GENTNER - A MINIATURISED LASER INSTRUMENT FOR PLANETARY IN-SITU ANALYSIS

E.K. Jessberger (1) and the International GENTNER Team

(1) Institut für Planetologie, Westfälische Wilhelms-Universität, Münster, Germany (ekj@uni-muenster.de/Fax: +49 251 8336301)

Planetary in-situ analysis is becoming one of the most important tools for exploring celestial bodies. Required are advanced tools characterised by (a) short measurement duration, (b) high sensitivity, high repetition rate, high reproducibility, high spatial resolution, (c) low mass, size, and resource needs, (d) high flexibility with respect to type, shape, and size of sample material, and (e) robustness towards contamination like dust coverage.

We propose a novel instrument - named GENTNER after the famous German physicist Wolfgang Gentner - that in its baseline configuration is a combination of Laser Induced Plasma Spectrometry (LIPS) and Raman Spectroscopy. The instrument determines rapidly and with high sensitivity the concentrations of many elements in many Martian rock, coarse fines and soil samples, while it also will provide information on organic components and mineralogical information. The detection of life-related elements like H, C, N, O, P, S, and Fe and the investigation of their lateral and vertical distributions as well as their occurrences in the various Martian materials will be indicative of biologic activity. In addition, the almost complete knowledge of the elemental inventory and of the mineralogy is a pre-requisite for understanding the geologic history of the visited sites and of planet Mars as a whole.

In its preliminary configuration as a stand-alone instrument GENTNER weighs 1942.2 g, needs 4.63 W power and in nominal use consumes 68.52 Wh. These figures greatly reduce by sharing components with other experiments.

The basic GENTNER concept consists of one or more small, light-weight Sensor Heads mounted on an arm and/or near a drill tip, and an Instrument Module (pump laser, spectrometer, computers etc.) installed on a rover. Optical fibres connect Sensor

Heads and Instrument Module. An essential feature is the non-prerequisite of sample preparation, a rather complex and risky operation in outer Space.
By the unification of LIPS and Raman, this new instrument GENTNER greatly profits from synergetic effects - sharing e.g. the optical spectrometer, the lasers and onboard data reducing facilities - and from recent developments in miniaturisation and from front-line laser research. It also benefits substantially from the combined expertise of twenty-eight scientists from six European countries that form the dedicated GENTNER Team covering all relevant scientific and technologic disciplines.