"Constraining the Drake Equation: The Past, Present, and Future of the Search for Life"

Dr. Kaitlin Rasmussen, University of Michigan

Thursday September 16th, 12-1pm, Planetary Hall 263

Abstract:
Are we alone in the Universe? 60 years ago, Frank Drake posed a unique answer to that question, positing that, given a handful of statistics about the local galaxy, one could calculate the number of intelligent civilizations currently residing in the Milky Way. Today, that equation poses a serious question to astrophysics: how can we better constrain those statistics?

First, I will address the "f_p" factor: the number of planets per star. While surveys such as TESS and Kepler have offered powerful constraints on planet formation around solar-type stars, the origins of planet formation remain a mystery. The Search for Exoplanets Around Metal-poor Stars with TESS (SEAMSTRESS) Survey is looking for the first exoplanets to form in the Universe, addressing several important questions: At what metallicity did planet formation begin? What physical mechanisms were responsible? What were the first planetary systems like?

Next, I will talk about the "n_e" factor: the number of planets which could support life. My present work studying the atmospheres of hot- and ultra-hot Jupiters at multiple orbital phases serves as a perfect testing ground for the statistical methods which will one day constrain the atmospheres of Earth-sized planets, answering the question: Is it Earth-like? Venus-like? Mars-like?

Finally, I will lead into the "f_l" factor, the fraction of habitable planets which could support life. One of the biggest challenges faced by the next generation of telescopes will be the massive degeneracy of possible atmospheres on Earth- and super-Earth-sized worlds. I will discuss new and intriguing techniques for characterizing both biosignatures and anti-biosignatures in the very-low signal-to-noise regime and address the question: Could life develop on a given planet?

Bio:
Dr. Kaitlin Rasmussen received her undergraduate degree in Astrophysics from Florida State University, and her PhD in Physics from University of Notre Dame. She is currently a postdoc working with Prof. Emily Rauscher at University of Michigan, where she focuses on early planet formation, improving methodology for exoplanet spectroscopy, and characterizing the next generation of spectrographs toward the search for life.