# 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, $fO_2$
- Alteration T, P, $fO_2$

**Controlled Melting Experiments**

- Crystallation T, P, $fO_2$

**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 . . . . .**