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Concepts for a Titan Explorer

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Titan is a complex, Earth-like system abundant with organics and provides an incredibly rich target for scientific exploration. Titan has the largest concentration of organic material in the Solar System aside from Earth, and an active hydrological cycle, with methane instead of water. Titan's clouds, rain, and greenhouse effects may provide important lessons for Earth. Titan's landscape features dunes, streambeds, and mountain ridges, as well as polar lakes filled with liquid hydrocarbons. The thick, nitrogen rich, atmosphere varies seasonally in temperature, dynamical behavior, and composition. Titan, with low gravity and a thick atmosphere, is uniquely accessible for in situ exploration, allowing a broad range of scientific tools to be brought to bear.

A Broad Set of Attractive Mission Concepts Are Feasible. Orbiters, Landers, and Aerial Vehicles are ideal mission elements with the potential to provide synergistic science at multiple, complementary scales. A flagship mission to Titan could be launched in 2018 arriving at Titan in the 2025-2026 timeframe. A 4-year orbital mission could return orders of magnitude more data about Titan than Cassini. Lander and Aerial Vehicle (Balloon) elements are tremendously enhanced by data relay from the Orbiter and provide in situ measurements as well as scientific context for remote sensing.