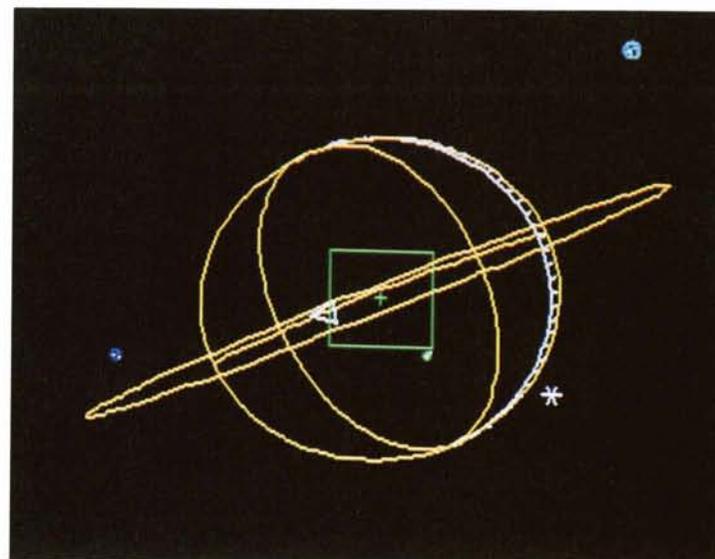




ASTRONOMY AID

In 1977, NASA launched the Voyager 1 and 2 space probes on an indefinite duration odyssey that included flyby encounters with the outer planets Jupiter, Saturn, Uranus and Neptune. The two spacecraft continued past Neptune on diverging paths that will eventually take them out of the solar system; for the interim, they are conducting the Voyager Interstellar Mission, reporting solar wind/solar cycle data and trying to determine the location of the heliopause, the boundary that represents the outer edge of the Sun's magnetic influence and the beginning of interstellar space.

In the mid-1980s, Jet Propulsion Laboratory (JPL) developed a computer program called MIP (Multimission Interactive Planner) to help astronomers analyze scientific and optical data collected on the Voyager's Grand Tour. MIP was also intended as an analysis tool for such other space missions as the Giotto spacecraft's 1986 rendezvous with Comet Halley; the Hubble Space Telescope's views of the universe; and the Galileo encounter in Jupiter, which begins in December 1995. A commercial version of the program called XonVu, pub-



lished by XonTech, Inc., Van Nuys, California, was created by John D. Callahan of Sun Valley, California, who had designed the original MIP while serving as an astronomer at JPL.

Callahan has since developed two more advanced programs based on MIP technology and made them commercially available. One, known as Grand Tour, has appeared in a number of software catalogs, including Andromeda Software, Inc., Amherst, New York; the other, Jovian Traveler, was published by Zephyr Services, Pittsburgh, Pennsylvania. The programs include refinements to MIP and improvements over XonVu, including pop-up menus that appear simultaneously with the graphic display.

The software packages simulate the missions of Voyager 1 at Jupiter and Saturn, Voyager 2 at Jupiter, Saturn, Uranus and Neptune, and Giotto in close encounter with Comet Halley. **Above** is

a simulation of Jupiter, its ring, and three of its moons as viewed by Voyager 1 on its 1979 approach to the planet; the green squares represent the fields of Voyager's wide angle and narrow angle cameras.

With these programs, space novices and professional astronomers can generate scenes of the planets, moons, stars or other objects seen by the Voyagers, or Comet Halley's nucleus and tail as viewed by Giotto. The programs take the user along the actual paths flown by the Voyagers and Giotto; a user cannot invent a new flight path. He can, however, zoom in on an object, rotate the field of vision, or change perspective. For example, he can view a space scene from the perspective of the spacecraft, from Earth, or from a point in space that provides a view of both the spacecraft and the encounter target. The programs can be used on a wide range of PCs.

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