

THE NEPTUNE CHALLENGE: MANY ANSWERS AND MORE QUESTIONS

In August, 1989, this journal published a collection of papers responding to Alex Dessler's challenge to the community to make predictions of what Voyager 2 might find during its encounter with Neptune later that month. As expected, Voyager revealed a giant planetary system of surprising diversity as described in the first reports in *Science*, 246, 1361-1532, 1989. A close polar flyby allowed magnetospheric studies over a wide range of latitudes, showing that Neptune's magnetic field is unexpectedly tilted and offset like that of Uranus. Although weakly heated by the Sun, Neptune's atmosphere is surprisingly dynamic, with a large anti-cyclonic storm system and high-speed winds. Voyager also discovered three ring arcs embedded in one of four complete, but tenuous rings, with six small satellites orbiting nearby. A close flyby of Triton revealed an atmosphere of nitrogen with a trace of methane, a bright polar cap, and several active geyser-like plumes.

In the year since the encounter, the investigators have refined their observations and they and others have developed considerably more detailed interpretations as indicated in the papers published in this special section. Several papers deal with properties of the magnetosphere associated with the large tilt and offset of the field or arising from the presence of Triton. Others provide new insight into Triton's unique surface, atmosphere, and ionosphere, and some compare new models for the interiors of Uranus and Neptune, discuss aspects of Neptune's atmosphere, or consider the character of rings that are unusually dusty.

The papers in this section also illustrate that although previous encounters have significantly increased our understanding of giant planetary systems, there is much to be learned from Neptune that will further improve our understanding of the complex processes responsible for the diversity revealed by the Voyager exploration of the outer solar system.

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