

Exobiology and The Search for Life on Mars

Overview Presented by:

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Requirements for Life

Presence of Water

Presence of Carbon

Energy Sources - Redox Potential

Geologically Active

Mars Meets the Requirements for Life

Requirements must guide our search for potential habitats and inhabitants on Mars

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Tools Available for Search for Life

Earth Based Observations

Telescopic i.e. atmospheric components

Space Missions

Flybys, *Orbiters* and Landers

Sample Return Missions

Surface and Near-surface samples

Ultimate Goal - Apply power of

Earth based Laboratories in Research

Martian Meteorites

**34 Samples BUT only 4 Falls are
suitable for study**

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Sources for Martian Methane

- **Abiotic sources**

- Volcanic or Hydrothermal

No Thermal “hot-spots” detected from orbit

- Cometary Infall - Only 2% contribution - too low
- Meteorite/Dust Infall - Only 4% contribution - too low

- **Biogenic sources**

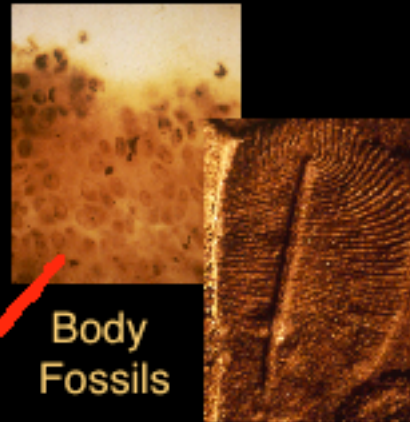
Supported by:

- Methane in Martian atmosphere - Methanogenic Bacteria?
- Abundance of Martian water - “life requires water”
- Indigenous reduced carbon in Martian meteorites
- Isotopic composition of reduced carbon- -15 to -18 ‰

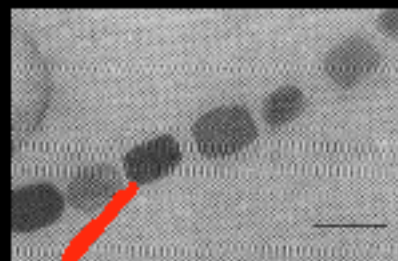
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- Biogenic-like magnetite in Martian Meteorites
 - Label Release Experiment - Viking??

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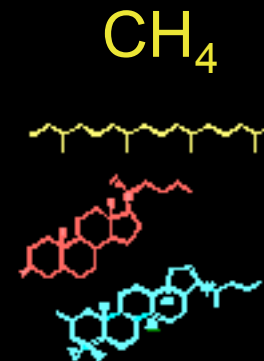
Fossil Biosignatures: What we look for...



Body Fossils



Biominerals

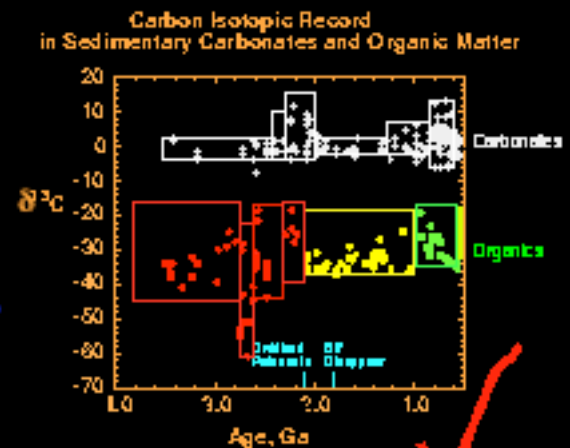


Chemical Fossils (Biomarkers)

Destroyed by UV?



Biofabrics



Stable Isotopes

After DesMarais, 2005

Exobiology and The Search for Life on Mars

Re-fly the suite of Analytical Instruments on Beagle2

Mass Spectrometer for Carbon Isotopic Analysis

Distinguish between:

Biogenic Carbon -Life

Abiotic Carbon - Geologic

Seek habitats where life may be located for future missions

In Situ Analysis for Biogenic Signatures

Sample Return Mission