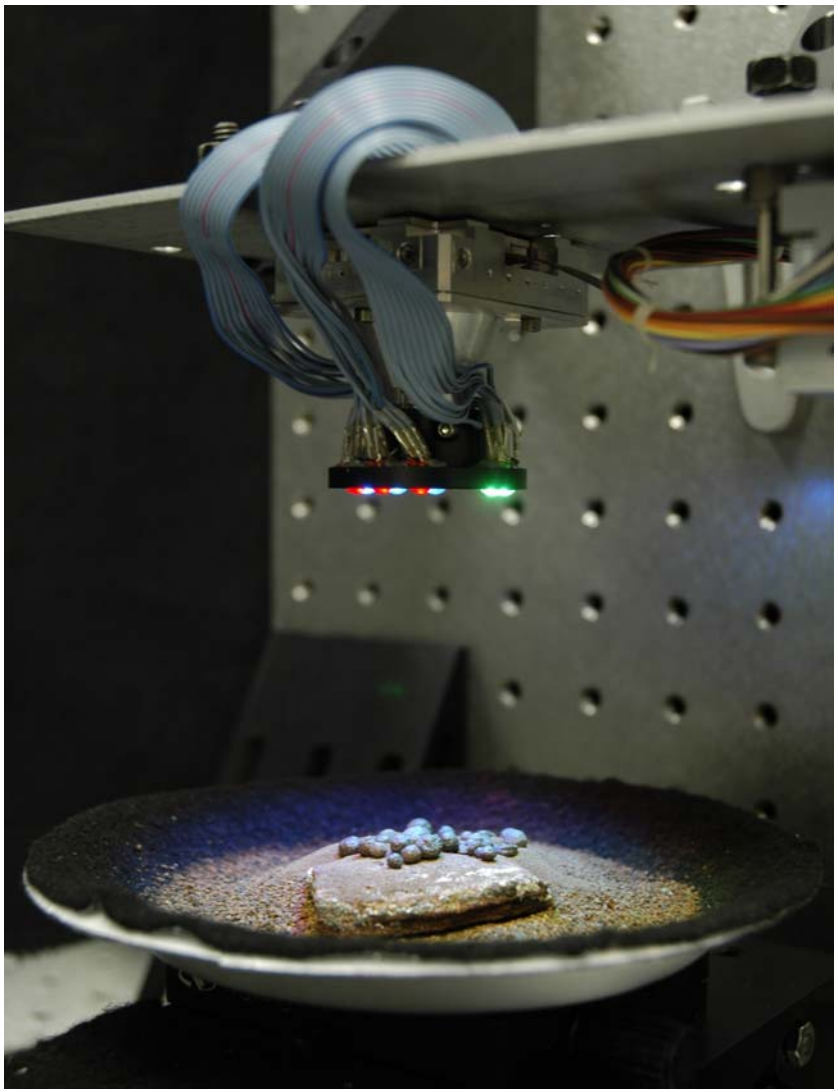
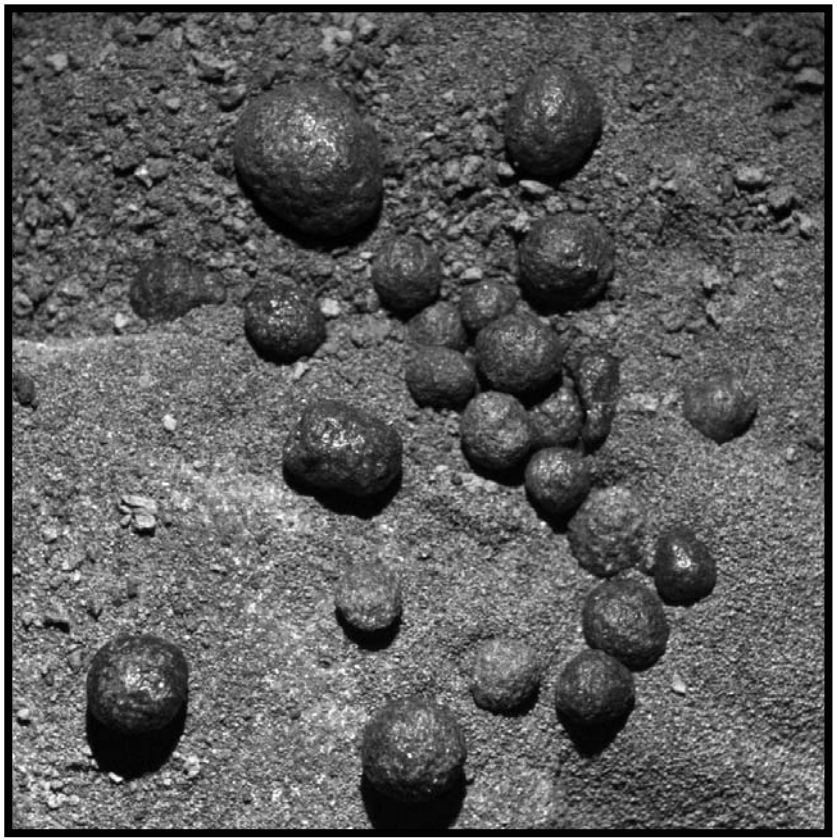
Compact Micro-Imaging Spectrometer



- CMIS-1
  - MER-MI with multi-wavelength LEDs
  - 3-band natural-color (485, 525, 660 nm)
  - Superior illumination approach vs. Beagle and MECA
- CMIS-2
  - MER-MI with broadband (400 – 1700 nm) lens
  - Multispectral 8-band illumination (485 – 940 nm)
- CMIS-3
  - Hyperspectral with ~20 bands (400 – 1700 nm) with substrate-removed InGaAs camera

Jack Farmer (jack.farmer@asu.edu), Glenn Sellar (glenn.sellar@jpl.nasa.gov), Laurel Kirkland (kirkland@lpi.usra.edu), John Armstrong (jcarmstrong@weber.edu)

Panchromatic vs. Multispectral



Panchromatic image acquired with an MER-MI EM (left) and 3-band multispectral image acquired with CMIS-1 (right) of terrestrial hematite concretions from Utah on a background of terrestrial rock (unknown) and JSC Mars-1 soil simulant (palagonite). The FOV is ~ 30 mm square with a resolution of 30 µm. Band centers for the 3-band image were 468 nm (blue), 525 nm (green), and 660 nm (red).

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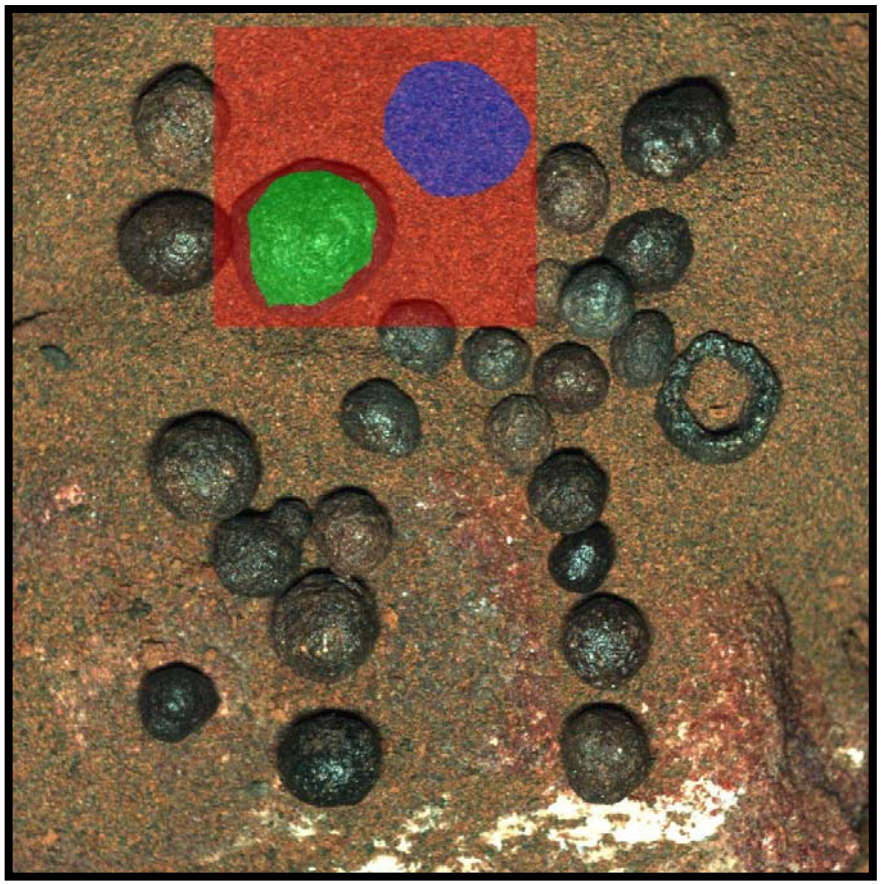
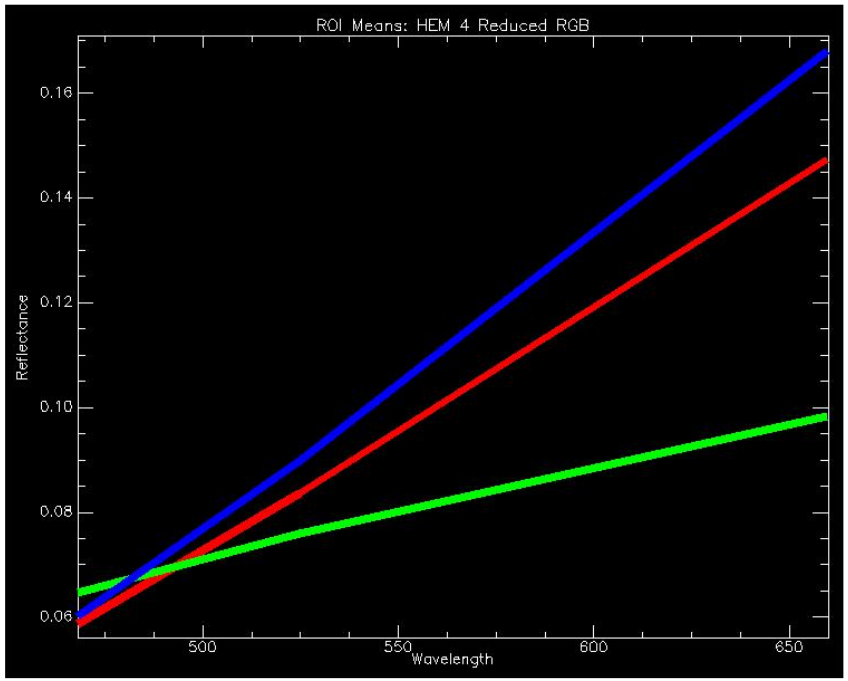
Imaging Spectrometer vs. Point Spectrometer





A point spectrometer, such as Mini-TES, would integrate over the entire FOV, while an imaging spectrometer is able to obtain distinct and unmixed spectra of the concretions and the soil in this example obtained with the CMIS-1 instrument.

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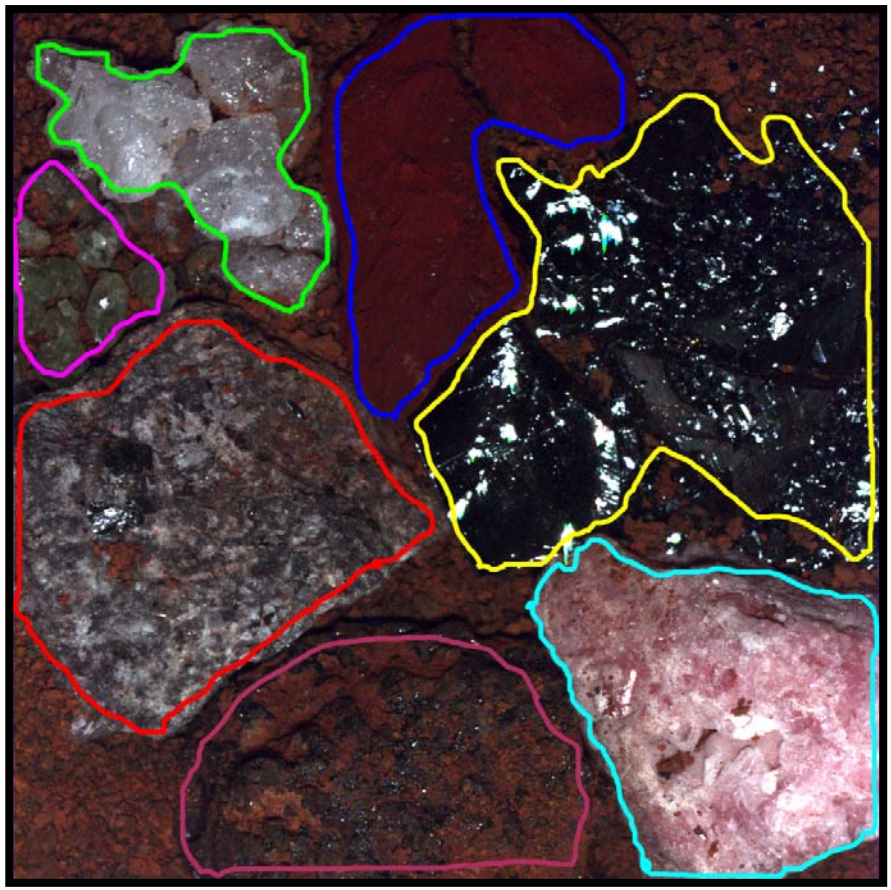

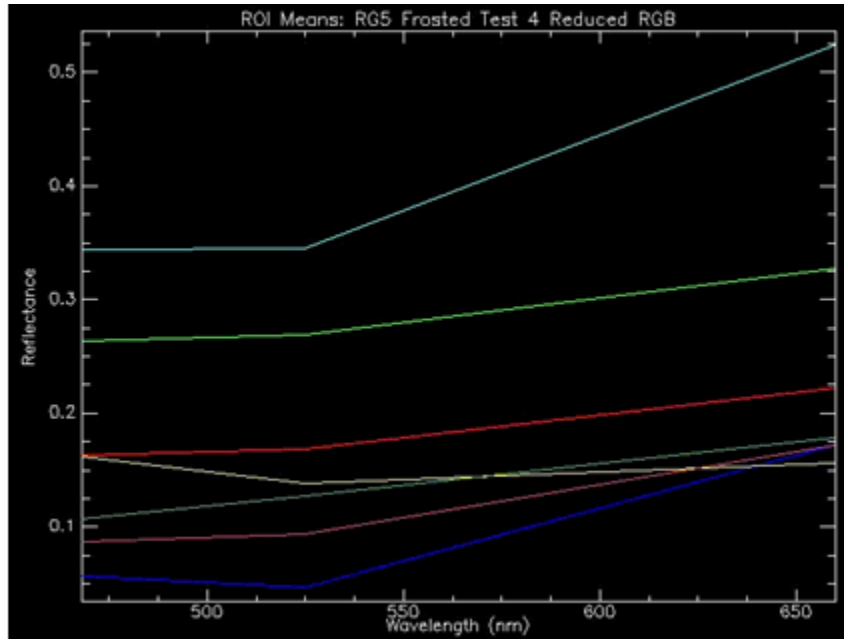

olivine
halite
red hematite
gray hematite
rhodochrosite
goethite
andesite

RGB micro image acquired by CMIS-1 (left) and spectra for seven regions of interest (right). Field of view is 30 x 30 mm, with 1024 x 1024 pixels, at a spatial resolution of 30 µm.

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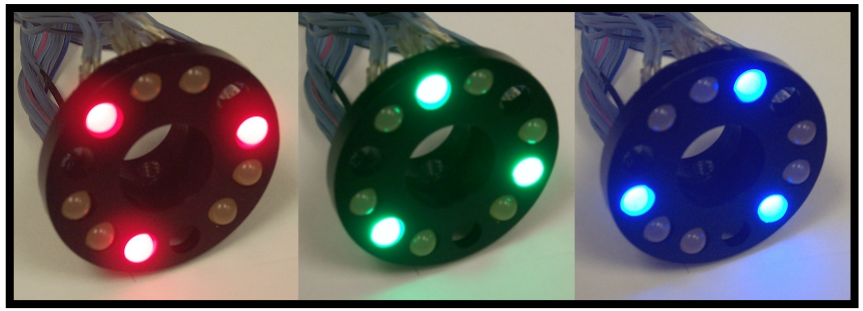
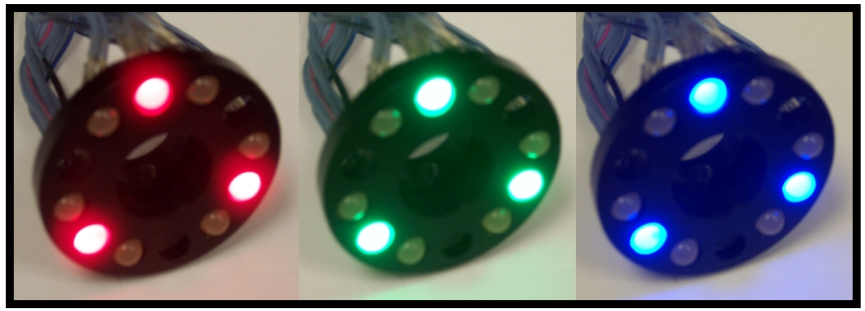
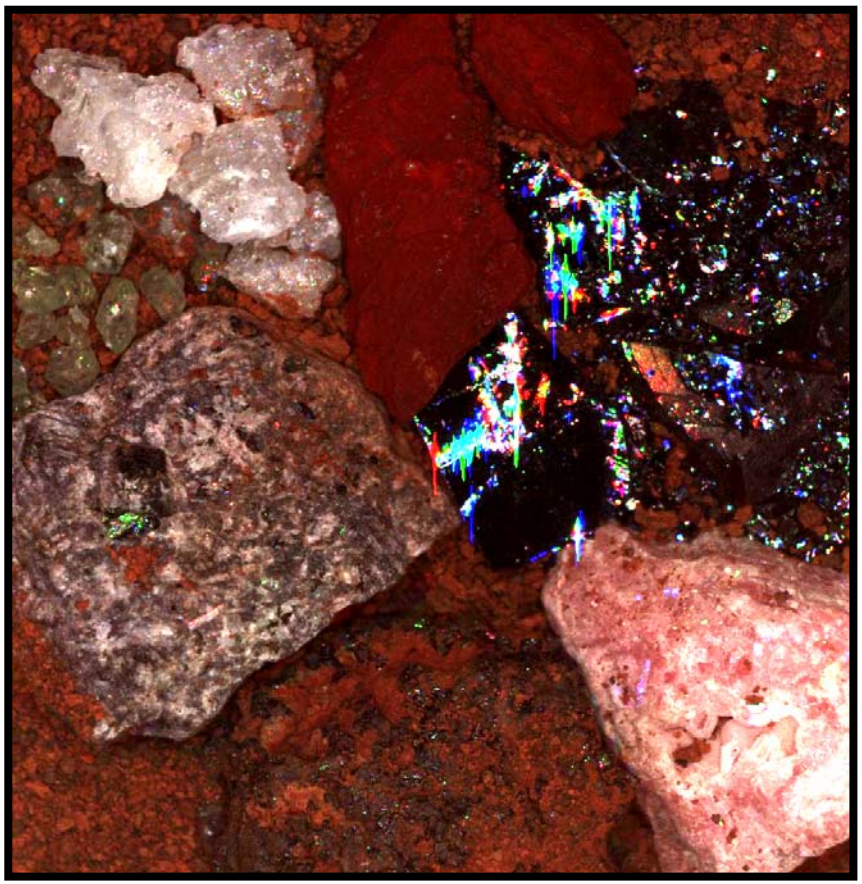
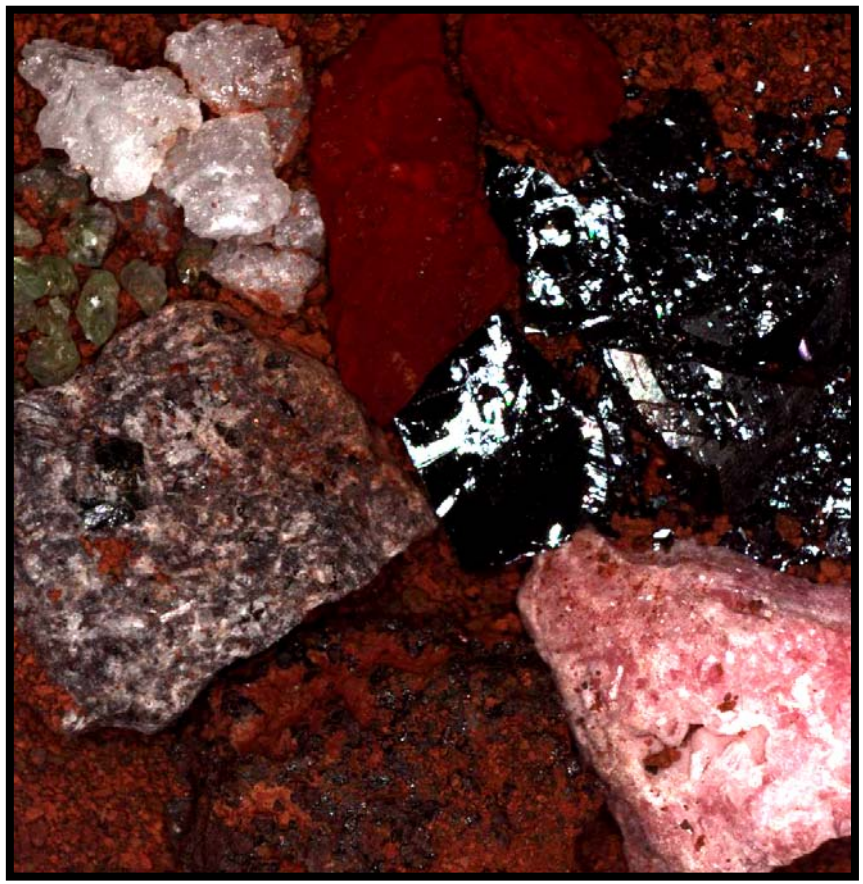
Isotropic Illumination Eliminates Angular Artifacts









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