

PORTABLE X-RAY FLUORESCENCE ANALYSIS OF NEOLITHIC STONE AXES – OPENING A WINDOW ON PREHISTORY

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Portable XRF offers some unique analytical capabilities for *in situ* measurements of archeological artefacts that cannot effectively be made by any other technique. In this mode of operation, the analyser is taken to the object to be analysed, placed in contact with its surface and an analysis sequence initiated. Unlike conventional laboratory techniques, no sample preparation is involved, the only flexibility available to the analyst is sample selection. Furthermore, analytical measurements are derived from surface layers rarely deeper than about 1 mm (depending on the critical penetration depth of the fluorescence X-ray of interest). If the measurement is designed to estimate the bulk composition of a sample, careful interpretation is required to avoid bias caused by surface contamination or surface alteration effects.

An example of an application where *in situ* PXRF is the only viable measurement technique is work recently undertaken at the OU in provenancing Neolithic stone axes. Stone axes found in the UK have been assigned to one of about 20 different groups, based mainly on petrographic information. The particular axe group of interest to this project is Group XIII, which has been identified with a source in the Preseli Mountains, SW Wales. The particular significance of this rock type is that it is the same as many of the 'bluestones' that form an inner circle of monoliths at the Stonehenge site, Salisbury Plain, the most important Neolithic monument in England. Two theories have been formulated to explain the origin of rock from S Wales at Stonehenge. The first is that because this bluestone comprises a very distinctive spotted dolerite, Neolithic man prized this rock to such an extent that he transported it to Stonehenge from the Preseli Mountains over a distance of about 300 km. The second theory is that these stones were transported to Salisbury Plain and deposited there as glacial erratics. One clue concerns the fact that Group XIII axes have been found at sites spread over an extensive area of England with one reported even from a site in S Scotland. By implication, Preseli spotted dolerite was widely traded by Neolithic man, evidence that supports the human transport theory for Stonehenge bluestones. However, petrological examination cannot always unambiguously discriminate between rock types. Much more reliable discrimination can be obtained by matching the trace element fingerprint of a sample with the composition of rock from Preseli. In this presentation to results of this PXRF investigation to confirm or disprove the provenance of Group XIII stone axes will be described, and therefore, by implication the origin of the bluestones at Stonehenge, so opening a window on the activities of Neolithic man.

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