Astrobiology News September 2017:
Taking the Plunge: Cassini's Final Act

I remember my first view of Saturn through the small telescope my mother purchased for my 16th birthday. Although some celestial wonders may disappoint when viewed through a small telescope, Saturn is not one of them! Several years later, while I was a student at Cornell University, Pioneer 11 brought us the first awesome images of Saturn's F-ring, with its striking "braided" appearance, produced by a delicate interaction with two small shepherd satellites[1]. At about the same time, I took an astronomy course from a pioneer in the field of radar studies of small Solar System bodies, who hired me to work with data from the Arecibo Observatory in order to explore the properties of Saturn's remarkable rings. Although he passed away far too early, I am forever indebted to Steve Ostro for his wonderful mentorship of a shy neophyte - a printout of the old Fortran program we used remains in my office to this day, over 35 years later.

In 2006, a quarter century after Pioneer's visit to Saturn, I helped organize a "Pale Blue Dot" workshop at the Adler Planetarium. This workshop, 3rd in a series of conferences named for Carl Sagan's eloquent description of Voyager 1's famous view of the Earth[2], brought together scientists from diverse disciplines in the budding field of astrobiology to consider the challenges in finding habitable, and possibly inhabited, worlds. During the workshop, we were treated to a hot-off-the-presses image of pale blue dot Earth seen through Saturn's rings by the Cassini spacecraft[3]. Since its insertion into orbit around Saturn in 2004, Cassini has revolutionized our understanding of this stunning planet, its rings, and moons, some of which may harbor environments conducive to life.

Cassini's 13-year mission ended on September 15th, as it plunged into Saturn's atmosphere[4]. The spacecraft's final act ensured that it wouldn't impact and contaminate Saturnian moons that might support life. First there's Titan, whose active hydrologic cycle including rain, rivers and lakes, is based not on water, but liquid methane and ethane. Titan also harbors a liquid ocean beneath its surface, which is likely composed of water and ammonia[5]. Then there's Enceladus, with its geysers consisting of ice, water vapor, and organic compounds. These geysers provide a unique access to the subsurface ocean under the icy crust of

this remarkable world[6]. Enceladus is a prime target to search for evidence of life in its icy plumes – its allure has motivated a Special Collection of free articles in the journal *Astrobiology*[7].

Cassini's many discoveries reignite the curiosity of my 16-year-old self, as I glimpsed this "Jewel of the Solar System" for the first time. Cassini was the first spacecraft to visit Saturn since Voyager 2's flyby when I began graduate school in 1981 – hopefully, the next mission will be forthcoming on a much shorter time frame, and will answer the fascinating question of life on one of Saturn's astonishing moons.

Until next month,

Grace

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[1] https://airandspace.si.edu/exhibitions/exploring-the-planets/online/solar-system/saturn/braided-ring.cfm
[2] https://www.nasa.gov/jpl/voyager/pale-blue-dot-images-turn-25
[3] https://www.nasa.gov/vision/universe/starsgalaxies/dotf-20061101.html
[4] For a moving account of Cassini's legacy, see http://www.planetary.org/blogs/emily-lakdawalla/2017/0915-cassini-the-dying-of-the-light.html
[5] https://saturn.jpl.nasa.gov/science/titan/
[6] https://science.nasa.gov/science-news/science-at-nasa/2014/27jul_101geysers
[7] http://online.liebertpub.com/toc/ast/17/9