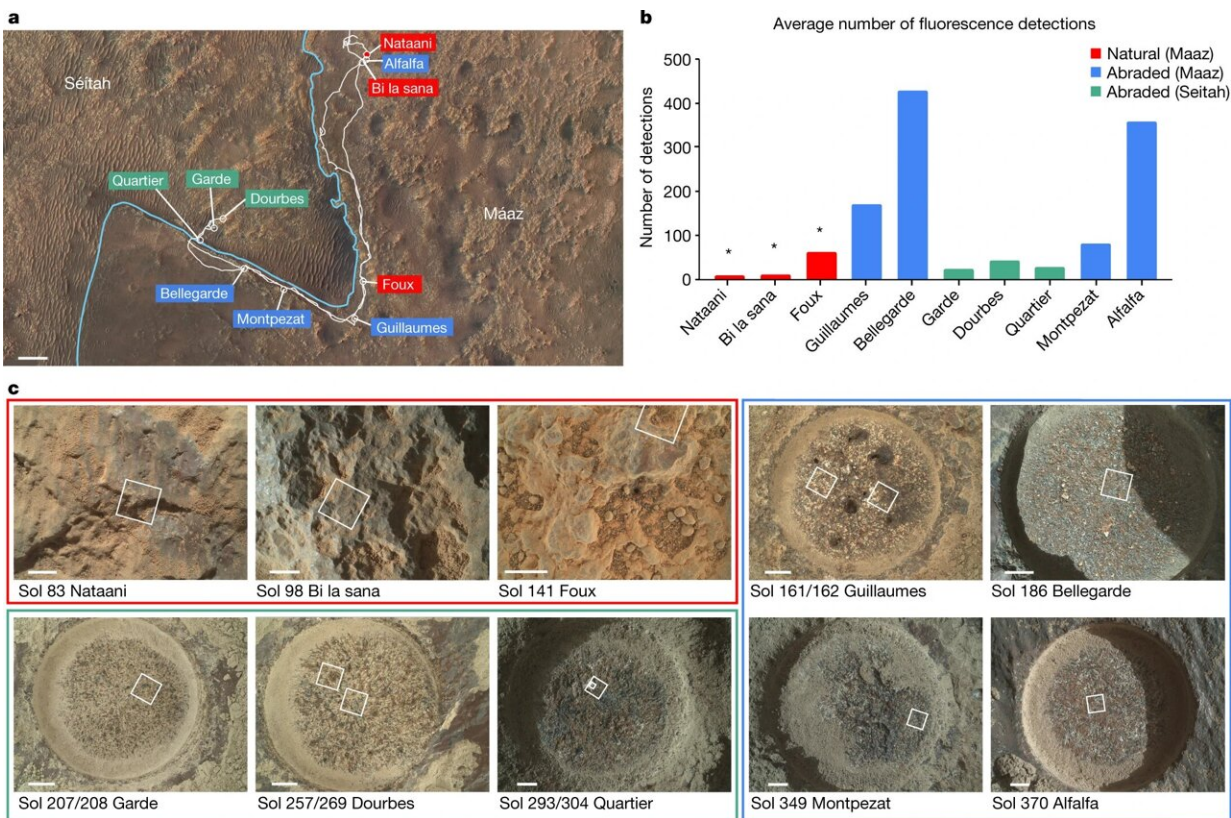


New study reveals evidence of diverse organic material on Mars

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Overview of targets analyzed by SHERLOC during the crater floor campaign. **a**, High Resolution Imaging Science Experiment (HiRISE) image of the region studied with the rover's traverse marked in white, the boundary between the Séítah and Máaz fm delineated by the light blue line, and each rock target labeled. Scale bar, 100 m. **b**, Average number of fluorescence detections (out of 1,296 points) from survey scans for each target interrogated by SHERLOC, arranged in order of observation. *The acquisition conditions were different for dust-covered natural targets as compared to relatively dust-free abraded targets,

possibly resulting in reduced detections. **c**, WATSON images of natural (red box) and abraded targets (Mááz is the blue box, Séítah is the green box) analyzed in this study, with SHERLOC survey scan footprints outlined in white. Two survey scans were performed on Guillaumes, Dourbes and Quartier. Sol 141 imaging on Foux had an incomplete overlap of WATSON imaging and SHERLOC spectroscopy mapping. Scale bars, 5 mm. Credit: *Nature* (2023). DOI: 10.1038/s41586-023-06143-z

A new study featuring data from the NASA Mars Perseverance rover reports on an instrumental detection potentially consistent with organic molecules on the Martian surface, hinting toward past habitability of the Red Planet. The research, led by a team of scientists that includes UF astrobiologist Amy Williams, was recently published in the journal *Nature*.

Scientists have long been fueled by the possibility of finding [organic carbon](#) on Mars, and while previous missions provided [valuable insights](#), the latest research introduces a new line of evidence that adds to our understanding of Mars. The findings indicate the presence of a more intricate organic geochemical cycle on Mars than previously understood, suggesting the existence of several distinct reservoirs of potential organic compounds.

Notably, the study detected signals consistent with molecules linked to aqueous processes, indicating that water may have played a key role in the diverse range of organic matter on Mars. The key building blocks necessary for life may have persisted on Mars for a far more extended period than previously thought.

Amy Williams, an expert in organic geochemistry, has been at the forefront of the search for life's building blocks on Mars. As a participating scientist on the Perseverance mission, Williams' work

centers on the quest for [organic matter](#) on the Red Planet. She aims to detect habitable environments, search for potential life materials, and uncover evidence of past life on Mars. Eventually, the on-site samples collected by Perseverance will be sent back to Earth by future missions, but it will be a complex and ambitious process spanning many years.

"The potential detection of several organic carbon species on Mars has implications for understanding the [carbon cycle](#) on Mars, and the potential of the planet to host life throughout its history," said Williams, an assistant professor in UF's Department of Geological Sciences.

Organic matter can be formed from various processes, not just those related to life. Geological processes and [chemical reactions](#) can also form organic molecules, and these processes are favored for the origin of these possible Martian organics. Williams and the team of scientists will work to further examine the potential sources of these molecules.

Until now, organic carbon had only been detected by the Mars Phoenix lander and the Mars Curiosity rover by using advanced techniques like evolved gas analysis and gas chromatography-mass spectrometry. The new study introduces a different technique that also potentially identifies simple organic compounds on Mars.

The chosen landing site for the rover within Jezero crater offers a high potential for past habitability: As an ancient lake basin, it contains an array of minerals, including carbonates, clays, and sulfates. These minerals have the potential to preserve organic materials and possible signs of ancient life.

"We didn't initially expect to detect these potential organics signatures in the Jezero crater floor," Williams said, "but their diversity and distribution in different units of the crater floor now suggest potentially different fates of carbon across these environments."

The scientists used a first-of-its-kind instrument called the Scanning Habitable Environments with Raman and Luminescence for Organics and Chemicals (SHERLOC) to map the distribution of [organic molecules](#) and minerals on rock surfaces. SHERLOC employs deep ultraviolet Raman and [fluorescence spectroscopy](#) to simultaneously measure weak Raman scattering and strong fluorescence emissions, providing crucial insights into the organic composition of Mars.

The findings mark a significant step forward in our exploration of the Red Planet, laying the groundwork for future investigations into the possibility of life beyond Earth.

"We are just now scratching the surface of the organic carbon story on Mars," Williams said, "and it is an exciting time for planetary science."

More information: Sunanda Sharma et al, Diverse organic-mineral associations in Jezero crater, Mars, *Nature* (2023). [DOI: 10.1038/s41586-023-06143-z](#)

Provided by University of Florida

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