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FOREWORD

The exploration of the planets is the modern counterpart to the exploration voyages of old. To reach the new world Columbus had to secure funding from Queen Isabella, outfit his three ships and set sail on a long journey. To explore the American Pacific Northwest, Lewis and Clark had a similar task of obtaining funding, purchasing equipment and going to points unknown, even though their path was across land and not sea. Today our journey is through space, rather than across land or sea, but we still travel with ships, now spaceworthy craft, rather than seaworthy. Our spacecraft are smaller than the ships of yore, crammed with electronics rather than provisions because man cannot go along on these journeys. We now rely on robots to be our eyes and ears at these distant worlds. Nevertheless, some aspects of exploration have not changed over the centuries. People are still fascinated by these unknown worlds and desire to explore them, and the process of obtaining the large sums of public moneys to finance these journeys still requires much pleading with authorities.

Saturn has long fascinated astronomers, planetary scientists, and the public at large, at first because of its prominent ring system and later because of its copious and varied moons, including Titan, one of the largest moons in the solar system, and the one having the most extensive atmosphere. Saturn, in fact, offers something for every discipline within the planetary sciences. While Saturn's structure and composition are similar to those of Jupiter its smaller size produces a magnetic field that is much different to that of Jupiter. Saturn's atmosphere has tremendous winds and storms like Jupiter, but the visible structure associated with these winds is generally veiled in an impenetrable haze. Saturn has a ring system vastly more developed than that of any other planet. It has a system of moons that are varied in their dynamical behavior, their apparent surface composition and interior structure, and atmospheric pressure. Surrounding this system is a large magnetic cocoon that protects Saturn from the direct effects of the solar wind. Now Saturn is to be probed with perhaps the most comprehensive single robotic mission ever flown to a planet, the Cassini-Huygens mission, respectively consisting of an orbiter (Cassini) and a probe (Huygens) provided (principally) by the two major partners NASA and ESA. This mission covers the full gamut of planetary discipline areas.

The orbiter carries the probe into orbit about Saturn. It then releases the probe into the atmosphere of Titan and relays the probe data back to Earth. After having accomplished its relay role, the orbiter continues to map the environment of Saturn for a total four years, and maybe more if an 'extended mission' can be performed.

Assembling a description of this ambitious mission has been almost as complex as the mission itself. We have split this special issue of Space Science Reviews into two volumes rather than attempt simultaneous publications of the entire set of articles. The articles in this first volume consist of three logical groups. The first five

articles describe the Cassini-Huygens mission, the Huygens probe, the Orbiter's tour around Saturn and the mission design. The next five articles describe the present state of understanding of Saturn environment and the science objectives of the mission. The last six articles describe the instrumentation and investigations on the Huygens entry probe that will make measurements of the atmosphere and perhaps the surface of Titan. These instruments will provide much of the initial science return of the mission and an exciting introduction to the evolving understanding of the Saturn system that the Cassini-Huygens mission will bring.

The purpose of these volumes is to provide interested planetary scientists with insight into the objectives of these investigations and how they are to be carried out. Whether these scientists are simply interested in the scientific results or in using the data themselves, they should find these articles helpful. The compilation of this volume is due to the efforts of many individuals, especially the referees and authors who worked together to develop what we hope is a readable and complete description of the mission. We especially wish to thank Anne McGlynn who assisted me in assembling this volume through much of its formulation.

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