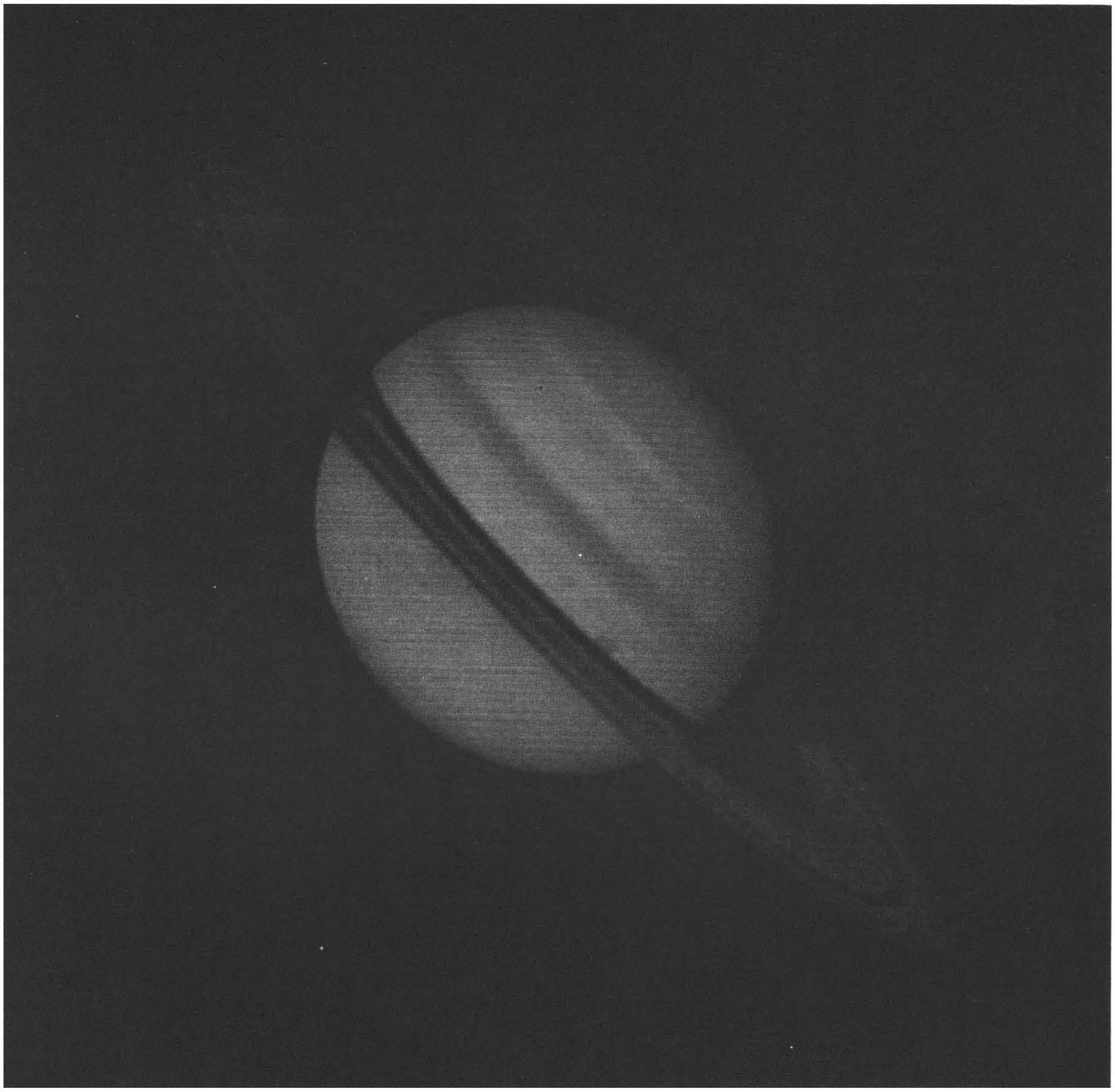
Voyager Bulletin

MISSION STATUS REPORT NO. 53 SEPTEMBER 19, 1980



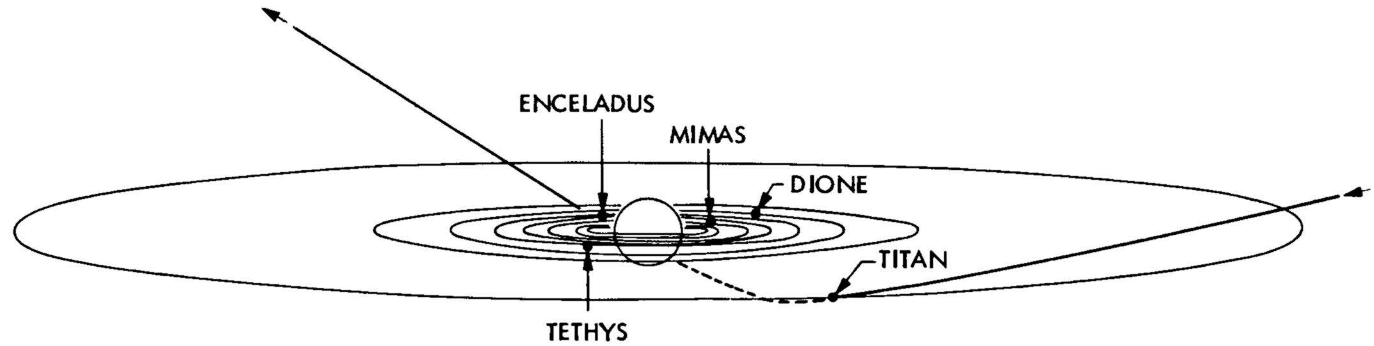
IN THE MOVIES — Nearly nine weeks before its closest approach to Saturn, Voyager 1 photographed four continuous rotations of the planet. This picture, taken September 12 from a range of 81 million kilometers (50.5 million miles) is part of that sequence. Very obvious are numerous bands in Saturn's atmosphere, the Cassini and Encke Divisions in the rings, the rings' shadow on the planet, and the planet's shadow on the rings (right). The Cassini Division is the more prominent gap in ring brightness, while the Encke Division is the fainter gap near the ring tip. Where the rings cross the face of the planet, the planet can be seen through the Cassini Division and the C-ring, the less dense ring between the cloudtops and B-ring. At the current sun illumination angle of 3°, the rings appear much darker than the planet itself, quite unlike most earth-based photographs.

NASA

National Aeronautics and
Space Administration

Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California

Recorded Mission Status (213) 354-7237
Status Bulletin Editor (213) 354-4438
Public Information Office (213) 354-5011



BENEATH THE RING PLANE – On November 11, Voyager 1 will pass about 4330 kilometers (2500 miles) from Titan's clouds, and then will dip below the ring plane. About twenty-two hours later, on its outbound leg, Voyager 1 will rise above the ring plane once again, passing through an area where Dione is thought to clear a path through the E-ring particles.

Update

Voyager 1 continues to build a data bank with its repetitive observations of the Saturn system. Sweeping across the system seven times a day, the ultraviolet spectrometer will provide information on the chemical constituents in the system, including any concentrations such as tori or clouds. The infrared spectrometer and radiometer is gathering infrared composition data on the atmosphere, thermal structure, and dynamics of Saturn. Two frames of planetary radio astronomy data are returned daily, recorded at 115.2 kilobits per second. Planetary radio astronomy data helped determine the radio rotation rate of Saturn, 10 hours 39.4 minutes. The cameras continue photographing the planet every 72° longitude, taking five images every 2 hours 3.2 minutes. Each of the five images is taken through a different filter – blue, orange, green, ultraviolet, and violet – for later color reconstruction. This long-time base set of images could be compiled into as many as five time lapse movies, each of which zooms in on one longitude of the planet. Photographs taken at long exposures through the clear filter three times each day are being used to search for several small new satellites to update the camera pointing for later photography. Routine calibrations also continue.

Voyager 2 is now cruising quietly, having received the computer sequence which will carry it through Voyager 1's busy encounter period. Routine calibrations will be performed, as well as solar conjunction experiments.

Four Rotations Imaged

Four rotations of Saturn have been captured by Voyager 1's narrow-angle camera and will be processed to make a color rotation movie before closest approach to the planet in November.

Voyager 1 photographed Saturn continuously for about 42 hours on September 12 - 14, returning pictures every 4.8 minutes. The images were taken through a set of three different filters every eight degrees of rotation.

This Saturn rotation movie will show less detail in the planet's atmosphere than did the Jupiter color rotation movie, due to both the distance and the high altitude haze at Saturn. Voyager 1 was about 81.2 million kilometers (50.5 million miles) from Saturn at the start of this movie sequence, in contrast to its Jupiter range of about 34.7 million kilometers (21.6 million miles). One reason is the need to capture the rings in the field of view in hopes that motion in the rings will be apparent in the time lapse movie. Jupiter filled about 480 pixels (picture elements) of the 800-pixel imaging frame; Saturn, from ring edge to ring edge, filled about 420 pixels. The movie could not be done later due to radio interference during solar conjunction.

In addition, a high altitude haze obscures detail in the planet's atmospheric structure. Nearly twice the distance from the sun as Jupiter, Saturn is much colder, and particulates in the atmosphere precipitate out lower in the clouds. Saturn's wind velocities are also greater than Jupiter's, perhaps resulting in shorter-lived features in the atmosphere.

Solar Conjunction

As seen from the spacecraft, the earth has now passed within 2° of the sun in its yearly orbit. Radio signals between earth and the spacecraft have passed within 5° of the sun since mid-September, resulting in poorer communications but also opportunities to study the sun's corona by its effects on the signals.

The period designated "solar conjunction" is that period when the angle measured from the sun to the earth to the spacecraft is 15° or less. When the angle is 5° or less, the "noise" in the radio signal is at its highest level. This period is September 12 - 23 for Voyager 2 and September 17 - 27 for Voyager 1. The smallest angle will be about 1.87° for Voyager 2 and 2.04° for Voyager 1.

Voyager's radio science team is conducting measurements of the solar corona's spatial and temporal variations by examining the corona's effects on the radio signals between earth and the spacecraft. Data is also being taken to test one aspect of the general theory of relativity which predicts that the radio signal will be delayed as it passes through the near-sun gravitational field. According to Einstein's theory, radio signals passing near the sun should be slowed in their round trip between earth and the spacecraft by about 0.0002 seconds. With special equipment located at the Deep Space Network tracking stations, the size of the delay can be measured to within one ten millionth of a second. Round trip light time for Voyager 1 is now approximately 2 hours 47 minutes. An opportunity to test the theory with such high precision has not existed since the Viking mission in 1976.