Searching for Signs of Life with the ExoMars Rover

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Based on what we knew about planetary evolution in the 1970's, many scientists regarded as plausible the presence of simple microorganisms on other planets. The 1976 Viking landers can be considered the first missions with a serious chance of discovering signs of life on Mars. That the landers did not provide conclusive evidence was not due to a lack of careful preparation. In fact, these missions were remarkable in many ways, particularly taking into account the technologies available at the time. The Viking results were a consequence of the manner in which the life question was posed. The apparent failure to detect organic molecules on Mars had an effect on all subsequent landed Mars missions, which focused initially on geology and later on habitability.

The second ExoMars mission is scheduled to launch on 24 July 2020. It will deliver to the martian surface a 310-kg mass rover and an instrumented landed platform having nominal mission durations of 218 sols and one Earth year, respectively.

The rover will explore the landing site's geological environment searching for signs of life. A drill—having a maximum reach of 2 m—will allow to collect samples from outcrops and from the subsurface. Such depth range has never been probed on Mars before. ExoMars' sampling capability will provide the best chance yet to access and analyse well-preserved sedimentary deposits, possibly containing molecular biosignatures, that may have been spared the ravages of ionising radiation.

The rover's Pasteur payload includes: panoramic instruments (wide-angle and high-resolution cameras, an infrared spectrometer, a ground-penetrating radar, and a neutron detector); a subsurface drill to acquire samples; contact instruments for studying rocks and collected material (a close-up imager and an infrared spectrometer in the drill head); a Sample Preparation and Distribution System (SPDS); and the analytical laboratory, the latter including a visual and infrared imaging spectrometer, a Raman spectrometer, and a Laser-Desorption, Thermal-Volatilisation, Derivatisation, Gas Chromatograph Mass Spectrometer (LD + Der-TV GCMS). The very powerful combination of mobility with the ability to access subsurface locations is unique to this mission.

After the Rover will have egressed, the Surface Platform will carry out environmental measurements at the landing site.

This presentation will discuss the ExoMars rover and the strategy to search for biosignatures.

Short Summary

This presentation will describe the mission and strategy to be used by the ExoMars rover to search for possible traces of past life on the red planet