

## **Astrobiology News March 2016: Seeking Out Strange New Worlds**

In one of the most famous episodes of *Star Trek: The Original Series*, *The City on the Edge of Forever*, Captain Kirk strolls down a street in New York City circa 1930 with Edith Keeler, a woman on whom Earth's future depends. He points to the leftmost star in Orion's belt (Alnitak) and tells her that in about a hundred years a famous novelist native to a planet orbiting that star will write a classic on the theme "Let me help"<sup>1</sup>. Time travel aside, imagine being able to point to a star visible to your unaided eye in the night sky and tell your neighbor – or your children – all about an Earth-like planet that orbits that star. That day may come sooner than you think!

Seven years ago this month, NASA's Kepler observatory was launched into space. Its mission was to search for exoplanets, planets orbiting distant stars. That mission has resulted in the discovery and confirmation of over 1,000 exoplanets, with thousands of exoplanet candidates awaiting confirmation. Most of these orbit faint, distant stars; however, next year, NASA will launch an observatory whose mission is to search for exoplanets orbiting bright, "nearby" stars. Whereas Kepler observed stars as distant as 3,000 light years by "staring" at a relatively small patch of sky in the Milky Way (about the size of your hand at arm's length, projected onto the sky), the Transiting Exoplanet Survey Satellite (TESS)<sup>2</sup> will conduct a survey of stars to distances of about 200 light years across nearly the entire sky. I encourage you to check out the details of TESS's design in *Hunting for Exoplanets Via TESS*<sup>3</sup>.

Kepler's goal was to gather statistics on numbers and types of exoplanets in order to help us understand the population as a whole. In contrast, TESS will monitor hundreds of thousands of bright, nearby stars during a 2-year mission. It is expected to catalog thousands of exoplanet candidates, including about 500 the size of Earth or slightly larger worlds known as "Super-Earths", which haven't had analogs in our Solar System (but see my January Astrobiology News article!) The proximity and brightness of the stars in the survey will make many follow-up observations possible, from the ground as well as from space. This will enable far more detailed studies of the properties of any discovered exoplanets. A technique known as transit spectroscopy can be used to infer the composition, and possibly the structure, of exoplanet atmospheres, by making observations across a range of different colors, or wavelengths, of light. This technique can tell us a lot about a planet's potential habitability.

We may not be traveling to worlds outside our Solar System anytime soon, even neighboring worlds, but you can take a virtual voyage to any of the currently known

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<sup>1</sup> <http://www.chakoteya.net/StarTrek/28.htm>

<sup>2</sup> <http://tess.gsfc.nasa.gov/>

<sup>3</sup> [www.manyworlds.space/index.php/2016/03/15/hunting-for-exoplanets-via-tess/](http://www.manyworlds.space/index.php/2016/03/15/hunting-for-exoplanets-via-tess/)

exoplanets by downloading NASA's *Eyes on Exoplanets*<sup>4</sup>. This is a great visualization tool that accurately renders 3D space. You can find out how long it would take to travel to a given exoplanet using various modes of transportation, compare the orbits of these worlds with the orbits of planets in our Solar System, and seek out exoplanets in the "habitable zones" of their stars, where temperatures are right for liquid water to exist. Be forewarned – once you start playing with this tool you may be hooked!

By the way, *Star Trek* authorities have suggested that Mr. Spock's home world, Vulcan, orbits a star a little over 16 light years away known as 40 Eridani A. Whether this star harbors actual exoplanets is not yet known, but may be in the near future! Under clear, dark-sky conditions (perhaps with the help of a star chart), you can locate this dim, naked-eye star about an hour west of the bright star Rigel in Orion. Rigel is easily visible in the western sky during evening hours before midnight in the early spring. By the time the new *Star Trek* movie comes out this summer, both stars will both be lost in the glare of our Sun.

Clear Skies,

Grace

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<sup>4</sup> <http://eyes.jpl.nasa.gov/eyes-on-exoplanets.html>