

Shadows and spacecraft

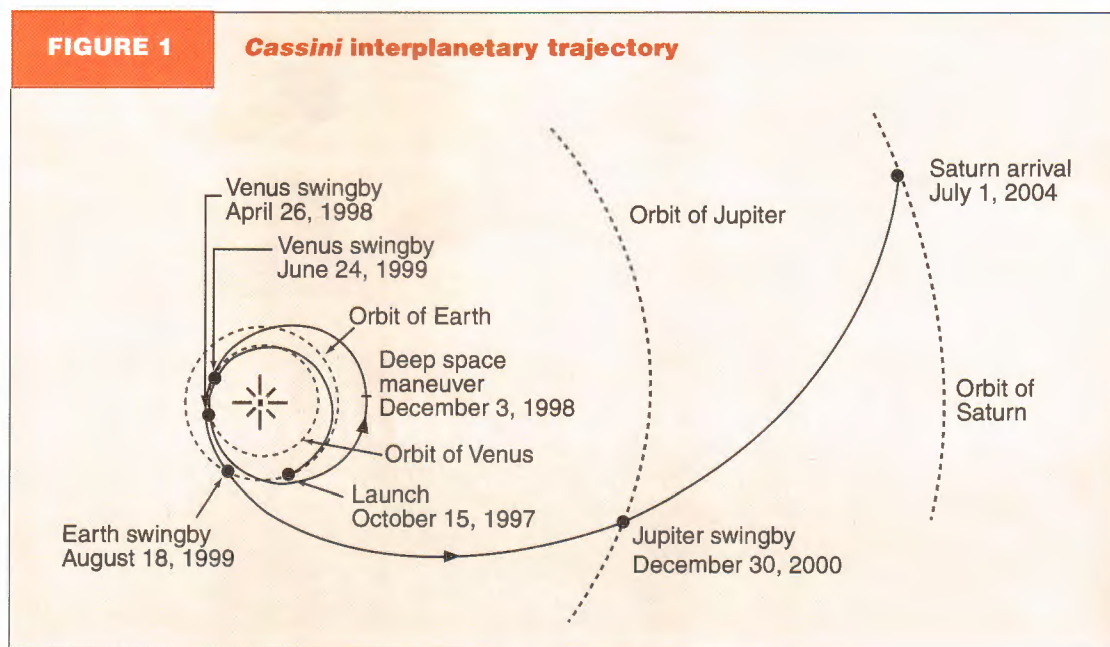
Throughout the fall of 2000 and winter of 2001, two NASA spacecraft will be investigating Jupiter. *Galileo*, which has been in orbit since December 7, 1995, will be continuing its exploration of Jupiter's magnetosphere and will pass by Ganymede in December. *Cassini* will pass by Jupiter on its way to a 2004 rendezvous with Saturn, but will come no closer than 9,721,846 kilometers (6,076,154 miles). This is the first time two spacecraft are within the vicinity of Jupiter at the same time. This unique opportunity allows scientists to gather data simultaneously using *Galileo's* vantage point deep within the magnetosphere and using *Cassini's* distant view.

In anticipation of this event, the *Cassini* Program will be sponsoring a series of activities for the public and education communities. On the evening of Saturday, December 30, 2000, the *Cassini* Program will be celebrating the turn of the millennium with an event in Pasadena, California. The event will focus on the history of Jupiter exploration and the combined data-gathering efforts of *Galileo* and *Cassini*.

If you can't make it to California, you can still join the fun with the "Jupiter Virtual Encounter." Beginning on October 1, 2000, and running for six months, the *Cassini* web site will be presenting science data gathered by *Cassini* and providing updates on the flyby activities (see Resources). Visitors to the web site will be able to view a computer simulation of the flyby and check the spacecraft's current status. A Jupiter Travel Guide will detail all the science and engineering of the flyby and provide readers with a in-depth description of the vast Jovian environment.

Meanwhile, back on Earth

While the spacecraft are collecting data from Jupiter's neighborhood, middle and high school students and their teachers will be observing the gas giant from Earth. These students will be participating in the Goldstone-Apple Valley Radio Telescope (GAVRT) science education project, which is a partnership involving the Lewis Center for Educational Research (LCER) in Apple Valley, California, the Telecommunications and Mission Operations Directorate (TMOD) at JPL, and the Apple Valley Unified School District. For additional information, see Resources for website address.



Two educator workshops are scheduled for the fall of 2000. On Friday, October 20, 2000, educators are invited to attend a workshop dedicated to the science of the Jupiter Flyby. Participants will hear lectures on Jupiter and the mission by scientists and engineers working with the *Galileo* and *Cassini* spacecraft. They will also have an opportunity to engage in hands-on classroom activities developed for this event. On Thursday, November 2, 2000, educators can learn about radio astronomy and how scientists are teaming with students to study Jupiter using radio-astronomy. The workshops will be held at NASA's Jet Propulsion Laboratory in Pasadena, California. To learn more about the upcoming Millennium Flyby of Jupiter, access the *Cassini* web site at www.jpl.nasa.gov/cassini.

If you are unable to attend this conference, consider taking advantage of one of the many workshops offered across the country by the Solar System Educators Program (SSEP). This program is a collaborative effort between the Jet Propulsion Lab, Space Explorers Inc., and the Virginia Space Grant Consortium. SSEP works with a large nationwide network of highly motivated space science specialists to offer workshops to other educators. Check out the Outreach section of their website (see Resources) for a list of locations, times, and content of these workshops.

Solar eclipse

On December 25, 2000, the Moon will pass between the Earth and the Sun, blocking about 75 percent of the Sun, and casting a shadow on the Earth's surface. During this partial solar eclipse, the Moon's shadow will follow a curved path across the North American continent (see Resources for website address of eclipse map).

This partial solar eclipse will be visible for most of the United States and Canada.

The maximum eclipse (72 percent) will occur at 12:34 PM EST. The eclipse will begin at 10:26 AM EST as the edge of the Moon begins to cover the disk of the Sun, and end at 2:43 PM EST as the Moon moves away from the Sun's disk.

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Below you will find some sample eclipse times. A list for other cities can be found at the website provided in Resources.

	Begins	Maximum	Ends
Los Angeles	15:37	16:23	17:13
Chicago	15:45	17:17	18:53
New York	16:09	17:47	19:21

Visible planets

- Mercury is visible over the eastern horizon before Sunrise for the first week or so of November. After that it moves behind the Sun toward superior conjunction and will not be visible until the next millennium.
- Venus is visible after Sunset low over the southwestern horizon.
- Mars rises several hours before the Sun and is visible over the eastern horizon.
- Jupiter rises over the eastern horizon at around Sunset and is visible the rest of the night.
- Saturn rises over the eastern horizon at around Sunset and is visible all night.

Moon phases

	Nov	Dec	Jan
First quarter	11/04	12/03	01/02
Full Moon	11/11	12/11	01/09
Third quarter	11/18	12/17	01/16
New Moon	11/25	12/25	01/24

Internet resources

Solar Eclipse

World map: SunEarth.gsfc.nasa.gov/eclipse/SEplot/SE2000Dec25P.gif

Viewing times: sunearth.gsfc.nasa.gov/eclipse/OH/LC2000.html#2000Dec25P

Cassini Project

Cassini website: www.jpl.nasa.gov/cassini

Cruise—Challenges of the Early Mission: www.jpl.nasa.gov/cassini/Mission/cruise.html

Educational guides and groups

Saturn—Educator's Guide: www.jpl.nasa.gov/cassini/educatorguide/

Getting There—How Do You Fly To Saturn?:

www.jpl.nasa.gov/cassini/Mission/traj.html

Goldstone-Apple Valley Radio Telescope:

deepspace.jpl.nasa.gov/dsn/applevalley

Space Science Educators Program: www.ssep.org