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A Sino-European collaboration to develop a potential payload element for the Chinese lunar exploration programme

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The University of Leicester is collaborating with Peking University to develop a candidate science payload concept for the Chinese Chang'e-II lunar exploration mission. The instrument suite is called the Peripatetic Scientific Tools for Lunar Exploration (PESTLE). To follow on from Chang'e-I, a lunar orbiter to launch in 2007, Chang'e-II is a rover, due to land c. 2012. The PESTLE instruments and tools are mounted on the end of a robotic arm.

Some of the instruments can draw on the heritage of the ESA Mars Express/Beagle 2 Position Adjustable Workbench (PAW). The PAW consists of a Rock Corer-Grinder, X-ray Spectrometer, Mössbauer Spectrometer, Microscope, Stereo Cameras and the Mole – a self-propelled subsurface sampler.

PESTLE can contribute to a geological evaluation of the Chang'e-II landing area with implications for lunar origin and history. For example, at the South Pole Aitken Basin, material excavated from the lower crust and upper mantle can potentially be investigated.

PESTLE can be used to assess the availability of lunar resources at the landing site. ^{3}He can be identified using a mass spectrometer and, in conjunction with the mole, its stratification can be investigated. A Mössbauer spectrometer can provide a measure of the residence time (maturity) of soil on the upper 1mm of the regolith. Maturity is a measure of the load of solar wind species and hence of the ^{3}He content. An X-ray

spectrometer can be used to identify ilmenite (using the Fe/Si-Al/Si and Mg/Si-Al/Si signatures), a resource from which oxygen can be obtained for propellant and life-support. Indeed, ^{3}He is preferentially retained in its crystal structure.

This concept will continue to be developed for formal submission as a candidate payload element for Chang'e-II. The PESTLE instrument suite offers an opportunity to form an ESA-China collaboration to build on the success of Double Star within the context of the Aurora programme.