



Seek signs of
past life

Explore a geologically
diverse landing site

Collect a
returnable
cache of
samples using a
coring system

Confirm ancient
habitability of site

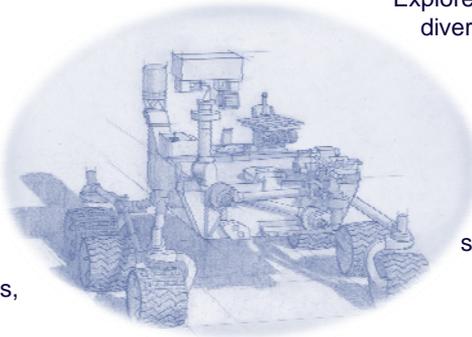
Use efficient
surface operations,
one Mars-year
lifetime

Make coordinated
scientific measurements,
down to microscopic
level

Prepare for human
exploration

Benefit from
design heritage
of Curiosity rover

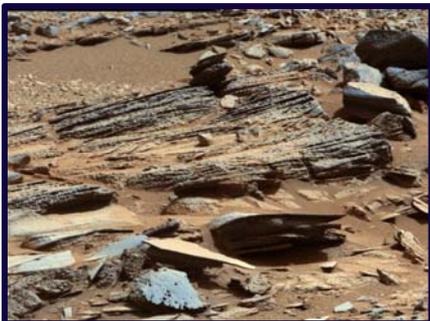
Improve Entry,
Descent, Landing
technology for precise
landing



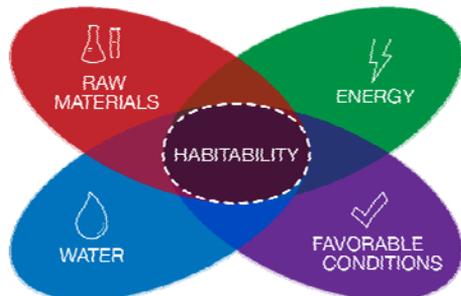
Examine Geological Record & Assess Habitability



The Mars 2020 rover would provide major breakthroughs using a combination of measurements previously unavailable to understand **ancient environments** on Mars that may have once been **abodes for life**.



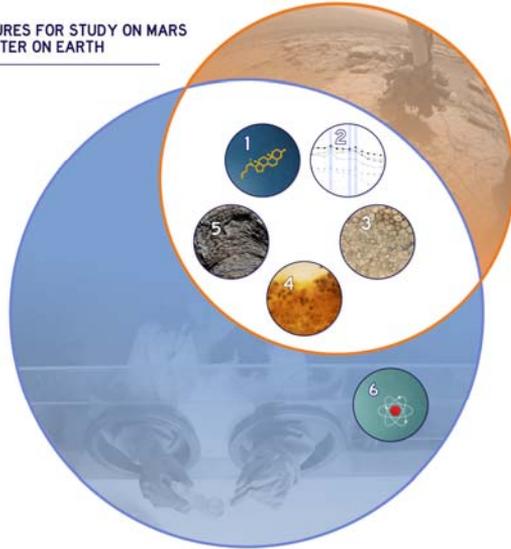
Shaler Outcrop, Gale Crater



Search for Potential Evidence of Past Life

TYPES OF BIOSIGNATURES FOR STUDY ON MARS AND POTENTIALLY LATER ON EARTH

- 1 Organics
- 2 Chemical Reactions
- 3 Minerals
- 4 Micro-structures and textures
- 5 Macro-structures and textures
- 6 Isotopes



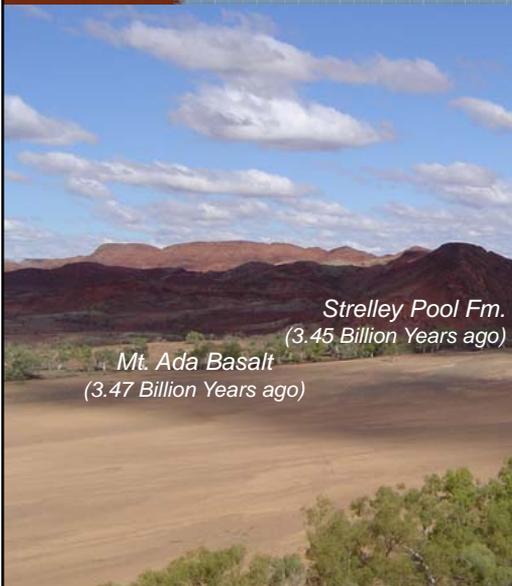
The Mars 2020 rover would be able **to begin a search for the signs of past life** on Mars by using its own instruments and by enabling the **possible future return** of the most promising samples to Earth.

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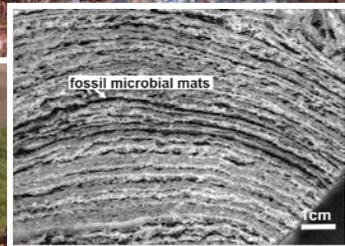
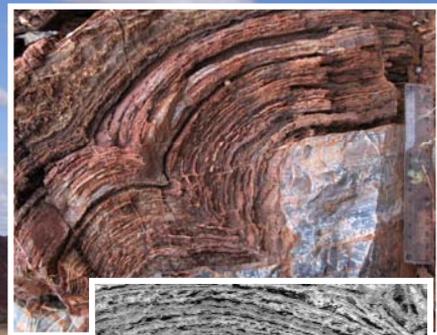
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Earliest Evidence of Life on Earth



Strelley Pool Fm.
(3.45 Billion Years ago)

Mt. Ada Basalt
(3.47 Billion Years ago)

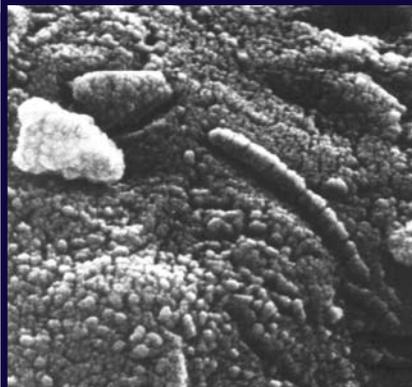


Oldest Convincing Evidence of Life on Earth: Pilbara Block of Australia.

(from Allwood et al., 2006; 2009)

Early Life on Mars?

- Life started early on Earth
- Earth and Mars similar in early history: high rates of impact and volcanism, aqueous environments, chemical gradients, magnetic field, warm climates, etc.



Scanning Electron Microscope image,
Allan Hills meteorite ALH84001

Life on Mars? Options:

1. Never any life on Mars
2. Life arose independently on Mars (2nd genesis)
3. Mars seeded from Earth
 - Mars and Earth exchange rocks as a result of impacts: ~50 martian meteorites found on Earth
 - Small fraction of ejecta from Earth would reach Mars unsterilized
4. Earth seeded from Mars:
Are We Martians?

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5

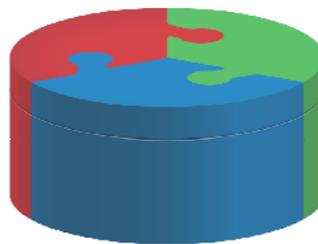
Assemble a Returnable Cache of Samples

The Mars 2020 rover would enable the enormous leap in Mars science that could come from eventually **returning to Earth** a storage cache filled with **compelling rocks and soils** for analysis using the full power of the world's laboratory capability.

Three attributes are essential to making a cache returnable:

SCIENCE MERIT

The cache has enough scientific value to merit returning.



PLANETARY PROTECTION

The cache complies with planetary protection requirements.

ENGINEERING

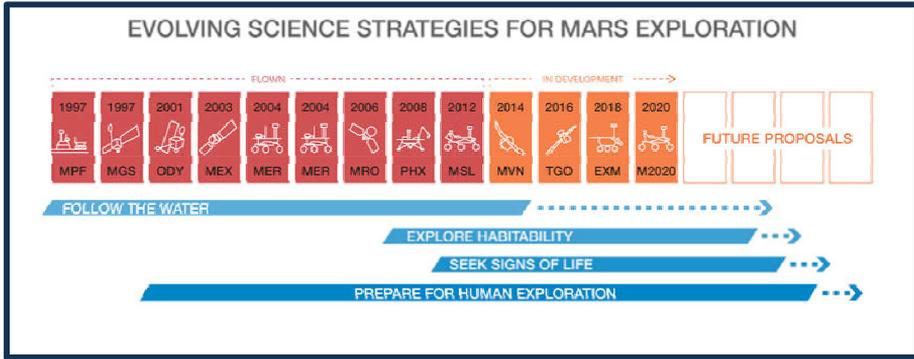
The cache is returnable in an engineering sense.

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6

The Mars 2020 rover is poised to take the **next most important step** in the astrobiological strategy for the exploration of Mars: the **creation of a returnable cache** of carefully selected samples for eventual return to Earth.



A mission with this objective would be a key milestone in the new Mars Exploration theme: "Seek Signs of Life."