A standard laser current driver is used to drive a single laser diode. Laser diode current, voltage, power, and wavelength are measured for each laser diode, and a method of selecting the most adequate laser diodes for space deployment is implemented. The method consists of creating histograms of laser threshold currents, powers at a designated current, and wavelengths at designated power. From these histograms, the laser diodes that illustrate a performance that is outside the normal are rejected and the remaining lasers are considered spaceborne candidates.

To perform laser lifetime testing, the facility is equipped with 20 custom laser drivers that were designed and built by California Institute of Technology specifically to drive NuSTAR metrology lasers. The laser drivers can be operated in constant-current mode or alternating-current mode. Situated inside the enclosure, in front of the laser diodes, are 20 power-meter heads to record laser power throughout the duration of lifetime testing.

Prior to connecting a laser diode to the current source for characterization and lifetime testing, a background program is initiated to collect current, voltage, and resistance. This backstage data collection enables the operational test facility to have full laser diode traceablity.

This work was done by Carl C. Liebe, Robert P. Dillon, Ivair Gontijo, Siamak Forouhar, Andrew A. Shapiro, Mark S. Cooper, and Patrick L. Meras of Caltech for NASA's Jet Propulsion Laboratory. For more information, contact iaoffice@jpl.nasa.gov. NPO-47164

Plenoptic Imager for Automated Surface Navigation

John H. Glenn Research Center, Cleveland, Ohio

An electro-optical imaging device is capable of autonomously determining the range to objects in a scene without the use of active emitters or multiple apertures. The novel, automated, low-power imaging system is based on a plenoptic camera design that was constructed as a breadboard system. Nanohmics proved feasibility of the concept by designing an optical system for a prototype plenoptic camera, developing simulated plenoptic images and range-calculation algorithms, constructing a breadboard prototype plenoptic camera, and processing images (including range calculations) from the prototype system.

The breadboard demonstration included an optical subsystem comprised of a main aperture lens, a mechanical structure that holds an array of micro lenses at the focal distance from the main lens, and a structure that mates a CMOS imaging sensor the correct distance from the micro lenses. The demonstrator also featured embedded electronics for camera readout, and a post-processor executing image-processing algorithms to provide ranging information.

This work was done by Byron Zollars, Andrew Milder, and Michael Mayo of Nanohmics, Inc. for Glenn Research Center. Further information is contained in a TSP (see page 1).

Inquiries concerning rights for the commercial use of this invention should be addressed to NASA Glenn Research Center, Innovative Partnerships Office, Attn: Steve Fedor, Mail Stop 4–8, 21000 Brookpark Road, Cleveland, Ohio 44135. Refer to LEW-18525-1.

Maglev Facility for Simulating Variable Gravity

Effects of gravity on thermal fluid systems and small living things can be tested.

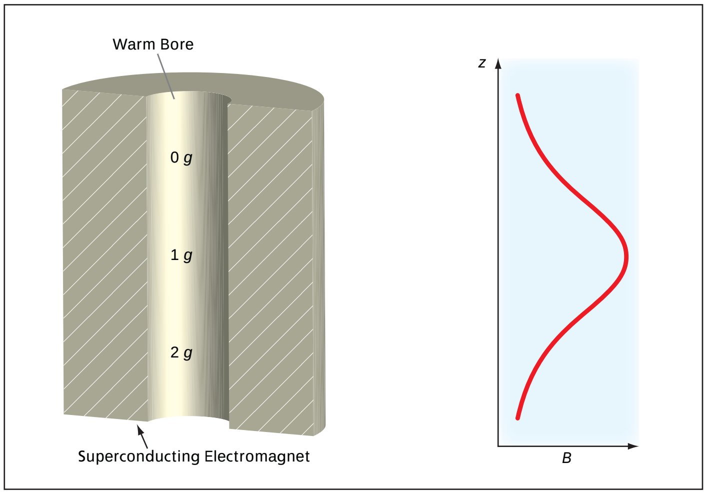
NASA's Jet Propulsion Laboratory, Pasadena, California

An improved magnetic levitation apparatus ("Maglev Facility") has been built for use in experiments in which there are requirements to impose variable gravity (including zero gravity) in order to assess the effects of gravity or the absence thereof on physical and physiological processes. The apparatus is expected to be especially useful for experiments on the effects of gravity on convection, boiling, and heat transfer in fluids and for experiments on mice to gain understanding of bone loss induced in human astronauts by prolonged exposure to reduced gravity in space flight.

The maglev principle employed by the apparatus is well established. The basic equation for equilibrium levitation of a diamagnetic object is

$$|\chi B \nabla_z B / \mu_0| = \rho g,$$

where χ is the magnetic susceptibility of the object, B is the magnitude of the magnetic-flux density, μ_0 is the magnetic permeability of the vacuum, ρ is the mass density of the object, g is the local gravitational acceleration, and $\nabla_z B$ is the vertical gradient of the magnetic field. Diamagnetic cryogenic fluids such as liquid helium have been magnetically levitated for studying their phase transitions and critical



The **Superconducting Electromagnet** generates a static magnetic field with a vertical gradient. For water or other substances of diamagnetism, the gradient magnetic field opposes or aids the gravitational body force by an amount that varies with position along the bore.