SEARCHING FOR TRACES OF LIFE WITH THE EXOMARS ROVER. J. L. Vago[1], O Witasse[1], D. Rodionov[2], and the ExoMars Team, [1]European Space Agency (Noordwijk, The Netherlands, jorge.vago@esa.int), [2]Space Research Institute of the Russian Academy of Sciences (IKI) (Moscow, Russia)

Based on what we knew about planetary evolution in the 1970's, people took more or less for granted the presence of simple life forms 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. If anything, the Viking results were a consequence of the manner in which the life questions were posed. The failure to detect organic molecules on Mars had an effect on all subsequent landed Mars missions, which thereafter focused mainly on geology.

In the mid 90's a group of European investigators worked to define what they thought would be necessary to tackle the life-on-Mars issue once again. Their recommendations gave rise to what would become the ExoMars Programme. Today ExoMars is an international collaboration between ESA and Roscosmos—with NASA contributions—to develop and launch two missions.

The 2016 ExoMars mission includes two elements: 1) the Trace Gas Orbiter (TGO) to study atmospheric trace gases and subsurface water with the goal to acquire information on possible on-going biological or hydrothermal rock alteration processes; and 2) the European Entry, Descent, and landing Demonstrator Module (EDM) to achieve a successful soft landing on Mars and demonstrate technologies for the 2018 mission landing. The TGO will also provide data communication services for surface missions, nominally, until end 2022. The mission will be launched in January 2016 using a Proton rocket and arrive to Mars in October 2016.

The 2018 ExoMars mission will deliver a 310-kg mass rover and an instrumented landed platform to the martian surface. The mission will pursue one of the outstanding questions of our time by attempting to establish whether life ever existed on Mars.

The rover will explore the landing site's geological environment and conduct a search for signs of past and present life. A drill will allow the rover to collect and analyse samples from outcrops and at depth. The subsurface sampling capability will provide the best chance to access and analyse well-preserved sedimentary deposits, possibly containing molecular biosignatures.

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 capable of reaching a depth of 2 m to acquire specimens; contact instruments for studying rocks and collected samples (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 where organic molecules may be well preserved is unique to this mission.

After the Rover will have egressed, the Platform will carry out scientific environmental measurements at the landing site. The mission is scheduled to launch in May 2018 on a Proton rocket, and arrive to Mars in January 2019.

Even in case of promising biosignature discoveries, confirmation of the results would require a more thorough analysis than can be performed by remote robotic means. For this reason, the long-term goal of ESA's Mars Exploration Programme remains an international Mars Sample Return (MSR) mission, sometime during the next decade. The ExoMars missions constitute a fundamental milestone for MSR, as they will make an important contribution toward determining what types of samples to return.

This presentation will concentrate on the ExoMars rover mission (including science objectives, instrumentation, and upcoming milestones), as well as briefly report on the progress achieved toward the identification of suitable landing sites.