Introduction to the special section:
Mars Global Surveyor Thermal Emission Spectrometer

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The Thermal Emission Spectrometer (TES) experiment was originally proposed for the Mars Observer mission in 1986. Its objectives were (1) to determine and map the composition of surface minerals, rocks, and ices; (2) to study the composition, particle size, and spatial and temporal distribution of atmospheric dust; (3) to locate water-ice and CO$_2$ condensate clouds and determine their temperature, height, and condensate abundance; (4) to study the growth, retreat, and total energy balance of the polar cap deposits; and (5) to measure the thermophysical properties of the Martian surface materials. The Mars Observer spacecraft failed to enter orbit about Mars in 1993. However, the TES experiment, focusing on the same broad set of objectives, was reflown on the Mars Global Surveyor spacecraft and began orbiting Mars in September 1997.

The TES consists of a Michelson interferometric spectrometer collecting thermal infrared spectral observations between -6 and 50 μm (1655-200 cm$^{-1}$), along with bolometric thermal (0.3-100 μm) and solar reflectance (0.3-3.9 μm) measurements. Data are collected from six ~3.5 mrad instantaneous fields of view (IFOVs) in each bore-sighted instrument subsection during one observation period (2 s). These IFOVs provide a contiguous strip three elements wide with a spatial resolution designed to be 3 km in the Mars Global Surveyor (MGS) mapping orbit altitude of 350 km. A pointing mirror is used to obtain views of space, an internal calibration surface, and the atmosphere above the limb of the planet. Complete global coverage of Mars will be obtained during the MGS mapping mission.

The TES investigation was designed to encompass a wide range of topics using the wealth of information contained in infrared spectra measured from orbit. The papers in this special section reflect this range of topics, including treatments of the surface composition, atmospheric temperature and dynamics, atmospheric aerosol properties, polar processes, and the thermophysical properties. This section also describes some of the analytical methods and spectral data that have been developed to interpret TES data. These papers focus on data collected during the Aerobraking and Science Phasing Orbits of the MGS mission (September 1997 through April 1998). The aerobraking phase of the MGS mission extended longer than planned owing to engineering difficulties. However, this unplanned set of observations provided a unique opportunity to observe the surface, atmosphere, and polar regions at local times and viewing geometries that would not have been possible in the nominal mission.

The success of the TES experiment is due to the tireless efforts of a large team of people. The TES flight instrument carries two small signature plaques signed by those who worked on the Mars Observer and Mars Global Surveyor TES instruments. These plaques contain the names of over 200 individuals who devoted many years of effort to the design, development, operation, and analysis of these experiments. Added to this list are the hundreds of individuals at Lockheed Martin Astronautics and the Jet Propulsion Laboratory who built the spacecraft and are operating the mission. This section, and the contributions the TES investigation is making to our understanding of Mars, is dedicated to all of them.

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