Proposal for an independent mission to land on Enceladus

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1 Background

Enceladus is a good candidate moon to look for life because it is a moon of Saturn, we have the technology to get there, and Cassini observed plumes that indicate presence of tiny particles during its flyby of Enceladus. There are lots of scientific papers that discusses how Enceladus is likely to have life. A "paper about Darwinism" [1] suggested in its conclusion that searching for poly-electrolyte genetic molecules can prove that life can evolve in Enceladus. The presence of poly-electrolyte genetic molecules would demonstrate that there is a biosphere in Enceladus.

Both the "Can life begin on Enceladus" [2] and the "Could it be snowing microbes on Enceladus" [3] argue that there can be microorganisms in Encelauds' hydrothermal vents because its hydrothermal vents are very similar to that of Earth' hydrothermal vents. It is known that there are microorganisms and macroorganisms around earth's hydrothermal vents in deep ocean without light. Therefore a similar condition inside of Enceladus can have similar living beings. If true then there could be snowing microorganisms on Enceladus surface due to the moon's occassional outburst of water/materials from underneath that fall back on the surface.

2 Method

My proposal is for NASA to allocate enough money to fund a mission for a space probe to land on the surface of Encelauds and collect any plumes, microorganisms, and poly-electrolyte genetic molecules. If there are budget constraints that are too tight then maybe the Europa Clipper can land on Enceladus after it has completed its mission in Europa.

In order for a probe to capture and collect plumes and microorganisms all the probe needs to do is have a flat surface and expose the surface to the skies of Enceladus. If the theory in the snowing microbes paper is correct then the probe's surface would have collected lots of microorganisms since they are

snowing from the sky. There are already existing methods to detect plumes both on earth and outside of Enceladus as Cassini has done.

In order for a probe to capture and collect poly-electrolyte genetic molecules, the following figure from the "Darwin paper" [1] demonstrates how.

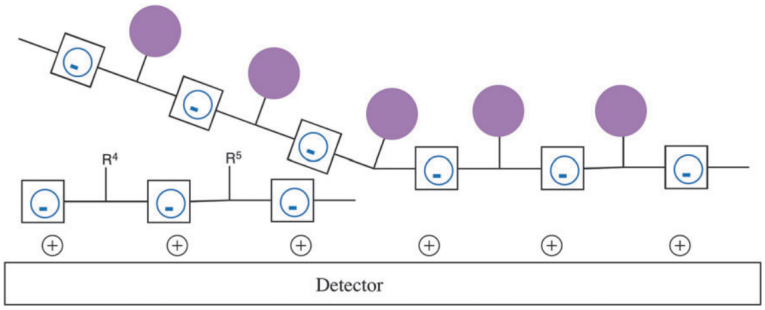

FIG. 4. A detector with a repeating positive charge on the surface could detect anionic Darwinian biopolymers in the enceladan geyser, by specific adsorption of the polyelectrolyte polymers onto that surface. A corresponding surface with a repeating negative charge could detect any cationic Darwinian biopolymers that might be in the geyser. Here, detection would be by displacement from the surface of a fluorescently tagged (magenta circles) short polyanionic biopolymer.

References

[1] Steven A. Benner. *Detecting Darwinism from Molecules in the Enceladus Plumes, Jupiter's Moons, and Other Planetary Water Lagoons.* Astrobiology, 2017.

[2] David Deamer and Bruce Damer. *Can Life Begin on Enceladus?* Astrobiology, 2017.

[3] Carolyn C. Porco; Luke Dones; Colin, Mitchell. *Could It Be Snowing Microbes on Enceladus? Assessing Conditions in Its Plume and Implications for Future Missions.* Astrobiology, 2017.