

The Raman Spectrometer

By Paul Garside, Conservation Scientist at the British Library

Modern analytical techniques have an increasingly significant role in the conservation of cultural heritage and can reveal important information about the composition, condition and history of artefacts. This, in turn, will help to inform decisions on the treatment, display and storage of these objects, as well as assisting in their interpretation.

One such technique is Raman spectroscopy, which can provide a 'chemical fingerprint' of a material, allowing it to be identified by comparison with a library of known samples. The technique works by using a low power laser to measure the characteristic frequencies at which different chemical bonds vibrate; the resulting spectrum gives an indication of the nature and extent of the various bonds in an object, which is directly related to its composition.



Above: One of the objects from the Library's collection which was investigated using the Raman spectrometer

This approach has the great advantages that samples do not need to be taken from an object, no direct contact is required and the low intensity of the laser causes no damage; furthermore, by carrying out the analysis using a fibre-optic probe it is possible to investigate items *in situ*, with as little disturbance as possible.



Above: Paul Garside, Conservation Scientist using the Raman spectrometer

Using a Raman spectrometer (provided by Perkin-Elmer on a six week loan), the pigments, dyes and inks on a variety of objects in the British Library's collection have been investigated in this manner. By identifying the pigments used, for example, on 18th century Chinese Qur'ans or 19th century Indian ivory miniatures, it is

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possible to gain a greater understanding of the way in which the use of various techniques, materials and cultural influences have spread. Materials that are at particular risk, or which may cause problems during conservation, can be highlighted, allowing the most appropriate methods of treatment to be chosen.

Finally, as many of these artefacts are fragile and difficult to handle, due to their age and construction, which can make access to areas of interest challenging, this study has revealed some of the particular problems which may be encountered when carrying out analyses of this kind and allowed solutions to be developed for future investigations.