If A Tree Falls on Mars, Does It Leave A Fossil?

Meridiani Planum Hematite Deposit and the Search for Evidence of Life on Mars: Iron Mineralization of Microorganisms in Rock Varnish

Allen, Carlton C. et al. Icarus 171 (2004): 20-30

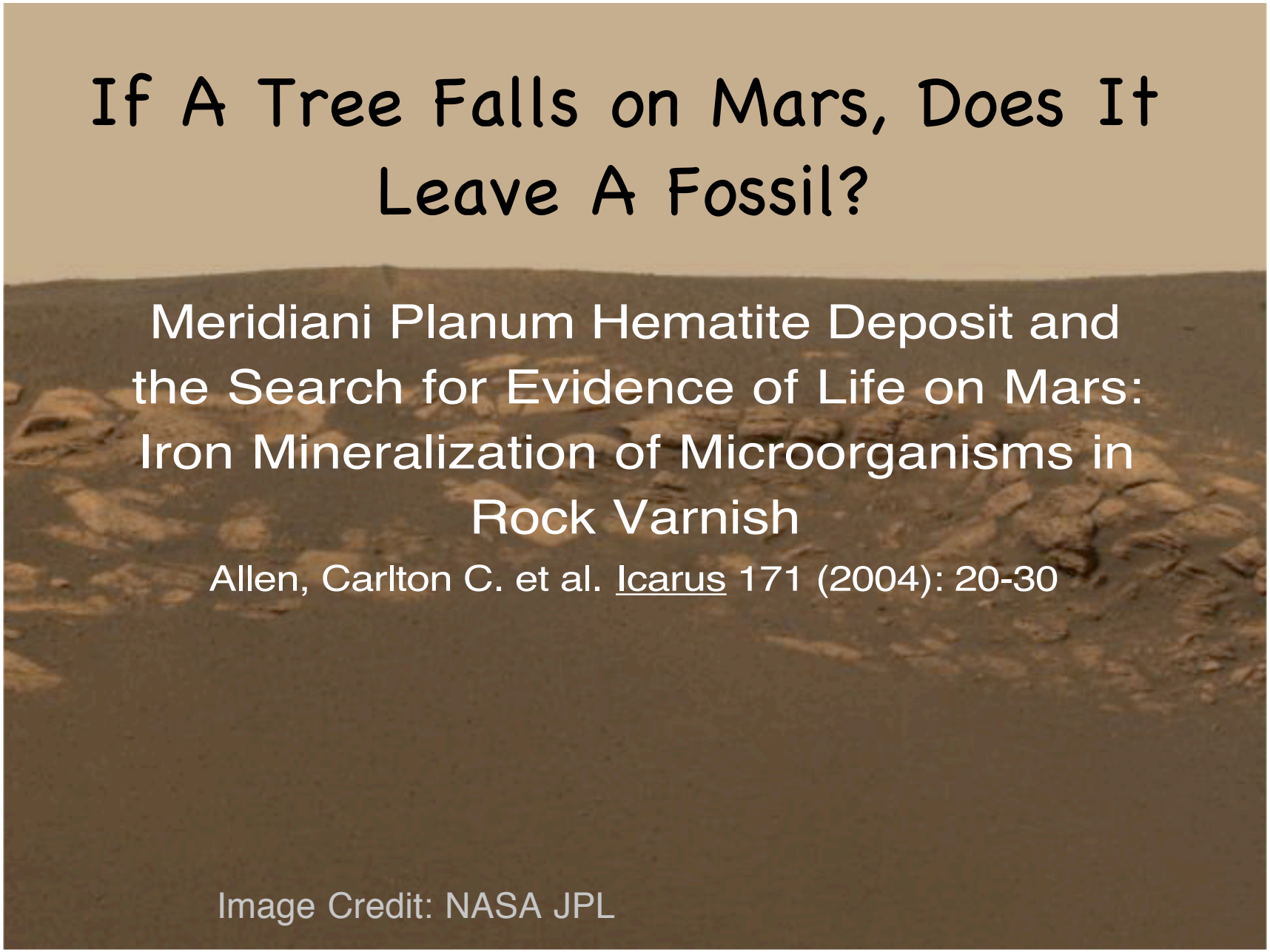

Image Credit: NASA JPL

Hematite?

- Reddish mineral: Fe_2O_3
- Opportunity's landing site: Hematite deposit in Meridiani Planum
- Evidence for Water?

Fossilization?

- Hematite could preserve fossils
- How this happens depends on how it formed
- Previous research: fossilization in three of the four H_2O-related scenarios

Formation of the Hematite

- O_2 + Fe + Standing H_2O
- Fe + Heat + H_2O
- Groundwater Percolation
- Surface weathering with H_2O present
- Oxidation of magnetite in lava (no water needed)

Rock Varnish?

- Clay and oxides, on Earth and Mars
- Natural product of weathering
- On Earth, life on varnish
- Purpose: detection of fossils in varnish on Earth

Methods

- Gathered varnish samples from AZ, Australia
- Quick examination by microscope
- Good samples put under electron microscope
- X-Ray spectrometer used

Results

- Found some fungi coated in varnish
- A few rare cases of bacteria cells cast in Fe, Mn
- Little evidence compared to the amount present
- May not persist for long time

On Mars?

- Can’t bring a SEM and TEM with you
- Researchers recommend sample return mission