All that life needs on Enceladus

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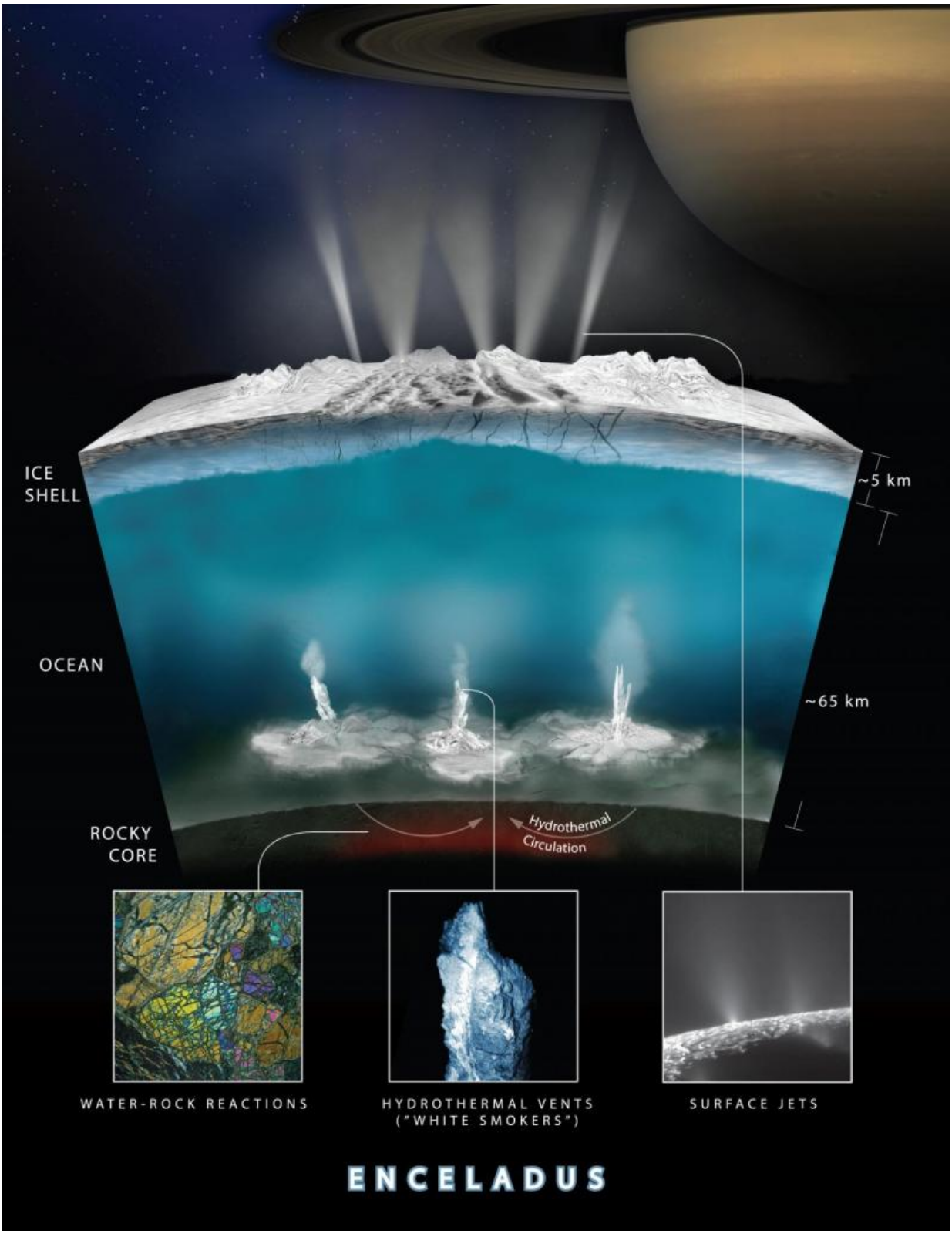


Artist's rendition of Enceladus Hydrothermal Activity. Scientists on NASA's

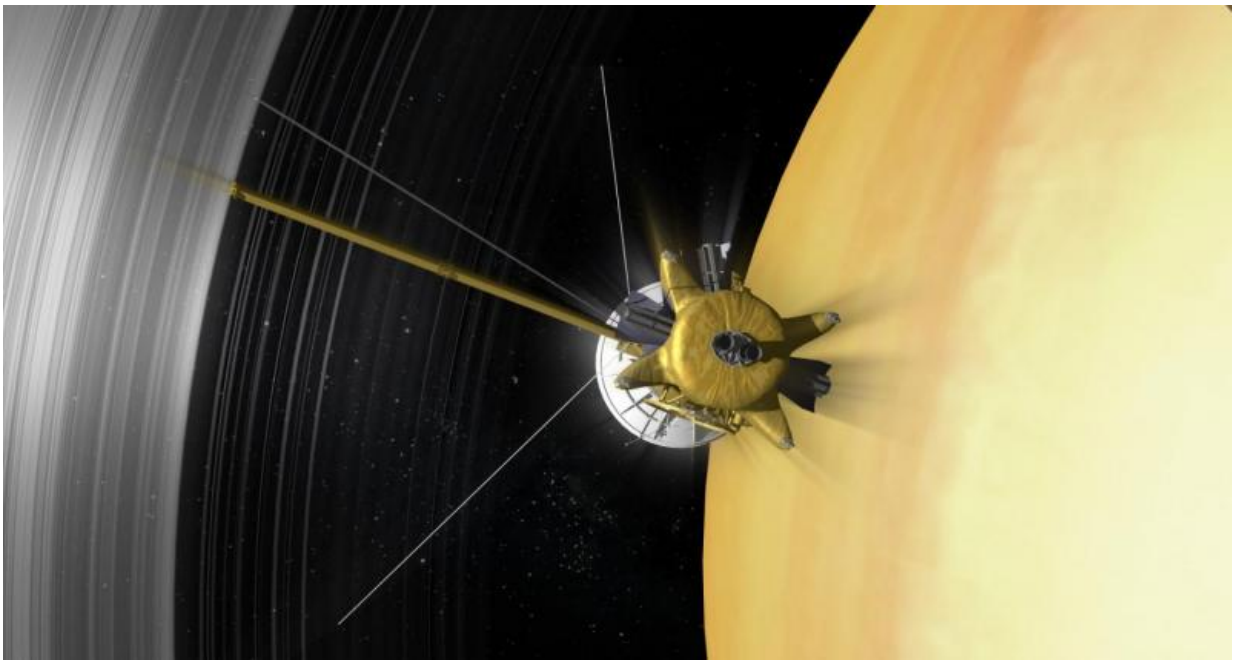
Cassini mission conjecture that this is how water interacts with rock at the bottom of the ocean of Saturn's icy moon Enceladus, producing hydrogen gas (H2). Credit: NASA

If chemical energy is life's coin and water is life's marketplace, there may be a swift economy alive and well beneath the icy shell of Saturn's brightest moon. Such was the announcement during NASA's April 13th press conference: that all three of the presumed key ingredients for life have been detected coming from Enceladus.

Since the unexpected discovery in 2005 that Saturn's icy moon actively vents gas, the Cassini spacecraft has buzzed the little body dozens of times. Using these flybys, scientists at NASA, ESA, and the Italian Space Agency, have discovered important details about the icy world, including the depth of the ice shell and acidity of the subsurface ocean. Most importantly, Cassini has conducted numerous content analyses of the vented plumes – giant spouts of liquid jetting miles out of Enceladus' southern pole. Billions of miles away, back on Earth, the signals from these analyses have been probed for signs that water, energy, and chemicals like carbon, hydrogen, nitrogen, and oxygen are all present in that far-off, deep ocean.

The results of a 2015 plume snapshot taken only 49 km over Enceladus' surface were finally revealed. During that daring deep-dive, Cassini's chemical-sniffer definitively found molecular hydrogen in the jet water. On Earth, molecular hydrogen, or H2, enters ocean water where hot hydrothermal vents emerge from the ocean floor. On Earth, the ensuing chemistry between heated rock and elements in salt water powers abundant life forms: everything from one-celled microbes to tube worms and crabs. This chemical mixture of water and H2 spouting out of Enceladus, in the words of Hunter Waite, team lead on the instrument

that detected the H2, "shows the potential for the existence of life in this interior ocean."



Artist rendition of Cassini spacecraft. Credit: NASA

When all of the necessary ingredients for – water, chemicals, and energy – appear to be available on another world – what comes next?

This September, Cassini will end its 20-year mission with the deepest dive of all: into Saturn's atmosphere. It remains to be seen what will follow in the wake of a generation of powerful, invaluable planetary research: research that has just found the best evidence yet of where life beyond Earth may be waiting to be discovered.

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