SCIENCE ACTIVITIES WITH BEAGLE 2, THE MARS EXPRESS LANDER. C. T. Pillinger,[1] I. P. Wright[1] and M. R. Sims[2] on behalf of the Beagle 2 Consortium, [1]Planetary Sciences Research Institute, The Open University, Walton Hall, Milton Keynes MK7 6AA, UK, [2]Space Research Centre, University of Leicester**,** Department of Physics and Astronomy, University of Leicester, University Road, Leicester, LE1 7RH, UK.

Beagle 2 seeks to perform a full geological, mineralogical and geochemical investigation programme to characterise a landing site on Mars likely to have experienced erosion by water transport mechanisms. The geochemical approach will include a qualitative, quantitative and isotopic inventory of the light elements, hydrogen, carbon, nitrogen and oxygen noble gases in their "organic", inorganic and atmospheric situations. The distribution of the elements between species and any observed isotopic fractionation is to be used as a guide to provenance and to understand the martian environmental cycles. Noble gas data can provide a history of the planet including the age of rocks. Since recent work with martian meteorites indicates the involvement of low temperature geochemistry on Mars, a major aim will concern exobiology, to establish whether (i) conditions appropriate to life prevail, (ii) any evidence for past life has survived or (iii) global disequilibrium, consistent with an active biology, exists. In undertaking these investigations Beagle 2 will address the age old question "Are we alone in The Universe?" Because of the presumed harsh oxidising conditions at the surface to atmospheric interface on Mars, materials selected from protected sites (sub-surface or rock interiors) must comprise the major source of data. In any event, this deleterious property of the planet has to be investigated for the benefit of future missions. The samples subjected to light element analysis will be scrutinised by close up imagery, documented in terms of chemical make up/mineralogy and age dated. The selection of appropriate materials for study requires and deployment of a burrowing device (the mole) and a rock grinder and corer.

At the focus of the Beagle 2 instrument package, and totally integrated with the lander, will be a mass spectrometer with a detector system compatible with a variety of modes of operation. It will be employed in conjunction with a chemical processing system designed to deliver species in a form fit for analysis, at high sensitivity and precision levels, including isotopic measurements. To survey the site, the lander will have multi-spectral panoramic cameras (stereo pair) and a wide field black and white imager. The mole is capable of recovering samples from up to 2 metres depth at close proximity to the lander. For sampling at greater distances from the lander it will crawl across the surface before burrowing under a selected boulder at a range of up to 10 metres. Samples from the interior of 10-20 cm diameter rocks will be obtained by coring following the removal of the weathered outer layers by the grinder. The mole and other sampling systems are deployed by a robotic arm with a reach of 75 cm. The arm interfaces with a sample handling/extraction facility. Likewise it is able to place X-ray and Mössbauer spectrometers, as well as a microscope, against the cleaned rock surfaces. A small number of additional environmental sensors based on both the lander and integrated with the mole will provide important information about Mars, such as temperature, pressure, wind speed, humidity and dust activity. The complete instrument package requires <6.1 kg and <20 watts which will be provided by the Beagle 2 lander systems. The arm, the mole and the grinder/corer are <4 kg. Data from the instruments will be relayed *via* the lander and orbiter back to Earth. All instruments proposed for Beagle 2 are either already developed or in an advanced stage of development.

The Beagle 2 proposal was submitted by The Open University, Leicester University, Mullard Space Sciences Laboratory, Rutherford Appleton Laboratory, Matra Marconi Space, Martin-Baker Aircraft Company, and DLR.