Jet Propulsion Laboratory
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Real-Time Mapping Spectroscopy in Air and Space

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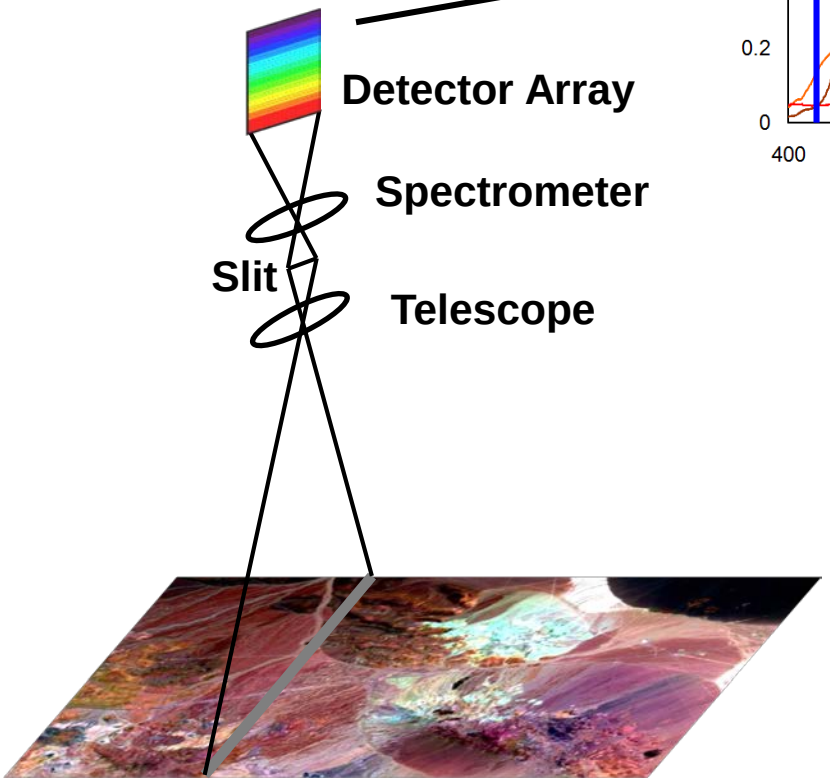
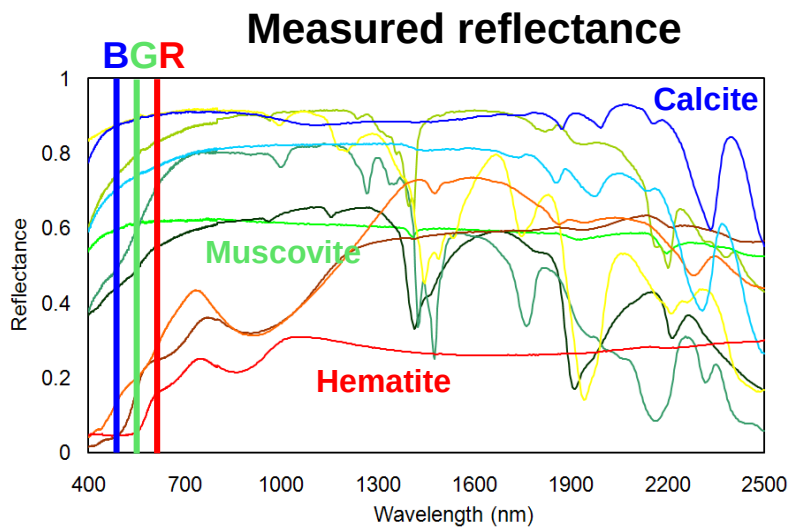
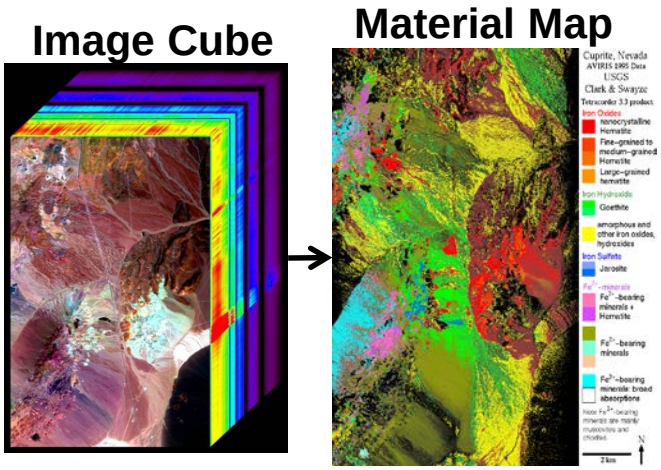
Basic principles: Pushbroom reflectance spectroscopy





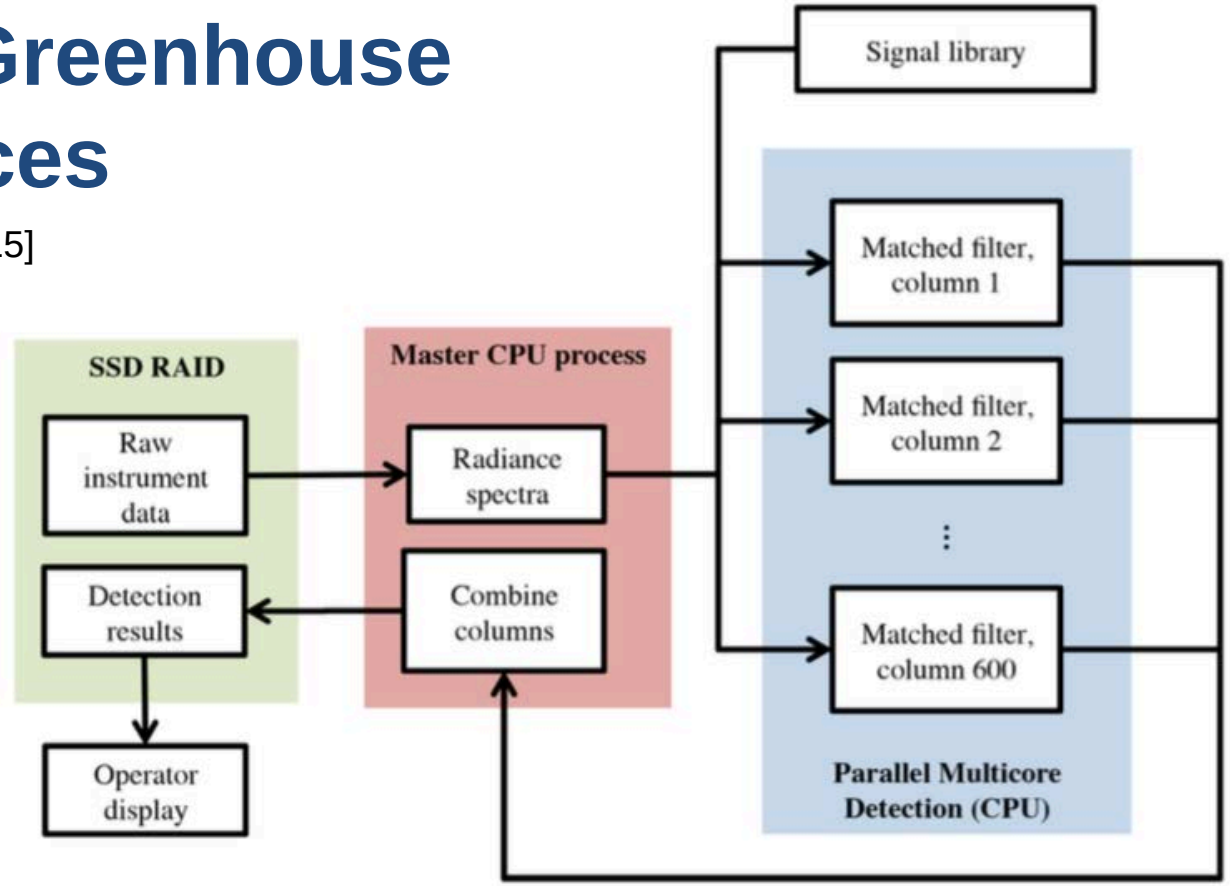


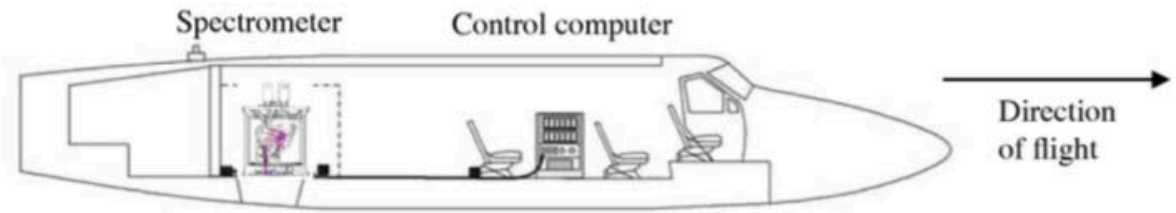
Real time analysis

1. Detect transient or rare targets
2. Disaster response
3. Data quality assurance
4. Robotic exploration
5. Hypothesis formation and testing

Example: Greenhouse point sources

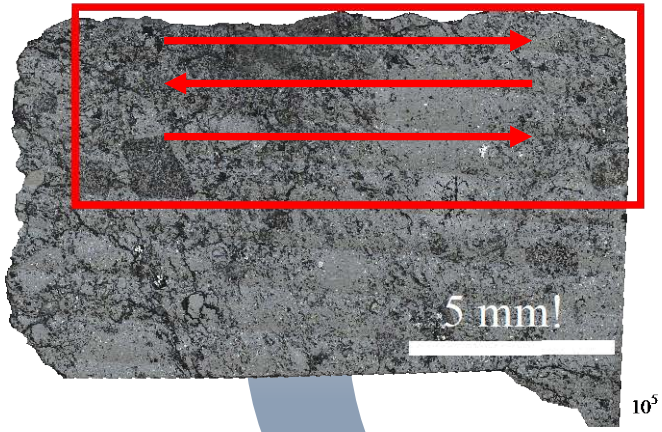
[Thompson et al., AMT 2015]





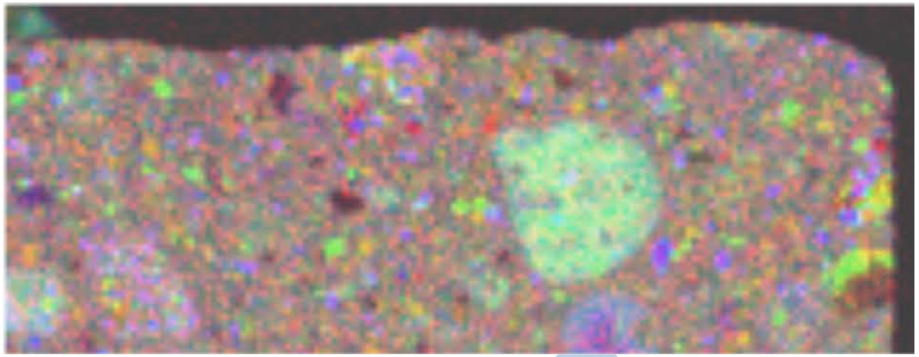
[Thompson et al., AMT 2015]

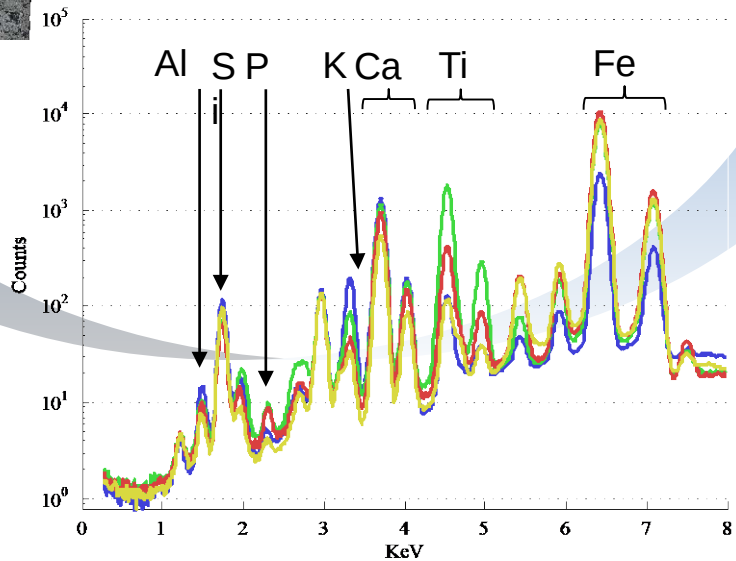
Rastering fluorescence spectra: Planetary Instrument for X-Ray Lithochemistry (PIXL)



1. "Black Beauty" Sample (Image from Thompson et al., Astrobiology 2015)

Elemental abundance maps





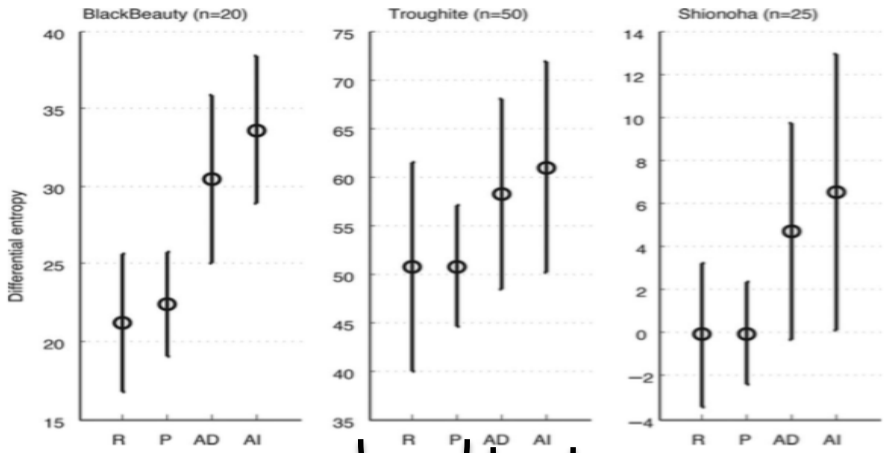
X-ray fluorescence peaks (one spectrum per location)

Thompson et al.
[david.r.thompson@jpl.nasa.gov]

Real time analysis

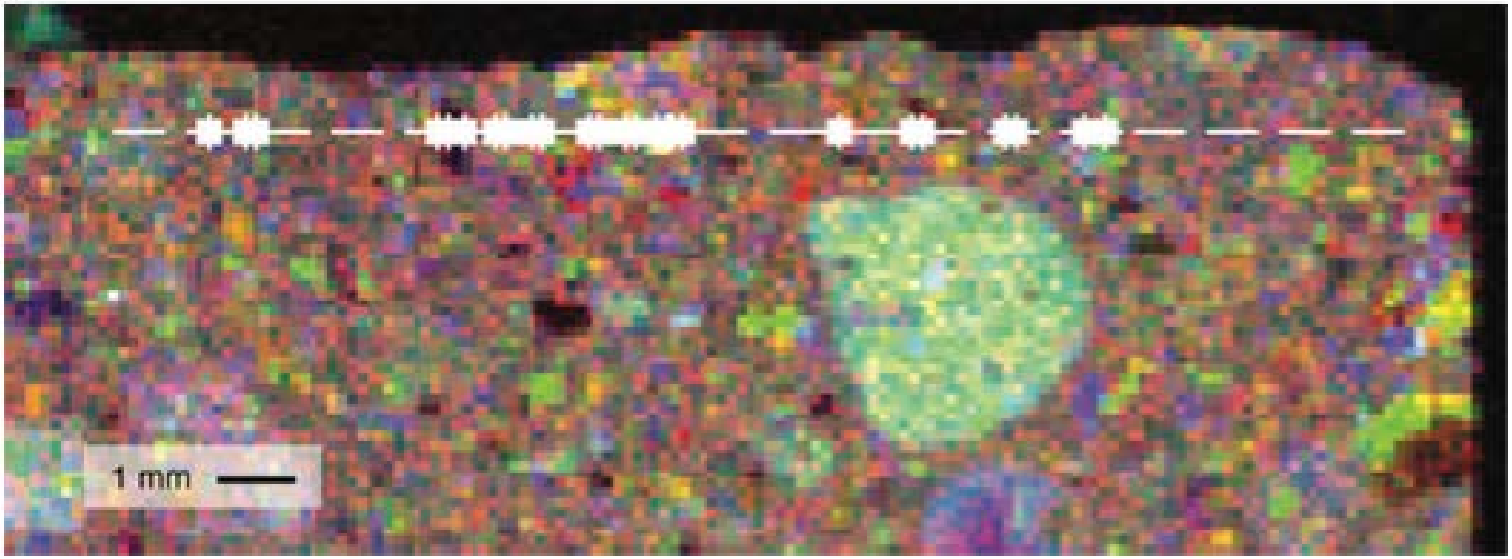
1. Keep watch for rare, anticipated compositions of scientific interest, and obtain a high SNR spectrum for confirmation
2. Re-acquire and focus on a small known feature under positional drift
3. Survey a new region quickly

Example



Non-adaptive performance

Adaptive performance



Thompson et al., Astrobiology 2015