**Astrobiology News February 2024:**
**Exoplanets and the Optimal Habitable Zone**

The Planetary Habitability Laboratory (PHL), maintained by the University of Puerto Rico at Arecibo, distinguishes two types of potentially habitable exoplanets: *optimistic* and *conservative*.[1] Worlds ranked among the conservative sample are more likely to have rocky compositions and support liquid surface water; however, the optimistic sample, which is characterized by somewhat larger and more massive exoplanets, may include some ocean worlds.[2] Of the more than 5,000 known exoplanets, only 29 are currently listed among the conservative sample, while 40 additional worlds fit the criteria for the optimistic sample. TOI-715 b is the most recently discovered exoplanet added to the conservative list.

At a distance of 137 light-years, and only about 1.5 times the size of Earth, TIO-715 b orbits within the habitable zone of its red-dwarf star.[3] This world may help astronomers better understand the formation of planetary systems, and why there appears to be a dearth in exoplanets between 1.5 and 2 times the mass of Earth orbiting low-mass stars.[4] The research team that made and confirmed the discovery of TIO-715 b, led by Georgina Dransfield at the University of Birmingham, also reported a second, possibly Earth-sized, exoplanet within the star's habitable zone.[5] If the second world is confirmed, it will represent the smallest habitable-zone exoplanet detected by the TESS mission[6] to date.

I remember the first Moon landing and the world-wide excitement it generated in 1969. I also recall how, during the brief three years between 1969 and when the Apollo Program ended in 1972, public reaction to human exploration of the Moon amazingly became "ho-hum, been there, done that." It has now been three decades since the discovery of the first exoplanets, and I fear that public responses to new exoplanet discoveries may be similar. Here's where I like to remind myself that for most of human history, generations passed without the world looking much different, and yet today, we take for granted the incredible technological breakthroughs that transform our lives every day and make possible knowledge that was inconceivable just a few generations ago.

The number of recognized potentially habitable exoplanets may seem exceedingly small – indeed, roughly 1% of the list of all currently known exoplanets – but as good as present surveys are, detecting Earth-sized planets in the habitable zones of Sun-like stars is in its infancy, as is our understanding of the conditions under which diverse types of life can flourish. Unless we experience a massive technological crisis, which, given all the existential threats we face today may be more likely than many assume, I suspect that within the span of a single human generation, we'll know whether life is common or rare in our little corner of the Milky Way Galaxy. This seems to be a good time to remind you

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[1] https://phl.upr.edu/hwc
[2] I've written about ocean worlds many times (see the Astrobiology News Archive: https://www.theclergyletterproject.org/Resources/Astrobiology.html)
[3] https://science.nasa.gov/universe/exoplanets/discovery-alert-a-super-earth-in-the-habitable-zone/
[4] https://academic.oup.com/mnras/article/516/3/4585/6692875
[5] https://academic.oup.com/mnras/article/527/1/35/7172075
[6] https://tess.mit.edu/

that you can be a part of the search for exoplanets by joining a project like Planet Hunters NGTS[7] on zooniverse.org!

Until next month,

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[7] https://www.zooniverse.org/projects/mschwamb/planet-hunters-ngts