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Entry Probe Missions to the Giant Planets

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The primary motivation for in situ probe missions to the outer planets derives from the need to constrain models of solar system formation and the origin and evolution of atmospheres, to provide a basis for comparative studies of the gas and ice giants, and to provide a valuable link to extrasolar planetary systems. As time capsules of the solar system, the gas and ice giants offer a laboratory to better understand the atmospheric chemistries, dynamics, and interiors of all the planets, including Earth; and it is within the deep, well-mixed atmospheres and interiors of the giant planets that pristine material from the epoch of formation can be found, providing clues to the local chemical and physical conditions existing at the time and location at which each planet formed.

Detailed explorations and comparative studies of the gas and ice giant planets will provide a foundation for understanding the integrated dynamic, physical, and chemical origins, formation, and evolution of the solar system. To provide a basis for significantly improved interpretations of the Galileo Jupiter probe measurements and to allow for comparative studies of gas giants Jupiter and Saturn, an entry probe mission to Saturn is needed. To provide a basis for comparative studies of the gas giants and the ice giants a probe mission to either Uranus or Neptune will be needed.

This poster summarizes a white paper prepared for the Space Studies Board's 2013-2022 Planetary Science Decadal Survey. The poster discusses specific measurements to be made by planetary probes at the gas giants, rationales and priorities for those measurements, and locations within the destination atmospheres where the measurements are best made.