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ExoMars: ESA's mission to search for signs of life on the red planet

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In the framework of its Aurora Exploration Program, in 2011 the European Space Agency (ESA) plans to launch the ExoMars mission.

ExoMars will deliver two science elements to the Martian surface: a Rover, carrying the Pasteur scientific payload; and a small, fixed surface station —the Geophysics/Environment Package (GEP). The Rover's scientific objectives are: 1) To search for signs of past and present life and 2) To characterise, in the shallow subsurface, the vertical distribution profile for water and geochemical composition. The science goals of GEP are: 1) to measure geophysics parameters necessary to understand the planet's long-term internal evolution and habitability, and 2) to characterise the local environment and identify hazards to future human missions.

Over its planned 6-month lifetime, the Pasteur Rover will travel a few kilometres searching for traces of past and present signs of life. It will do this by collecting and analysing samples from within surface rocks, and from underground —down to 2-m depth. The very powerful combination of mobility with the capability to access locations where organic molecules might be well preserved is unique to this mission. ExoMars will have the right tools to try to answer the question of whether life ever arose on the red planet.

The ExoMars mission contains two other elements: a Carrier and a Descent Module. The Carrier will bring the Descent Module to Mars and release it from the hyperbolic arrival trajectory. The Descent Module's objective is to safely deploy the Pasteur Rover and the GEP —developing a robust European Entry, Descent and Landing System (EDLS) is another fundamental goal of this mission. The mission's data relay capability will be provided by a NASA orbiter.

The Pasteur Rover's mass is presently estimated at 180 kg, including the Pasteur scientific payload. The Pasteur payload contains: Panoramic Instruments: stereoscopic cameras, a ground-penetrating radar, and an IR spectrometer; Contact Instrument for studying surface rocks: a close-up imager and a Mössbauer spectrometer; a subsurface drill capable of reaching a depth of 2 m, and also of collecting specimens from exposed bedrock; a sample preparation and distribution unit; a microscope; an oxidation sensor; and a variety of analytical instruments for the characterisation of organic substances and geochemistry in the collected samples.

Latitudinal bands between –15º and 45º can be targeted for landing, ensuring that the mission is flexible enough to accommodate interesting new sites based on latest available data from on-going Mars orbital missions.