

New Approaches for Old Rocks: An Isotopic Toolkit to Investigate the Provenance of Archaeological Material

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Isotopic studies (U–Pb, Lu–Hf and trace elements) of mineral grains have utility in archaeological provenance investigations, from tracing rock tool fragments to multi-tonne megaliths. Sedimentary rocks commonly contain detrital minerals derived from crystalline igneous source(s). The isotopic characteristics of this detrital cargo can fingerprint a rock artefact to its source via a detailed geological heritage. This method was applied to the Altar Stone, the central sandstone megalith of Stonehenge, to reveal its ultimate source from the Orcadian Basin of northeast Scotland. Nonetheless, the sources of many lithological artefacts remain unknown, and potential insight into ancient societies awaits grain-scale isotopic fingerprinting. Here, we present a workflow of *in-situ* isotopic analyses via ultra-low volume, comparatively non-destructive mass-spectrometry techniques. Using case studies from Britain’s megalithic culture, including the Altar Stone, we demonstrate that provenance determinations are possible using little or only legacy sample material. Ultimately, more detailed source insights become evident when a multi-mineral strategy is implemented.