

Bringing a Chemical Laboratory Named Sam to Mars on the 2011 Curiosity Rover. P. R. Mahaffy¹, L. Bleacher¹, A. Jones¹, P. G. Conrad¹, M. Cabane², C. R. Webster³, S.A. Atreya⁴, H. Manning⁵, and the SAM Team, ¹NASA Goddard Space Flight Center, Code 699, Greenbelt, MD 20771 (Paul.R.Mahaffy@NASA.gov), ²LATMOS (IPSL CNRS) T45, E4,45-46, Universite Pierre et Marie Curie (PARIS VI), B102 4 Place Jussieu, 75252 Paris Cedex 05, ³Jet Propulsion Laboratory, 4800 Oak Grove Drive, Pasadena, CA 91109, ⁴University of Michigan, Ann Arbor, MI 48109-2143, ⁵Concordia College, Moorehead, MN.

Introduction: An important goal of upcoming missions to Mars is to understand if life could have developed there. The task of the Sample Analysis at Mars (SAM) suite of instruments [1] and the other Curiosity investigations [2] is to move us steadily toward that goal with an assessment of the habitability of our neighboring planet through a series of chemical and geological measurements. SAM is designed to search for organic compounds and inorganic volatiles and measure isotope ratios. Other instruments on Curiosity will provide elemental analysis and identify minerals. SAM will analyze both atmospheric samples and gases evolved from powdered rocks that may have formed billions of years ago with Curiosity providing access to interesting sites scouted by orbiting cameras and spectrometers.

SAM Instrument Suite: SAM's instruments are a Quadrupole Mass Spectrometer (QMS), a 6-column Gas Chromatograph (GC), and a 2-channel Tunable Laser Spectrometer (TLS). SAM can identify organic compounds in Mars rocks to sub-ppb sensitivity and secure precise isotope ratios for C, H, and O in carbon dioxide and water and measure trace levels of methane and its carbon 13 isotope. The SAM gas processing system consists of valves, heaters, pressure sensors, gas scrubbers and getters, traps, and gas tanks used for calibration or combustion experiments

[2]. A variety of calibrant compounds interior and exterior to SAM will allow the science and engineering teams to assess SAM's performance. SAM has been calibrated and tested in a Mars-like environment (Figure 1).

Keeping Educators and the Public Informed: The Education and Public Outreach (EPO) goals of the SAM team are to make this complex chemical laboratory and its data widely available to educators, students, and the public. Formal education activities include developing templates for professional development workshops for educators to teach them about SAM and Curiosity, incorporating data into Mars Student Data Teams, and writing articles for the ChemMatters journal that is widely distributed to high school students. Informal education activities include professional development telecons for the NASA Museum Alliance and development of a landing site selection activity that will bring to the attention of students and the public the interesting work done by Mars scientists who study the best locations for Curiosity to explore. Each of these products can be used by interested groups and venues wishing to participate in the Year of the Solar System.

References: [1] Mahaffy, P.R., Space Sci. Rev. 135, 255 (2008). [2] Mahaffy, P.R. (2009) Geochem. News, 121.

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