

Astrobiology News January 2019: The Role of Citizen Scientists in New Discoveries

Zooniverse is the world's largest and most popular platform for online citizen science.¹ Last month, I mentioned the launch of *Planet Hunters TESS*; this month, I want to tell you about two exciting new discoveries by citizen scientists participating in *Exoplanet Explorers*, which uses data from the Kepler Observatory's Second Mission.² Both discoveries are described extensively in *Zooniverse* blogs posted on January 7th.³

Exoplanet K2-288b orbits in the habitable zone of the smaller of two low-mass red dwarf stars that form a binary system. Its size places it in a rare category of planets being dubbed "sub-Neptunes" – worlds thought to lie in a transition region between potentially habitable "super-Earths" and worlds more like the gas giants in our Solar System. K2-138g, just a bit smaller than Neptune, is the 6th planet discovered in the K2-138 system, which harbors a somewhat more massive "orange dwarf" star. The K2-138 system shares some similarities with the TRAPPIST-1 system, which you can read more about in the Astrobiology News posts from March and May 2017.⁴

What makes the K2-138 and TRAPPIST-1 systems similar is that the planets all orbit close to their stars, with very short periods. Five of the 6 planets in K2-138, and all 7 planets in the TRAPPIST-1 system, form a so-called *resonant chain*, where the planet orbits are related by the ratios of small integers. The orbiting bodies in such systems exert periodic gravitational influence on each other. In most cases, interactions such as these are unstable, but under some conditions, the resonances can be stable and self-correcting. Studying planetary systems like these yields important insights into how different types of planets form, and how resonant orbits remain stable.

This is not the first time that citizen scientists have played critical roles in discovering new planets – the first *Planet Hunters* project, which used data from the Kepler Observatory's original mission, resulted in 12 peer-reviewed academic publications, including the discovery of the 1st planet in a quadruple star system! With *TESS* data coming in fast and furious, there will likely be many more contributions to come!⁵ Those of you who have participated in *Zooniverse* projects also know that they span many

fields of academic research – not just science. Since the free do-it-yourself Project Builder was launched in 2015,⁶ researchers have been able to design their own projects, which has greatly increased the rate at which new projects can be launched on the website.

More projects mean we need more citizen scientists to join the “Zooniverse universe!” We are especially interested in helping religious and interfaith communities build and participate in projects that reflect their values and interests. For example, a science project might have the goal of alleviating suffering or protecting the environment; a humanities project might entail mining information from historical texts, art, or maps, that have been acquired from organizations, museums, or sacred sites. If Clergy Letter Project members have any ideas about projects that might interest you, please let me know!

Until next month,

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¹ <https://www.zooniverse.org/>

² https://www.nasa.gov/mission_pages/kepler/main/index.html

³ <https://blog.zooniverse.org/>

⁴ <http://theclergyletterproject.org/Resources/Astrobiology.html>

⁵ <https://www.zooniverse.org/about/publications>

⁶ <https://www.zooniverse.org/lab>