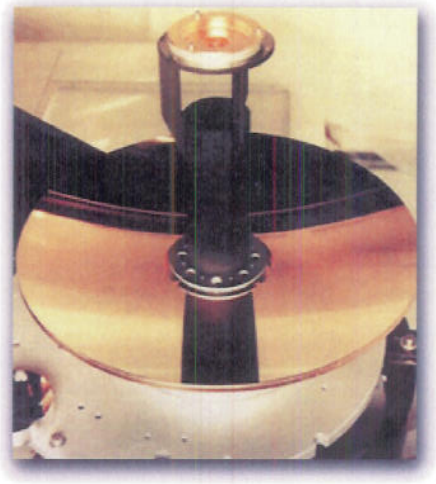
LASERS&OPTRONICS

Mapping Mars
Lasers & Optronics



Early this month, the spacecraft Mars Global Surveyor will have arrived for its first fly-by of Mars after a ten-month journey. Part of the spacecraft's scientific payload is the Mars Orbiter Laser Altimeter (MOLA), a device designed to map the planet's surface over a two-year operational period beginning in March1998–the intervening period will be used by the Jet Propulsion Laboratory (Pasadena, Calif.) to slip the spacecraft into orbit gravitationally.

The MOLA system will map the Martian surface from an orbital range of 227 miles, firing pulses from a Nd:YAG laser at a rate of 10 pulses per second. Each pulse will cover an area of 160 m^2. By timing the variations in the laser light reflected back to the MOLA system, scientists can determine, to within an accuracy of one meter, the height and shape of landscape features such as plains, valleys, craters, and mountains. According to Dr. Jack Bufton at NASA Goddard Space Flight Center, the fundamental wavelength of Nd:YAG was chosen for this mission because of the payload constraints of the interplanetary mission.

The primary mirror in the collection optics is approximately 21 inches in diameter and gold-plated beryllium. The mirror blank was fabricated by Brush Wellman (Cleveland, Ohio) and ground by OCA Applied Optics (now Corning OCA, located in Garden Grove, Calif.). The gold plating was applied by Epner Technology (Brooklyn, N.Y.), using the company's proprietary pure-gold deposition process known as Laser Gold™. This process is an electrochemical deposition of gold, rather than the more-common vacuum deposition coating process, thereby allowing more controllable process variables than would be available in vacuum-deposited gold.

A similarly coated mirror, approximately 36 inches in diameter, is planned for a vegetation canopy lidar due for launch in about one year. That system will be used for measuring tree height (and hence biomass) and inferring atmospheric conditions at treetop levels.

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