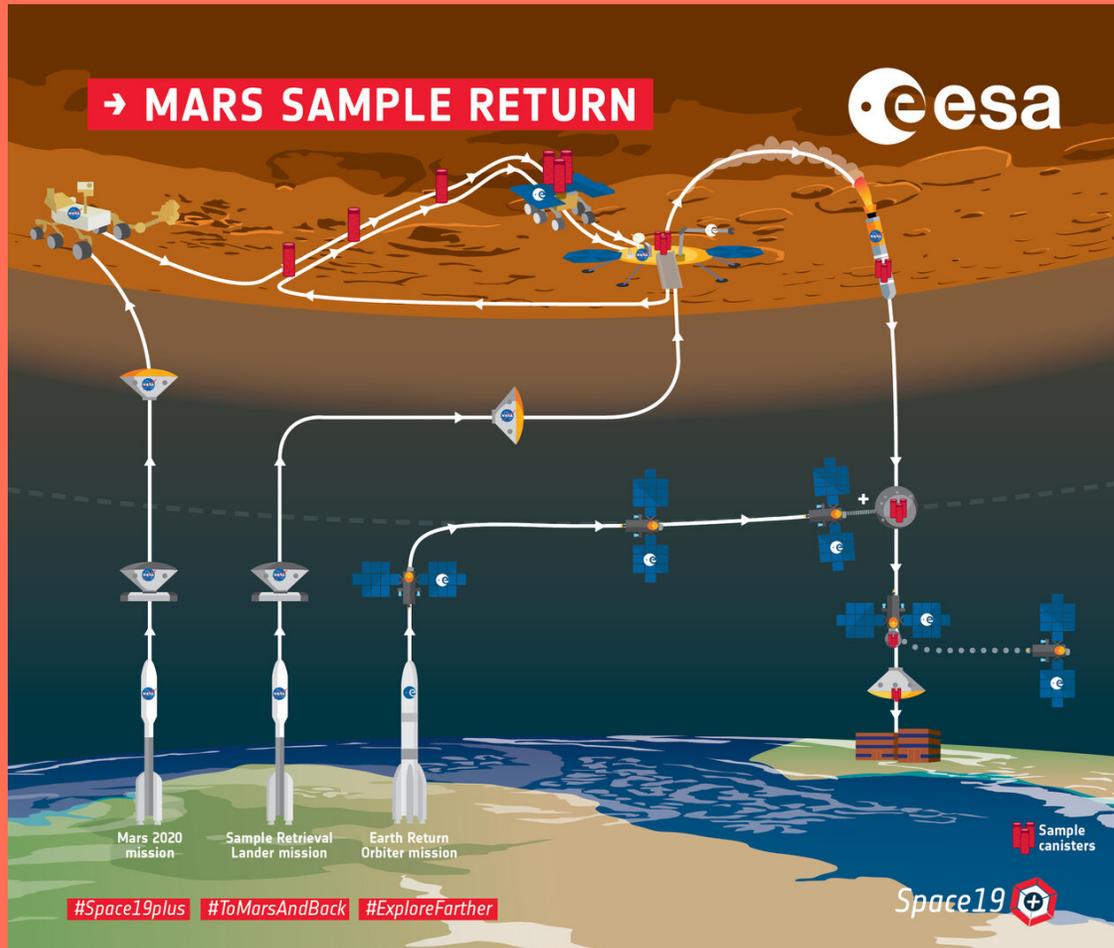


Mars Sample Return: science and engineering



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The NASA 2020 Mars Rover mission, that will land at **Jezero Crater, Mars**, will collect and cache geological samples for their future **return to Earth**. The transportation to Earth will require a sample-retrieval mission and an Earth return mission. Both of them are now being developed by ESA. An international team of 77 researchers (International MSR Objectives and Samples Team, iMOST) has prepared a white paper describing the potential goals of the Mars Sample Return (MSR) mission. This team has reviewed the state of the art of the latest scientific and engineering discoveries about Mars and its exploration plans, to define the scientific objectives, the samples of interest, their amount, the requirements on sampling, and the analytical methods that would be applied to the Martian samples once on Earth. These suggestions were adapted to the realities of the NASA 2020 Mars Rover sampling system.

The objectives of the sample studies required to improve our understanding of the past history, present state and future exploration risks and potentials of Mars are classified as: 1) Geological environments; 2) Life; 3) Geochronology; 4) Volatiles; 5) Planetary-scale geology; 6) Environmental Hazards and 7) In-Situ Resource Utilization (ISRU).

This has also been covered recently by two science outreach articles: [Rocks, Rockets And Robots: The Plan To Bring Mars Down To Earth](#) by Robin George Andrews, *Scientific American*, January 2020. [Bold space mission to bring back rocks from Mars takes shape](#) by Daniel Clery, Paul Voosen, *Science*, 21 November 2019.

Beaty, D.W., Grady, M.M., McSween, H.Y., Sefton-Nash, E., Carrier, B.L.,...,and Zorzano, M.P. (2019), The potential science and engineering value of samples delivered to Earth by Mars sample return. *Meteoritic and Planetary Sciences*, 54: S3-S152.

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