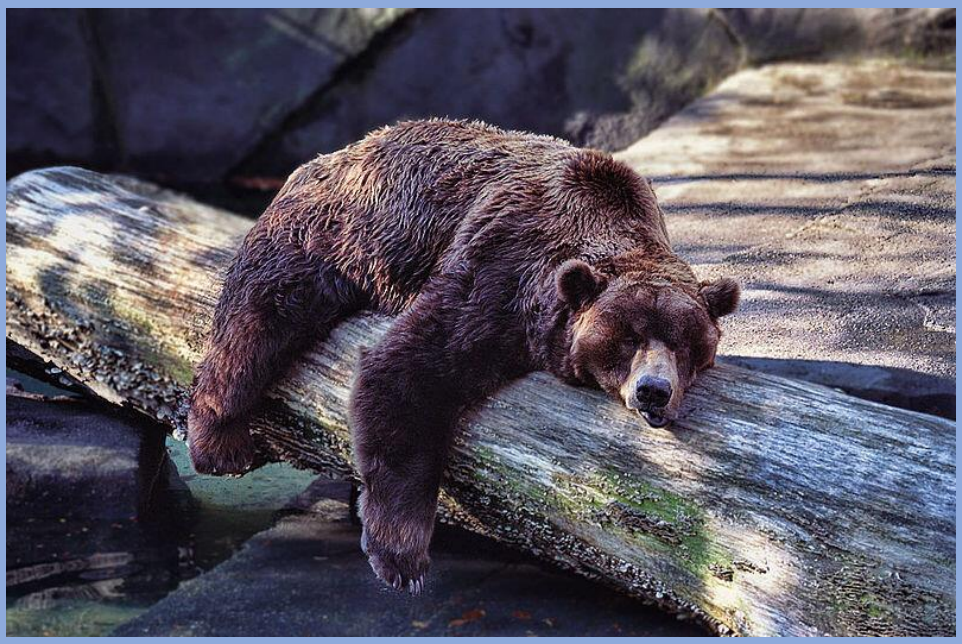
Lunar caves are not only a geologically pristine record of the Moon's history, but they could also provide a safe home for future human explorers. ESA gathered a spectrum of over 60 experts in many different areas of science and engineering to design a mission to enter a pit on the Moon's surface and explore the entrance to a lunar cave.

Mars

Hibernate for a trip to Mars, the bear way

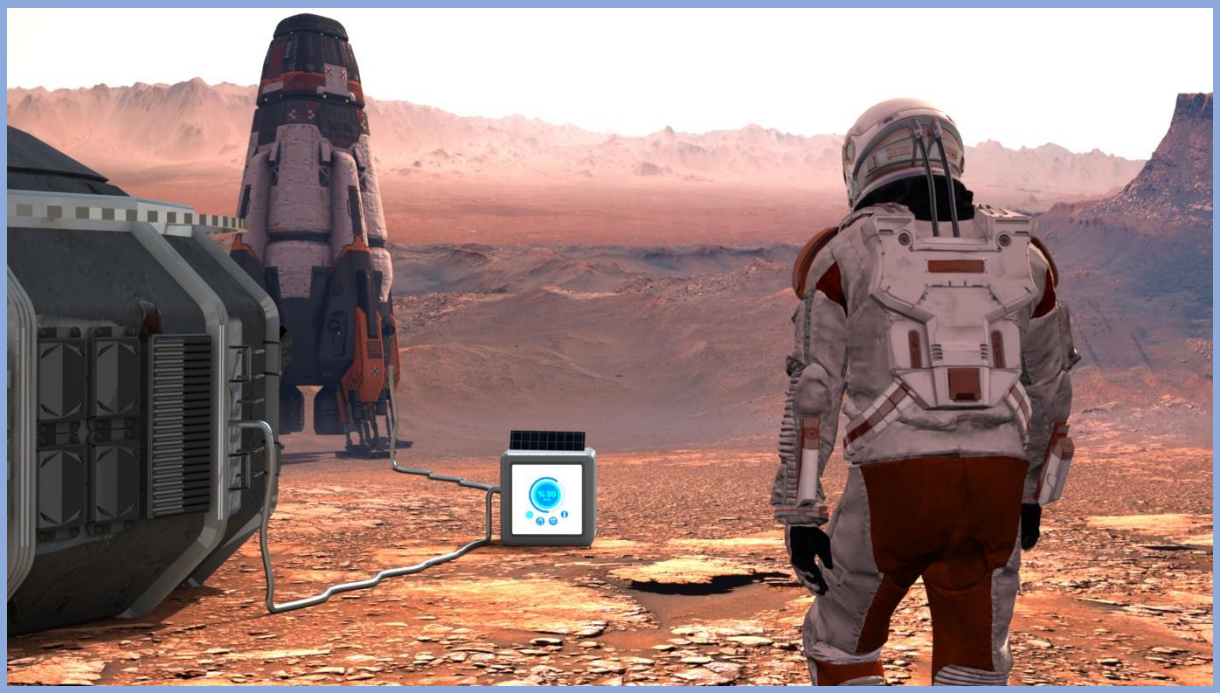
Hibernating astronauts could be the best way to save mission costs, reduce the size of spacecraft by a third and keep crew healthy on their way to Mars.

An ESA-led investigation suggests that human hibernation goes beyond the realm of science-fiction and may become a game-changing technique for space travel.



Turning astronaut waste into fuel on Mars

To survive on Mars will mean maximising use of all available resources. A team from Spanish technological centre Tekniker is working on a system that uses sunlight to produce fuel from astronaut wastewater. Makes a strong case for letting us old guys go to Mars as we tend to produce more of the stuff or perhaps it's just a load of c**p.



Beyond

What technology would aliens need to visit Earth?

Video (thanks to Steve Knight, Hampshire Astronomical Group) – A summary of various forms of propulsion from chemical rockets to wormholes.

Roger Dymock
ARPS Assistant Director Exoplanets