



**British Astronomical Association**  
Supporting amateur astronomers since 1890

# Infinite Worlds



## Supplement to Issue 8

The e-magazine of the  
Exoplanets Division  
Of the

Asteroids and Remote Planets Section

Supplement to Issue 8

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## **Introduction**

There was a considerable amount of material for inclusion in the October issue. So, in order to meet my publication deadline, and keep the issue to a reasonable size, I have included the remainder in this supplement.

## **Discoveries**

### **Smallest Earth-sized free-floating planet**

<https://en.uw.edu.pl/an-earth-sized-rogue-planet-discovered-in-the-milky-way/>

Scientists announced the discovery of the shortest-timescale microlensing event ever found, called OGLE-2016-BLG-1928, which has the timescale of just 42 minutes. “When we first spotted this event, it was clear that it must have been caused by an extremely tiny object,” says Dr. Radosław Poleski from the Astronomical Observatory of the University of Warsaw, a co-author of the study. Indeed, models of the event indicate that the lens must have been less massive than Earth, it was probably a Mars-mass object. Moreover, the lens is likely a rogue planet. “If the lens were orbiting a star, we would detect its presence in the light curve of the event,” adds Dr. Poleski. “We can rule out the planet having a star within about 8 astronomical units – the astronomical unit is the distance between the Earth and the Sun”.

## **Conferences/Meetings/Seminars/Webinars – Scheduled**

### **PLATO**

Mark Kidger advises that it is quite probable that there will be no PLATO meetings until 2021 Autumn at the earliest. However there is an online [PLATO ESP 2020 workshop 30 November to 2 December 2020](#) Registration is now closed but our PLATO contact Steve Futcher will be attending (virtually).

### **Exoplanet Demographics Conference**

The exoplanet field has transitioned rapidly from discovery to characterization. As the numbers of known exoplanets grows, our ability to discern and understand the underlying populations and planets that produce the observed distributions we see also grows. [This conference](#) will bring together community members working both theoretically and observationally on understanding exoplanet demographics. Due to the large number of participants, we will be using a Zoom webinar for this conference. Please see this article (<https://support.zoom.us/hc/en-us/articles/115005474943-Meeting-and-webinar-comparison>) for more information on how a Zoom webinar differs from a Zoom meeting. You must register for the webinar separately from the conference in order to receive the webinar connection information. The Zoom webinar registration information will be provided after Oct. 26.

## **Publications/Videos**

### **Which stars can see Earth as a Transiting Exoplanet**

Transit observations have found the majority of exoplanets to date however an exoplanet's orbit must be aligned with our line of sight to observe a transit. This paper asks, from which stellar vantage points would a distant observer be able to search for life on Earth in the same way? SETI searches like the Breakthrough Listen Initiative are already focusing on this part of the sky. As part of the extended mission, NASA's TESS will also search for transiting planets in the ecliptic to find planets that could detect life on our transiting Earth as well.

<https://arxiv.org/abs/2010.09766>

### **Could we ever live on a different planet?**

<https://www.youtube.com/watch?v=-IGHxBvRnSM> (Thanks to Steve Knight)

A little basic at first but worth watching all the way through – RD

The first extra-solar planet – or exoplanet – was only discovered in 1995. Now, a new space-based telescope has discovered thousands more, and some of them may be just like Earth.

Planet Hunters follows the astrophysicists at the forefront of the search for Earth's twin, and tells the little-known story of the two Canadians who invented the technique that made modern planet-hunting possible. Gordon Walker and Bruce Campbell also detected the first exoplanet ever discovered, but that's not what the history books say...

Related links

Strange New Worlds: The Search for Alien Planets and Life beyond Our Solar System by Ray Jayawardhana

The Mearth Project - <https://www.cfa.harvard.edu/MEarth/Welcome.html>

The Virtual Planetary Laboratory - <https://depts.washington.edu/naivpl/>

Allen Telescope Array - <https://www.seti.org/ata>

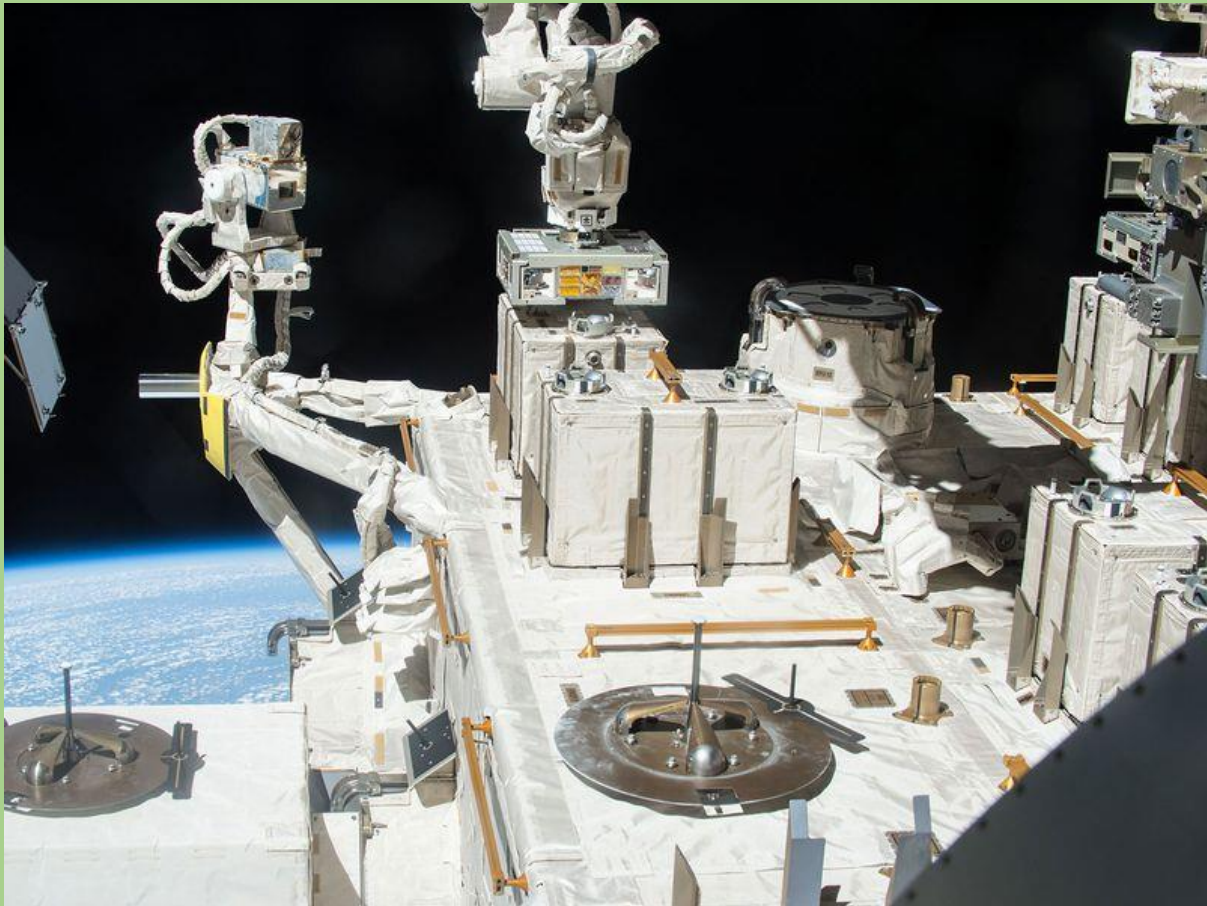
## **Astrobiology**

### **In Search for a Planet Better than Earth: Top contenders for a Superhabitable World**

The fact that Earth is teeming with life makes it appear odd to ask whether there could be other planets in our galaxy that may be even more suitable for life. Neglecting this possible class of "superhabitable" planets, however, could be considered anthropocentric and geocentric biases. Most important from the perspective of an observer searching for extrasolar life is that such a search might be executed most effectively with a focus on superhabitable planets instead of Earth-like planets. We argue that there could be regions of astrophysical parameter space of star-planet systems that could allow for planets to be even better for life than our Earth. We aim to identify those parameters and their optimal ranges, some of which are astrophysically motivated, whereas others are based on the varying habitability of the natural history of our planet. Some of these conditions are far from being observationally testable on planets outside the solar system. Still, we can distil a short list of 24 top contenders among the >4000 exoplanets known today that could be candidates for a superhabitable planet. In fact, we argue that, with regard to the search for extrasolar life, potentially superhabitable planets may deserve higher priority for follow-up observations than most Earth-like planets.

## Bacteria can survive in space

<https://www.smithsonianmag.com/science-nature/scientists-discover-exposed-bacteria-can-survive-space-years-180975660/>



A robotic arm places a container with three panels of bacteria outside the ISS. Credit JAXA/NASA

A robotic arm on the International Space Station in 2015 mounted a box of exposed microbes on a handrail 250 miles above Earth. The hearty bacteria had no protection from an onslaught of cosmic ultraviolet, gamma, and x-rays. Back on Earth, scientists wondered whether the germs might survive these conditions for up to three years, the length of the experiment, and if they did, what the results might tell the researchers about the ability of life to travel between planets. The results show that the *Deinococcus* bacteria survived the three-year experiment. *Deinococcus* bacteria cells in the outer layers of the masses died, but those dead outer cells shielded those inside from irreparable DNA damage. And when the masses were large enough, still thinner than a millimeter, cells inside survived for several years.

## Life on Venus ?

The detection of phosphine gas in the clouds of Venus—a possible sign of life—might be due to a fluke in data processing, new analyses suggest -

<https://www.nationalgeographic.com/science/2020/10/venus-might-not-have-much-phosphine-dampening-hopes-for-life/>

## **Mars may have looked like the Canadian Arctic**

[https://www.cbc.ca/news/canada/british-columbia/mars-scars-glacier-canada-high-arctic-study-](https://www.cbc.ca/news/canada/british-columbia/mars-scars-glacier-canada-high-arctic-study-1.5673949#:~:text=What%20this%20tells%20scientists%20is,we're%20looking%20at%20he)

[1.5673949#:~:text=What%20this%20tells%20scientists%20is,we're%20looking%20at%20he](https://www.cbc.ca/news/canada/british-columbia/mars-scars-glacier-canada-high-arctic-study-1.5673949#:~:text=What%20this%20tells%20scientists%20is,we're%20looking%20at%20he)  
[re.](https://www.cbc.ca/news/canada/british-columbia/mars-scars-glacier-canada-high-arctic-study-1.5673949#:~:text=What%20this%20tells%20scientists%20is,we're%20looking%20at%20he)

The deep valleys scarred into the surface of Mars under thick sheets of ice show that the planet once mirrored the Canadian High Arctic, says a new study. Published Monday in the journal [Nature Geoscience](#), the study says many of the valley networks carved into the surface of Mars were formed by water melting beneath glacial ice. It means there were fewer free-flowing rivers than previously thought.

## **Characterising Atmospheric Technosignatures**

Scientists at the Center for Astrophysics, Harvard and Smithsonian and the University of Rochester are collaborating on a project to search the universe for signs of life via technosignatures, after receiving the first NASA non-radio technosignatures grant ever awarded, and the first SETI-specific NASA grant in over three decades. Researchers believe that although life appears in many forms, the scientific principles remain the same and that the technosignatures identifiable on Earth will also be identifiable in some fashion outside of the solar system. "Technosignatures relate to signatures of advanced alien technologies similar to, or perhaps more sophisticated than, what we possess," said Avi Loeb, Frank B Baird Junior Professor of Science at Harvard. "Such signatures might include industrial pollution of atmospheres, city lights, photovoltaic cells (solar panels), megastructures, or swarms of satellites."

<https://www.freepressjournal.in/science/new-study-to-search-the-universe-for-signs-of-technological-civilisations>

<https://www.centauri-dreams.org/2020/06/23/advancing-the-search-for-technosignatures/>

## **Why have we not found any Aliens**

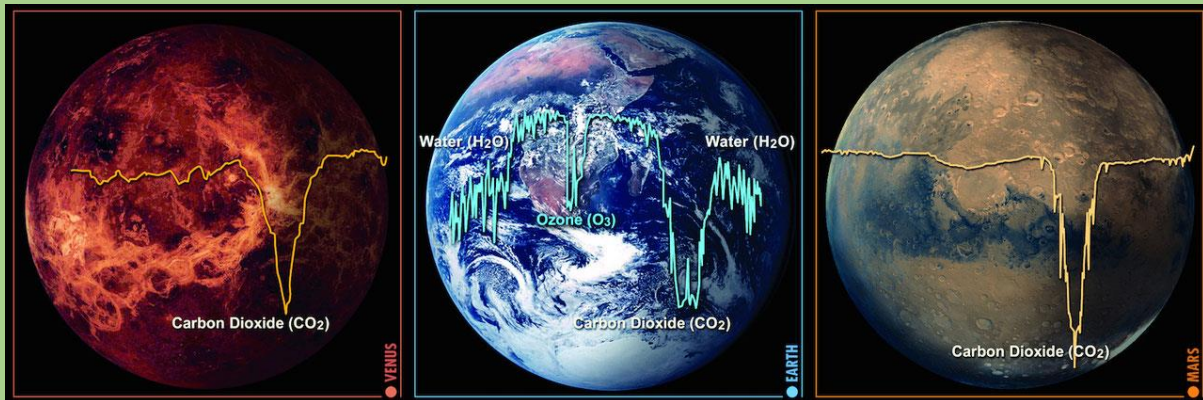
A [talk](#), a Royal Institution event, given by Keith Cooper editor of Astronomy Now. He explores how far SETI has come since its modest beginnings, where it's going and the assumptions that we make in our search for extra-terrestrial life. His book *The Contact Paradox* published by Bloomsbury is related to this talk

## **Space Missions**

### **Large Interferometer For Exoplanets (LIFE)**

A [mission](#) designed to characterise exoplanet atmospheres. LIFE is a project initiated in 2017 and officially kicked-off in 2018 to develop the science and technology and a roadmap for an ambitious space mission that will allow humankind for the first time to detect and characterize the atmospheres of dozens of warm, terrestrial extrasolar planets. Thanks to NASA's Kepler mission and dedicated, long-term exoplanet searches from the ground, we know that rocky exoplanets are ubiquitous in the Milky Way and very likely also in the immediate Solar neighbourhood. Detecting these nearest planets, understanding the (atmospheric) diversity of other worlds and searching for indications of habitability and biological activity is a cornerstone of 21st century astrophysics and will provide us a new perspective on our place in this vast Cosmos.





Of the four terrestrial planets in our Solar System, Venus, Earth and Mars possess significant atmospheres. Image credit: ESA 2001. Illustration by Medialab

Will exoplanets with similar properties in size and mass have also similar atmospheres? How common are habitable exoplanets?

### Space – stepping stones to other star systems

#### Moon

##### **UK's role in the Lunar Gateway**

The UK will play a key role in [NASA's Artemis mission](#). Businesses across the UK will be involved in [building the service module and habitation module](#) of the [Lunar Gateway](#), a new space station orbiting the moon, generating economic benefits and high-skilled jobs. The UK has already committed over £16 million for the first phase of the design of these elements.

##### **Permanent base**

[ESA's Moon Village](#). Jan Wörner, Director General of the European Space Agency, has a bold new vision for space exploration. "My intention is to build up a permanent base station on the Moon. Meaning that it's an open station, for different member states, for different states around the globe." See also

[https://www.esa.int/About\\_Us/Ministerial\\_Council\\_2016/Moon\\_Village](https://www.esa.int/About_Us/Ministerial_Council_2016/Moon_Village)

##### **Water**

NASA's Stratospheric Observatory for Infrared Astronomy (SOFIA) has confirmed, for the first time, water on the sunlit surface of the Moon. This discovery indicates that water may be distributed across the lunar surface, and not limited to cold, shadowed places.

"We had indications that H<sub>2</sub>O – the familiar water we know – might be present on the sunlit side of the Moon," said Paul Hertz, director of the Astrophysics Division in the Science Mission Directorate at NASA Headquarters in Washington. "Now we know it is there. This discovery challenges our understanding of the lunar surface and raises intriguing questions about resources relevant for deep space exploration." [https://www.nasa.gov/press-release/nasa-s-sofia-discovers-water-on-sunlit-surface-of-moon/#:~:text=NASA's%20Stratospheric%20Observatory%20for%20Infrared%20Astronomy%20\(SOFIA\)%20has%20confirmed%2C,sunlit%20surface%20of%20the%20Moon.&text=SOFIA%20has%20detected%20water%20molecules,in%20the%20Moon's%20southern%20hemisphere.](https://www.nasa.gov/press-release/nasa-s-sofia-discovers-water-on-sunlit-surface-of-moon/#:~:text=NASA's%20Stratospheric%20Observatory%20for%20Infrared%20Astronomy%20(SOFIA)%20has%20confirmed%2C,sunlit%20surface%20of%20the%20Moon.&text=SOFIA%20has%20detected%20water%20molecules,in%20the%20Moon's%20southern%20hemisphere.)

## Mars

### SpaceX Starship test flight

“Mars is looking real” says Elon Musk after the [first successful test flight](#) of its full-size Starship SN5 prototype.

And finally...for the fashionistas out there

More exoplanet T-Shirts - <https://www.redbubble.com/shop/exoplanet+t-shirts>



Roger Dymock

ARPS Assistant Director Exoplanets