M^3 Science is Tied to NASA Space Science Themes of Early Evolution of the Solar System and How Planets Work

Moon Mineralogy Mapper (M^3)

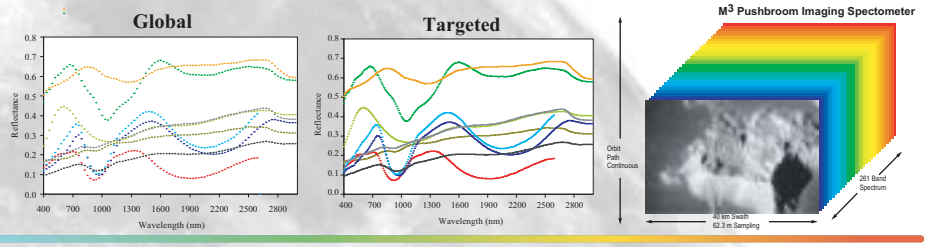
Unlocking the Mysteries of the Moon

The Moon Mineralogy Mapper (M3) is a state-of-the-art high spectral resolution imaging spectrometer that will characterize and map the mineral composition of the Moon. The M3 instrument will be flown on Chandrayaan-1, the Indian Space Research Organization (ISRO) mission to be launched in September 2007. The Moon is a cornerstone to understanding early solar system processes, and M3 high-resolution compositional maps will dramatically improve our understanding about the early evolution of the terrestrial planets and will provide an assessment of lunar resources at high spatial resolution.

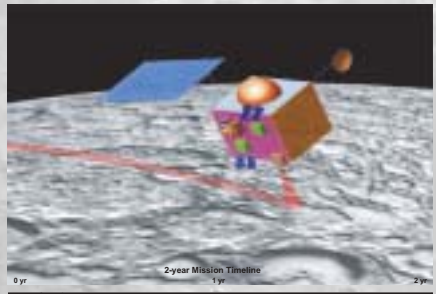
M^3 Science Overview

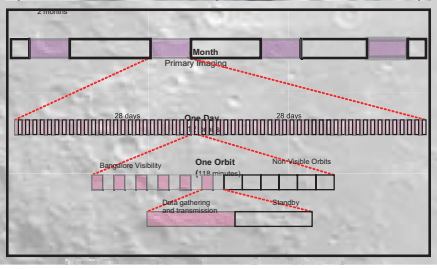
- *Characterize and map the lunar surface composition in the context of its geologic evolution*
  - *Evaluate primary crustal components and their distribution across the highlands*
  - *Characterize the diversity and extent of different types of basaltic volcanism*
  - *Identify and assess deposits containing volatiles including water*
  - *Map fresh craters to assess properties of impacts in the recent past*
  - *Identify and evaluate concentrations of unusual/unexpected minerals*
- *Assess the Moon mineral resources at high spatial resolution*

Strong Science Team	
Carle Pieters, PI	Brown University
Rob Green, Inst. Sci.	JPL
Bonnie Buratti	JPL
Cassandra Runyon	College of Charleston
James Head	Brown University
Jack Mustard	Brown University
Jessica Sunshine	SAIC
Joseph Boardman	AIG
Larry Taylor	Univ. of Tennessee
Matt Staid	PSI
Roger Clark	USGS
Stefanie Tompkins	SAIC
Tom McCord	Univ. of Hawaii



M^3 Mission Overview





- *Launch: September 2007*
- *Launch Vehicle: Polar Satellite Launch Vehicle, India*
- *Spacecraft: Provided by India*
- *Launch Site: SDSC, India*
- *Cruise Time: 5.5 days*
- *Final Orbit: 100 km, polar*
- *Mission Duration: 2 years (four two-month optimal imaging geometry with global access)*
- *Field of View: 40 km*
- *Imaging modes:*
  - *Global (125 m/pixel res)*
  - *Targeted (63 m/pixel res)*
- *Ground Station: Bangalore, India*
- *Science Data: ISRO to JPL to Science Team*

Instrument Design Overview

- *Single detector with spectral range 700 to 3000 nm @ 10 nm*
- *Optional mode 400 to 3000 nm @ 10 nm*
- *640 spatial elements*
- *Offner Spectrometer*
  - *High Signal-to-Noise ratio*
  - *High Uniformity*
  - *Simple*
- *All aluminum optics*
- *Single dual-blaze electron-beam grating*
- *Robust on-board calibrator*
- *Two cryo-cooler for redundancy*
- *Mass < 10 kg, Power < 13 W*
- *Easy accommodations on Chandrayaan-1*
- *Robust, high heritage*

Education/Public Outreach Objectives

M^3 investigation provides unique opportunity to inform, engage and excite the public about the Moon and its exploration. Our plan is to:

- *Work with educators at U.S. Space & Rocket Center to refine our K-16 content*
- *Enhance the existing lunar curricula materials (eg., Exploring the Moon, Planetary Geology) that connect with the young STEM audiences*
- *Work with Program Evaluation and Research Group at Lesley University to maximize impact on users*
- *Enhance the National MoonBuggy Contest and Lunar Terrain project*
- *Model MoonViz after JPL's very successful MarsViz*
- *Develop virtual lunar classroom with Montana Univ.*
- *Work with OSS Support Network & working groups*
- *Involve minority institutions*

Management Overview

The Brown University-based PI, Dr. Carle M. Pieters, will lead the project and have overall responsibility for project resources and mission success. JPL will support the PI with an experienced management and systems engineering team. All institutions and science team members are committed to providing the necessary resources, personnel and facilities to ensure mission success.

Schedule and Cost Overview

The M^3 investigation schedule is driven by launch in September 2007. Operations, science analysis and E/PO activities will continue through 2010. Ample cost reserves, as well as schedule reserves are available to cover development and interface contingencies.