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Science Highlights from Cassini/Huygens mission to Saturn System

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Cassini, the most distant planetary orbiter ever launched, arrived at Saturn in 2004. For the next 13 years, through almost half a Saturnian year, this spacecraft made astonishing discoveries about the planet, rings and moons, reshaping and fundamentally changing our understanding of this unique planetary system. Cassini sent back its final bits of unique science data on 15 September 2017, as it plunged into Saturn's atmosphere, vaporizing and satisfying planetary protection requirements.

Among many firsts, Cassini discovered icy jets of material streaming from tiny Enceladus' south pole proving that it is the source of the E Ring and that its water dominates the magnetosphere; found hydrocarbon lakes and seas on Titan; detected sub-surface oceans in Enceladus and Titan; provided multi-wavelength coverage of a great northern storm, the first of its kind on Saturn since 1990; demonstrated that the Saturn Kilometric Radiation period does not reflect the planet's internal rotation; revealed curtain-like aurorae flickering over Saturn's poles; and constrained our understanding of the 3D structure and dynamics of multi-particle ring systems. In addition, the Huygens probe sent back amazing images of Titan's surface and made detailed measurements of atmospheric composition, structure and winds.

During its last year of exploration, Cassini completed its investigations of the Saturn system, probed as-yet unsolved mysteries, observed seasonal and temporal changes, and addressed new questions that arose during the mission, some of which could only be answered during the final, unique orbits plunging between the rings and planet. Science highlights and new mysteries gleaned from the Ring Grazing and Grand Finale orbits will be discussed.The research described in this paper was carried out in part at the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.