VIRTUAL MICROSCOPE FOR EXTRA-TERRESTRIAL SAMPLES: A NEW TOOL FOR PUBLIC ENGAGEMENT IN PLANETARY SCIENCES M. Anand[1,2], S. P. Kelley[1], A. G. Tindle[1] and P. C. Whalley[3], [1]Department of Earth and Environmental Sciences, CEPSAR, Open University, Milton Keynes, MK7 6AA, UK (m.anand@open.ac.uk) [2]Department of Mineralogy, The Natural History Museum, London, SW7 5BD, UK. [3]Knowledge Media Institute, Open University, Milton Keynes, MK7 6AA, UK

Introduction: The public's fascination with space and extra-terrestrial rocks is well documented and the role of meteorites and returned lunar samples in educating the public and school children about the nature, origin and evolution of the Solar System is unrivalled. However, thus far, such education and outreach efforts have been limited because of the accessibility issues of unique and precious extra-terrestrial samples and the relatively limited reach of world museums and institutions that have impressive collections of meteorites.

The latest on-line technological advancements have allowed scientists, researchers and educators to reach audiences located beyond national geographical boundaries and this presents a tremendous opportunity for outreach work in a global setting. In this respect, we would like to describe a new project which we have piloted at the Open University which involves developing a web-based virtual microscope for extra-terrestrial rock samples.

With the virtual microscope it is possible to illustrate not only mineralogical features of extra-terrestrial rocks, but also important petrological and structural features that directly relate to planetary processes involved in their formation.

Methodology: Involves collecting up to 1000 high-resolution images of each thin-section using a polarizing microscope. The images are then either stitched together to create large area mosaics, or compiled into rotation movies. These resources are then integrated into proprietary software to produce a web-based virtual microscope library which users can then access in a very similar way to a real microscope. Users can pan around the images, change magnification (by zooming in and out), change lighting conditions (from plane polarised light to between cross-polars), and study changing mineral colours (pleochroism and birefringence) as the section is rotated (Fig. 1). It is also possible to make measurements of individual crystals or perform modal analysis using a superimposed grid.

Current Status: We have created a small database for extra-terrestrial samples which can be accessed at http://www.open.ac.uk/planetarygeology/p12_1.shtml. This includes three lunar samples (two Apollo basalts and a lunar meteorite), one Martian meteorite, and two chondritic meteorites. The variety of rock types represented in our current collection allows users to learn about the main mineralogical differences between rocks from different planetary bodies and in the case of meteorites, various shock-induced features can also be easily identified. The mineralogical makeup and the state of preservation (i.e., lack of weathering and shock features in pristine Apollo lunar basalts compared to the highly brecciated and metamorphosed sample of a Martian meteorite) illustrate some of the important planetary processes these samples have been subjected to.

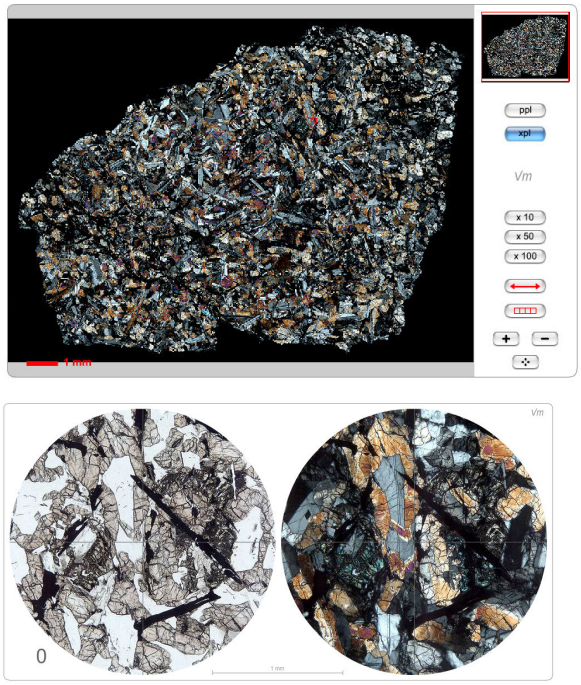

Fig. 1 A screenshot of the web-based virtual microscope of lunar meteorite LAP 04841.
Top – crossed-polar view of a whole thin-section. Buttons on the right allow users to switch from plane polarized light (PPL) to crossed polars (XPL), vary magnification, pan around, zoom in an out on an area of interest, and overlay a grid or scale.
Bottom – the two circular areas are rotation movies in PPL (left) and XPL (right). The user can rotate these two circles simultaneously - something not possible with a real microscope!

Future Developments: We plan to build upon this preliminary dataset by creating a virtual microscope

library for a range of planetary samples including unique and rare meteorites, to which we will add images of rock hand specimens and brief background information about each imaged sample. We are also developing mobile versions of virtual microscopes, making it even more versatile (an iPod version is well advanced). It is expected that the virtual microscope database will provide resources that will also appeal to the academic and research community, thus ensuring its widest possible use for educational, research and outreach purposes.

One of the main objectives of this project is to stimulate the public's interest in planetary and astronomical sciences through a range of multi-media platforms such as PCs, laptops, and other hand-held devices. The use of current technologies in delivering this project will also engage and excite the young audience for science and engineering subjects. Because the internet will be the main medium of dissemination for the virtual microscope, the impact of this project will transcend national boundaries and will be of international relevance, especially with the emergence of new space-faring nations.

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