Recent developments in the analysis of the forming techniques of ancient pottery using μCT and SANS

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Pottery may be used to explore a wide variety of themes within archaeological studies, and material science-based techniques have long been used to explore patterns in ceramic variability. These have commonly focused on the composition of pottery fabrics, and questions of the provenance and circulation of objects and commodities. Recently, however, new analytical methods have been developed to broaden the scope of material science studies, to investigate the specific techniques (such as wheel-throwing, moulding, or the assembly of coils or slabs) used by ancient potters to form vessels, thereby engaging more directly with anthropologically informed questions of technological choice, and the human social and cultural aspects of production.

Two new approaches, using X-ray microtomography (μCT) and small-angle neutron scattering (SANS), will be presented and compared, with reference to both modern experimental vessels and archaeological pottery sherds. Significantly, these techniques offer the opportunity for both non-destructive and quantitative analysis. For μCT, in addition to examining potential macrostructural features (e.g. coil joins), the orientation of sub-millimetre inclusions and voids may be visualised and measured in 3D space and correlated with a range of forming techniques. For SANS, the orientation of micro- to nanoscale scattering domains within the clay fraction itself are utilised, providing an analytical technique that, uniquely, may be used to investigate forming techniques in both coarse- and fine-textured fabrics.

Such archaeological investigations also pose a challenge regarding the scale of measurements required. The need for data from large numbers of often low prestige artefacts differs from the priorities of other areas of culture heritage artefact studies, which have generally focused on the detailed analyses of individual high-value or unique objects (e.g. paintings, sculptures, jewellery). Accordingly, such requirements need to be considered not only with regard to workflows, but also regarding instrumentation, data processing and evaluation, and the structure of user access programs.

Short Bio:

Dr John Gait is an archaeologist and research fellow at the Budapest Neutron Centre. His research focuses on the archaeological science analysis of ancient pottery. He is currently developing new techniques for the analysis of pottery manufacture, with ongoing projects investigating material from the Neolithic to Medieval periods, from Austria, Egypt, Greece, Hungary, Italy, the Netherlands, Slovenia and Sudan. Prior to joining the BNC in 2021 from the British Museum, he was the Williams post-doctoral Fellow at the British School at Athens, and International Guest Researcher at the University of Uppsala. He gained his PhD in 2012 from the University of Liverpool.