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PIONEER 11 WILL FLY OUTSIDE RINGS OF SATURN

NASA's Pioneer 11 will fly just outside the rings of Saturn during the first encounter with the giant planet in 1979.

The spacecraft will pass 30,000 kilometers (18,000 miles) from the edge of the outer ring and will swing in, under the ring plane, to a distance of 25,000 km (15,000 mi.) from the surface of Saturn.

The decision to fly outside the rings rather than to pass inside them was made recently by Dr. Noel W. Hinners, NASA Associate Administrator for Space Science, and A. Thomas Young, Director of Planetary Programs.

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FLY OUTSIDE RINGS OF SATURN (National
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The decision is based primarily on the desire of the space agency to use Pioneer as a pathfinder for two Voyager spacecraft which are headed for Saturn encounters in 1980 and 1981.

Voyager 1 is scheduled to encounter Saturn in November 1980 after flying past Jupiter, followed by Voyager 2 in August 1981. If all goes well at Saturn, the option is available for Voyager 2 to head for a Uranus encounter in 1986.

Pioneer's outside pass will cross the ring plane at about the same distance as the trajectory that would use Saturn's gravity to hurl Voyager 2 towards Uranus.

Because of the uncertainties with the ring crossing even at 30,000 km (18,000 mi.) from the outer edge of the rings, "it is essential for us to do everything we reasonably can to ensure Voyager's success," according to Young.

If Pioneer does not survive the rings at Saturn, NASA will almost certainly have to reassess its plan to continue to Uranus with Voyager 2, according to agency officials.

"Alternatively, a successful Pioneer will greatly increase our willingness to commit Voyager 2 to the Uranus option, even if Voyager 1 has perhaps not achieved all of its objectives at Saturn," Young said. "Thus either survival or non-survival of Pioneer on the outside trajectory can have an important influence on Voyager plans, and therefore on achieving the maximum science return from all three spacecraft."

Chances of surviving the outside pass are estimated to be much greater than those of surviving an inside pass, which would have brought Pioneer as close as 6,000 km (3,700 mi.) to the planet.

The Pioneer project office at NASA's Ames Research Center, Mountain View, Calif., and most of the Pioneer scientific investigators had favored a trajectory which would have taken Pioneer inside the rings.

Pioneer was targeted for Saturn after providing man with his second closeup look at Jupiter in December 1974. A sister spacecraft, Pioneer 10, flew past Jupiter for the first time in December 1973. The 1979 Pioneer flyby will mark the first encounter with Saturn.

The rings of Saturn are an extraordinary phenomenon familiar to every amateur astronomer. The rings were discovered by Galileo in his primitive telescope, but they were first recognized as rings by Christiaan Huygens in 1656. Until the recent discovery of the rings of Uranus, Saturn was believed to be the only ringed planet in the solar system. The four rings (the fourth was discovered in 1969) range outward some 137,000 km (85,000 mi.) from the center of Saturn. The widths of the rings range from 25,000 km (16,000 mi.) for the innermost to 16,000 km (10,000 mi.) for the outermost ring.

Relative to their diameter, the rings are very thin, with estimates ranging from a few inches to 16 km (10 mi.). When viewed edge-on from Earth, the rings are practically invisible. When viewed at an angle, they are a brilliant sight.

In 1970 astronomers determined that the ring particles were made of ordinary water ice. Radar measurements made in 1973 indicate that the rings contain large chunks of solid material in orbit like a swarm of tiny moons, but scientists still don't know whether the smaller particles are mostly snowball-sized or still smaller, perhaps no larger than a grain of sand.

The origin of Saturn's rings is not known for sure. Scientists speculate that a large satellite once wandered too close to Saturn and was torn apart by the planet's gravitational forces. Another theory is that the same forces prevented the satellite from ever forming out of the material in the rings.

Saturn itself is about 120,000 km (74,000 mi.) in diameter. Its mass is calculated to be 95 times that of Earth. Yet it is believed to be a gaseous body with a density less than water.

Saturn's atmosphere is mostly hydrogen. One of 10 moons circling Saturn, Titan, is the largest satellite of any planet. It is also the only known moon with an appreciable atmosphere.

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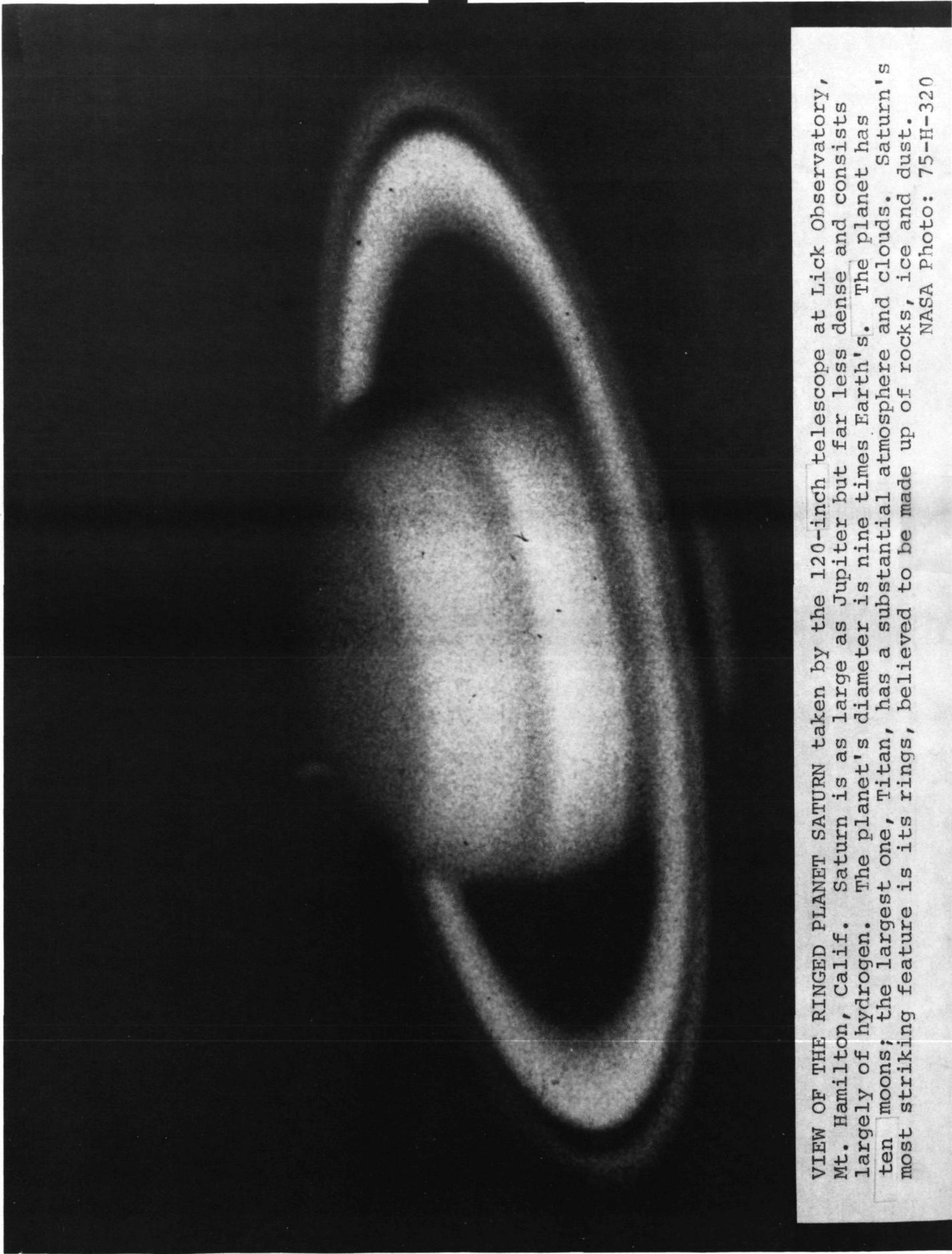
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VIEW OF THE RINGED PLANET SATURN taken by the 120-inch telescope at Lick Observatory, Mt. Hamilton, Calif. Saturn is as large as Jupiter but far less dense and consists largely of hydrogen. The planet's diameter is nine times Earth's. The planet has ten moons; the largest one, Titan, has a substantial atmosphere and clouds. Saturn's most striking feature is its rings, believed to be made up of rocks, ice and dust.

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