

# **Carnegie Mellon**

## **Materials Science and Engineering Seminar Series**

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*“Magnetic Measurements in Missions to Mars”*

**Friday, January 29, 2010**

**11:30 A.M. Seminar in Scaife Hall 125**

Magnetic properties characterization is a powerful tool in the study of celestial bodies. The magnetic measurements of the planets lead to different kinds of information like the determination of the existence or the absence of a dipolar or multipolar magnetic moments, and thus the existence or not of a global magnetic field; the interaction of the global or local magnetic field with the solar wind; the conductive properties of the constituent materials of the crust and mantle; or the identification of surface materials, some of which indicate water in their formation process. Since the magnetic properties of a planet play a crucial role not only in the geology but also in the potential habitability, planetary scientists have designed and developed experiments for magnetic characterization of almost all the celestial bodies that have been explored. Many magnetic oxide, hydroxide, or oxyhydroxide minerals are discussed within the context of the question of life on Mars. These also parallel interesting biological materials studied in biomedical applications on earth. Among the more than thirty missions devoted to the exploration of Mars, more than fifty percent had magnetic payloads onboard.

This talk, ‘Magnetic Measurements in Missions to Mars’, presents an overview of the missions with magnetic instrumentation will be performed focusing on two types of missions: (1) The first of these missions measured the global magnetic field in-orbit: the American Mariner 4 (1964), the Soviet Mars 2, Mars 3 (1971), Mars 5 (1973), Phobos 2 (1988), etc and the successful Mars Global Surveyor (1996). (2) The second focused on *in situ* experiments devoted to the study of the formation of the planet and the possible past and present habitability through the magnetic characterization of the minerals of the martian soil: the old Viking 1, Viking 2 (1975) and the Sojourner rover of the Mars Pathfinder mission (1996), and the future missions like MetNet (Finland, Russia and Spain), Exomars (ESA) or the Mars Science Laboratory (NASA).