



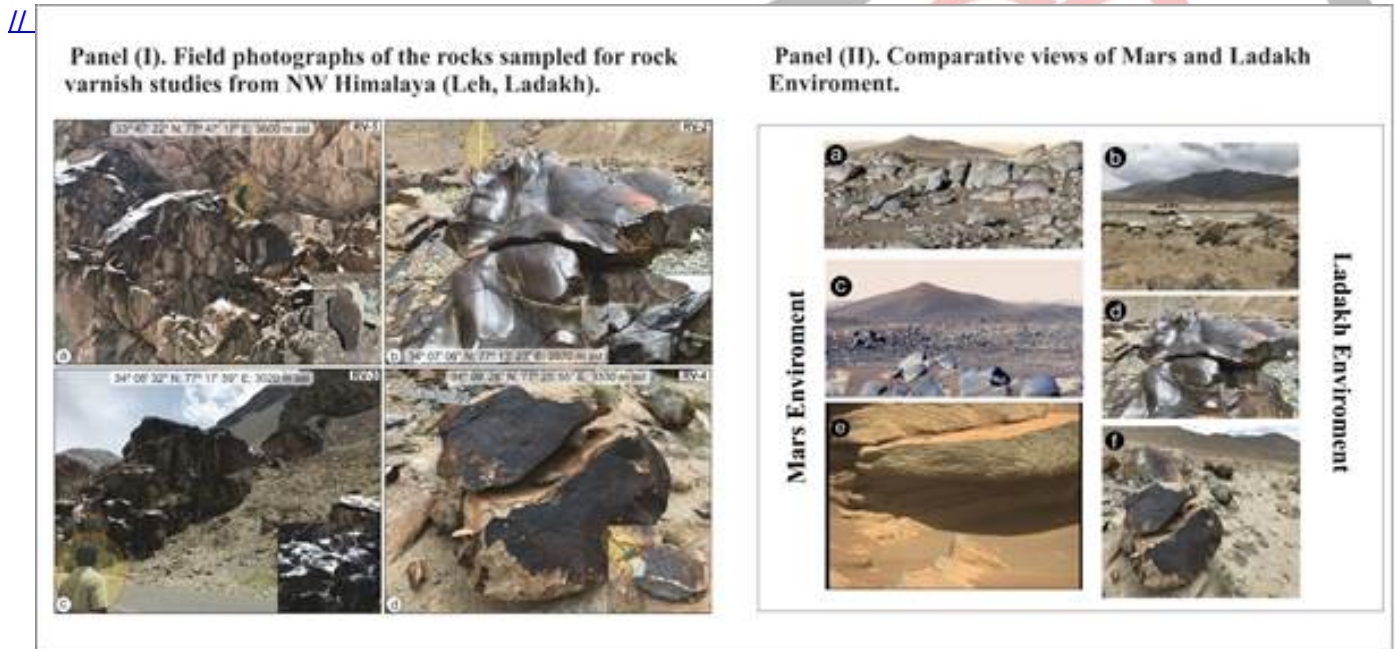
# Ladakh's Rock Varnish

Source: PIB

## Why in News?

Recently, **Magnetofossils**, fossilised magnetic particles from magnetotactic bacteria, have been **discovered in rock varnish layers in Ladakh**.

- Rock varnish is a **dark brown to black coating** that covers stable, subaerially exposed rock surfaces in arid and semiarid regions.



## What are the Key Highlights of the Study?

- **Findings:**
  - The analysis of the rock varnish samples from Ladakh revealed higher concentrations of **oxidized manganese (Mn<sup>4+</sup>)** and **carboxylic acid** functionality, indicating organic signatures.
  - These findings suggest that the rock varnish in Ladakh, a **potential Martian analogue site**, contains enriched **concentrations of magnetic minerals likely derived from biotic sources**.
    - Magnetic minerals are those **that preserve a record of the Earth's magnetic field from when they formed** and can be found in rocks, sediments, and soils.
- **Significance:**
  - The study offers **valuable insights for astrobiology** by demonstrating how life can thrive in extreme environments, **such as Ladakh, the "cold desert of India."**

- The findings are crucial for planning future space missions by [Indian Space Research Organisation \(ISRO\)](#) and other space agencies, including **Mars exploration**, where **identifying habitable environments is a primary goal**.
  - Identifying biotic signatures in rock varnish **helps scientists target potential biosignatures on Mars and other planets**, supporting the search for extraterrestrial life
    - A biosignature is **any characteristic, element, molecule, substance, or feature** that can be **used as evidence for past or present life**.

## Magnetofossils

### ▪ About:

- **Magnetofossils** refer to fossilised remains of **magnetotactic bacteria** that contain magnetic minerals.
  - **Magnetotactic bacteria** leave **fossilised magnetic particles** in geological records.

### ▪ Magnetotactic Bacteria:

- Magnetotactic bacteria **are mostly prokaryotic organisms** that arrange themselves along the [earth's magnetic field](#). It was discovered by **Salvatore Bellini in 1963**.
- These organisms follow **the magnetic field to reach places that had optimal oxygen concentration**. This process is facilitated by the presence of iron-rich crystals within their cells.
  - **Magnetotactic bacteria** create **tiny crystals of magnetite or greigite** within their cells to navigate **changing oxygen levels** and **sediment saturation** in water bodies.
  - Crystals within magnetotactic bacteria are arranged in a **chain configuration** through **magnetotaxis**.
- Rare **giant magneto fossils are less common** than conventional magnetic fossils, these are likely **produced by eukaryotes** rather than bacteria.

## UPSC Civil Services Examination, Previous Year Question (PYQ)

### Q. Consider the following: (2021)

1. Bacteria
2. Fungi
3. Virus

Which of the above can be cultured in an artificial/synthetic medium?

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

Ans: (a)

### Q. Consider the following statements: (2018)

1. The Earth's magnetic field has reversed every few hundred thousand years.
2. When the Earth was created more than 4000 million years ago, there was 54% oxygen and no carbon dioxide.

3. When living organisms originated, they modified the early atmosphere of the Earth.

**Which of the statements given above is/are correct?**

**(a)** 1 only

**(b)** 2 and 3 only

**(c)** 1 and 3 only

**(d)** 1, 2 and 3

**Ans: (c)**

PDF Reference URL: <https://www.drishtias.com/printpdf/ladakh-s-rock-varnish>

