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## Life on Mars Curiosity rover identifies methane and numerous organic molecules

Thursday 8 June, the journal *Science* announced that the Curiosity rover, using its SAM instrument operated from the Toulouse Space Centre in France, has identified methane and numerous organic molecules on Mars.

Curiosity resumed drilling on Mars recently after its drill had remained off line all of last year. This time, the SAM instrument (Sample Analysis at Mars) has detected 100 times more organic molecules in the planet's subsurface than before, at a depth of five centimetres, and above all more complex molecules like thiophene, benzene and toluene. Curiosity's core mission is to advance scientific investigations on the question of whether Mars once supported life. If it did, there must have been at some point a complex organic chemistry phase, for which Curiosity has now found evidence. The second discovery, also made by the SAM instrument, concerns regular releases and notably seasonal patterns of methane emissions, which peak in summer and drop in winter. Where the methane is coming from is still unknown, but it could be of mineral or biological origin. These latest discoveries still do not constitute evidence that there is or once was life on Mars.

A number of future missions are lining up to continue the search for possible traces of life on the red planet. The first is InSight, set to land on Mars on 26 November, for which France, led by CNES, is supplying the SEIS seismometer. InSight will be the first mission to probe the deep interior of Mars to find out more about its geophysical structure. Indirectly, such information could also provide key clues about whether Mars once harboured life. ExoMars is the third European mission to Mars, being led by the European Space Agency (ESA). Scheduled to land in early 2021, it will be capable of drilling down to two metres below the surface, whereas Curiosity can go no further than five centimetres. Here again, the mission will be carrying several scientific instruments to which CNES and French research laboratories are contributing. Lastly, NASA's Mars 2020 mission, the follow-on to Curiosity, plans to land on Mars in February 2021. France is supplying the rover's 'chemical eyes', the SuperCam instrument offering vastly improved performance over its predecessor ChemCam operating on Curiosity. SuperCam will use Raman spectroscopy to remotely measure the chemical composition of any organic molecules found in Martian rocks. It will also have an infrared spectroscopy capability, notably to identify clay-bearing sedimentary rocks that formed when conditions on Mars would have been conducive to life. Mars 2020 will collect samples to be returned to Earth at a later date. Only analysis of such samples in the laboratory is likely to answer once and for all the question of whether life ever existed on Mars.

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