## Astrobiology News August 2018: A Planet is Born!

Over the past few decades, we've accumulated increasing evidence that indicates most stars should be accompanied by planet-sized worlds. We've detected thousands of *exoplanets* orbiting stars, and we've observed dusty *protoplanetary* disks, comparable in size to our Solar System, surrounding young stars. Now, thanks to new high resolution imaging abilities, we are beginning to learn how planets actually form within those disks.

Earlier this year, two independent research teams detected indirect evidence of planets forming within the disk of a young star known as HD 163296, by studying the motions of gas within the star's disk using the Atacama Large Millimeter/submillimeter Array (ALMA)<sup>1</sup>. Just last month, a gas giant exoplanet known as PDS 70b became the first newly forming planet to be imaged directly with the European Southern Observatory's Very Large Telescope, and a new study has measured the rate at which the planet is growing.<sup>2</sup> PDS 70b is "only" 370 light-years away and its star is a "mere" 10 million years old!

The new study makes use of an *adaptive optics* system on the 6.5-meter Magellan Clay Telescope in Chile. Adaptive optics is a technique used to remove distortions (aka "twinkling") produced as a star's light passes through Earth's atmosphere.<sup>3</sup> The research team used the luminosity of a spectral line emitted by hydrogen, known as H-alpha, to trace the amount of hot hydrogen gas falling onto the planet. They found the gas giant planet is currently growing at the rate of about one hundred millionth of the mass of Jupiter per year, and is likely to be near the end of its growth period.<sup>4</sup> Observing a variety of planets in the act of forming will help us better understand the amazing diversity of distant worlds.

On a separate note, I would like to remind folks of a public event entitled *Becoming Interplanetary: What Living on Earth Can Teach Us about Living on Mars*, which will be held at the Library of Congress on September 27, 2018. Check out the web site for details as they become available, and note that the day's events will be streamed online for remote viewers!<sup>5</sup>

Until next month,

## Grace

<sup>1</sup> Teague, R. et al. 2018, *A Kinematical Detection of Two Embedded Jupiter-mass Planets in HD 163296*, ApJL, 860, L12 and Pinte, C. et al. 2018, *Kinematic Evidence for an Embedded Protoplanet in a Circumstellar Disk*, ApJL 860, L13.

<sup>3</sup> Although initially developed for astronomical imaging, adaptive optics has found many applications in medical imaging, including the way vision scientists and opthalmologists view the retina.

<sup>4</sup> Wagner, K. et al. 2018, *Magellan Adaptive Optics Imaging of PDS 70: Measuring the Mass Accretion Rate of a Young Giant Planet within a Gapped Disk*, ApJL, 863, L8. <sup>5</sup> https://www.decolonizemars.org/becoming-interplanetary/

<sup>&</sup>lt;sup>2</sup> https://aasnova.org/2018/08/17/planet-formation-caught-in-the-act/