ANALYTICAL CAPABILITIES AND FINDING LIFE ON MARS

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- What will we do?
- Where will we do it?

Petrography
Optical and Electron Microanalysis

- Solidification
- Alteration
- Shock

Crystal Structure
X-ray diffraction
Electron diffraction

- Mineral identification
- Alteration
- Shock

Chemical Compositions
Neutron activation
Beam microanalysis
Mass spectrometry

- Rock/mineral compositions
- Alteration
- Trapped volatiles
- Crystallization T, P, fO₂
- Alteration T, P, fO₂

Controlled Melting Experiments

- Crystallation T, P, fO₂

Isotope Dating

- Crystallization ages
- Shock ages

Stable Isotope Studies

- Parent body
- Temperature, chemistry of alteration
- Atmospheric history

Paleomagnetism

- Constraints on core
- Temperature limits on alteration

Microscopy
Optical
Electron
Atomic force

- Cells
- Microfossils
- Biominerals
- Biofilms

Mass Spectrometry

- Detection, identification and location of organic molecules
Isotope Fractionation
Carbon
Oxygen
Sulfur

- Indications of life

Biochemical Analysis
DNA/RNA
Amino acids
Cell wall components
Amphiphiles

- Life detection
- Life identification
- Terrestrial contamination

Reproduction and Growth

- Life detection
- Life identification
- Terrestrial contamination

Challenge Studies
Cells
Organisms
Microcosms

- Life detection
- Life identification
- Biohazards
- Terrestrial contamination

Mars

- Establish geological context
- Collect documented samples
- Conduct first level analysis
- Select samples for return to Earth

Earth

- Screen samples for hazard
- Conduct highest quality analysis
- Document sample histories
- Preserve samples for future studies

And much more . . . .