OMEGA/MARS EXPRESS FEED FORWARD TO MSR. J-P. Bibring, Institut d'Astrophysique Spatiale (IAS), Orsay, France (bibring@ias.fr).

Introduction: Following on the pioneering ISM/Phobos and TES/MGS compositional mapping of Mars, OMEGA and HRSC on board Mars Express, coupled to the MERs ground truth, and complemented by CRISM and HIRISE on MRO, have unprecedently increased our understanding of the evolution of Mars by coupling compositional data to geomorphological context exhibiting the space and time evolution of the martian environment, at all timescales from geological and climatic to seasonal variations. An important outcome is the very high degree of diversity of the surface, coupled to a high level of preservation, which enables to potentially sample surface material recording most if not all eras constituting the Martian history. There exist a number of areas in which landing would enable collecting samples reflecting this diversity, on a small spatial scale.

Mars uniqueness: Mainly due to its size, sufficiently large (as compared to the Moon) to have been subjected to a high level of internal activity, as traced e.g. by the remnant crustal magnetization, the volcanic features, the fluvial structures, and sufficiently small (as compared to the Earth) not to have suffered global resets, Mars is unique in comparative planetology to exhibit surface terrains enabling potentially to reconstruct the entire history of inner solar system differentiated bodies. A variety of both pristine and altered phases have been identified and mapped in their geological and environmental context, by OMEGA: the cratered crust is characterized by abundant Low Ca Pyroxene (LCP), while the magma outflows are enriched in High Ca pyroxenes (HCP); within the crust, a number of spots show the presence of hydrated phyllosilicates (the discovery of which is one major outcome of the OMEGA investigation); sulfates are found in younger terrains, mostly associated with the Tharsis tectonic event; the reddish and bright soil is dominated by anhydrous ferric oxides (hematite), tracing an alteration without liquid water involved, operating till nowadays. No carbonates have been mapped, which pleads towards an early atmospheric escape. Collecting relevant samples, and analyzing in the lab their elemental, isotopic, mineralogical and molecular constituents, would enable dating and characterizing the processes that took place all along Mars evolution.

Mars habitability: A fundamental outcome of the OMEGA/Mars Express discoveries, confirmed by CRISM/MRO, is the potential for Mars to have harbored habitale conditions, very early in its History, as recorded by the presence of hydrated phyllosilicates, in crustal-correlated spots. The relevant era ended rapidly, through a global climatic change likely triggered by the drop of the dynamo, followed by the volcanic building of Tharsis. The areas still preserving this record are not located where optical images would tend to indicate, that is in connection with fluvial structures. On the opposite, they are located within the oldest crustal terrains, in sites exposed through either erosion or impact. The possibility to sample material still preserving the record of the potential emergence of extraterrestrial live (as biorelics) is a major trigger and stimulus for MSR programmes.

Ready to go MSR: The present knowledge of Mars history, as described by surface structures characterized by their composition, derived from Mars Express and MRO extended mapping, complemented by the MERs, MSL and ExoMars in situ mission, are sufficient to define a scientifically successful MSR with respect to where to go, what to sample, what to measure when returned. There is no need for further characterization, that would justify a new precursor mission. The case will be made, based on the results we will present and discuss, that programmatically, it is just time to go MSR.