Astrobiology News September 2016:
A Potentially Habitable Exoplanet in Our Cosmic Backyard

A few weeks ago, the discovery of an exoplanet slightly more massive than the Earth orbiting the Sun's nearest stellar neighbor[1] brought the discussion of searching for life beyond our Solar System very close to home (close on a cosmic scale, anyway)! A "mere" 4.25 light-years distant, Proxima Centauri b orbits its M-dwarf star with a period of just over 11 days. Its small orbit - about 20 times smaller than the Earth's orbit about the Sun - places this world at the right distance from its cool, dim, red star to have a temperature in the right range for liquid water.

M-dwarf stars offer particularly intriguing, as well as challenging, environments, for hosting habitable exoplanets. On the one hand, these stars are very abundant, comprising about 70% of all the stars in our Galaxy. They also have lifetimes of trillions of years, good news for the development and possible longevity of complex life, or even civilizations, that might evolve. On the other hand, M-dwarf stars suffer frequent and intense outbursts of damaging ultraviolet (UV) radiation. Additionally, exoplanets having temperatures conducive to life as we know it have to orbit so close to these cool stars that they would be *tidally locked*, presenting the same face to their stars all the time (as the Moon does to the Earth).

These challenges aren't necessarily showstoppers for life. For example, some forms of life on Earth absorb harsh UV and transform it to less energetic light, leading to the suggestion that biofluorescence might be an evolutionary adaptation for life in the presence of stars subject to such temperamental outbursts.[2] In any event, Proxima Centauri b surely warrants considerable future study. In fact, it's already the suggested target of a proposed robotic mission. The idea is to accelerate a tiny nanocraft to 20% of the speed of light using powerful lasers, enabling a close-up look at this distant world after a journey of 20-25 years, followed by another 4 years for Earth to receive whatever information the tiny probe transmits back.[3] The project itself has a 10-year development timeline; nevertheless, the fact that such an interstellar voyage might be accomplished within a century of the launch of Earth's first artificial satellite is remarkable!

I encourage everyone to read a blog written by my Adler colleague, Lucianne Walcowicz: *Do Dolphins Dream of Space Travel?*[4]. Lucianne's research focuses on the potential habitability of exoplanets orbiting M-dwarf stars. By the way, if you happen to live in Chicagoland and you're a fan of science fiction, you'd probably enjoy the Adler Planetarium's *REEL Science* Film Series, where we watch popular science fiction movies and then discuss some of the *real* science relating to the movie themes afterwards. In a continuing celebration of the 50th anniversary of *Star Trek*, October's movie will be *Star Trek IV: The Voyage Home*[5], which speculates that whales might be more interesting than humans to a hypothetical extraterrestrial civilization…

Until next month,

Grace

P.S. *A personal invitation*: In April 2015, I wrote about the relevance of so-called "yellowballs", discovered by citizen scientists working on the *Milky Way Project* (MWP), to understanding the origin of our Solar System[6]. The MWP[7] was just re-launched with incredible new images and better measuring tools to catalog signposts of star formation across our Galaxy. My colleague, Charles Kerton, and I are leading the yellowball study and need your help classifying the new images – please consider going to the website and joining us in this effort!

Grace Wolf-Chase, Ph.D. (gwolfchase@adlerplanetarium.org)

---

[1] http://www.jpl.nasa.gov/news/news.php?feature=6600

[2] http://news.nationalgeographic.com/2016/08/planet-proxima-centauri-life-glowing-corals-radiation-space-science/

[3] http://www.space.com/33844-proxima-b-exoplanet-interstellar-mission.html

[4] http://blogs.scientificamerican.com/guest-blog/do-dolphins-dream-of-space-travel/

[5] http://www.adlerplanetarium.org/events/reel-science-star-trek-iv-10-06-16-2016-10-06/

[6] http://www.theclergyletterproject.org/pdf/abnews42015.pdf

[7] https://www.zooniverse.org/projects/povich/milky-way-project