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MESSENGER's First Mercury Flyby: An Overview of Observations

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The Mercury Surface, Space ENvironment, GEOchemistry, and Ranging (MESSENGER) spacecraft, under NASA's Discovery Program, will be the first probe to orbit the planet Mercury. Launched in August 2004, MESSENGER is midway through a complex interplanetary cruise phase that involves six planetary flybys. The first of three flybys of Mercury will occur on 14 January 2008, an event that marks the first spacecraft visit to the innermost planet since Mariner 10 last did so nearly 33 years ago. MESSENGER will approach Mercury from the night side, cross the dawn terminator shortly after closest approach, and view Mercury's sunlit side primarily on departure. During the flyby, the Mercury Dual Imaging System will acquire an 11-color mosaic of part of the hemisphere not seen by Mariner 10, including the entire Caloris basin; several large monochrome mosaics at a range of resolutions, several of which will provide an opportunity for stereo analysis; a series of color frames designed for photometric analysis; and inbound and outbound movies. The Mercury Atmospheric and Surface Composition Spectrometer will obtain the first high-resolution spectral reflectance measurements (at ultraviolet to near-infrared wavelengths) of surface composition, conduct night-side and day-side limb scans of exospheric species, and map the composition and structure of Mercury's sodium tail region. The Magnetometer will measure near-equatorial portions of Mercury's internal field and document the major plasma boundaries of Mercury's magnetosphere. The Energetic Particle and Plasma Spectrometer will characterize high-energy ions and electrons, and

make the first measurements of low-energy ions, in Mercury's magnetosphere and its heliospheric environment. The Mercury Laser Altimeter will carry out the first space altimetric profile of the planet, and the Gamma-Ray and Neutron Spectrometer and X-Ray Spectrometer will provide a first look at surface elemental composition. The Radio Science experiment will sample Mercury's long-wavelength gravity field. Together, the MESSENGER flyby observations will serve to optimize the measurements to be made during the mission orbital phase and, more importantly, substantially advance our understanding of Mercury's geology, surface chemistry and mineralogy, interior, exosphere, and magnetosphere.