Journal & Proceedings of the Royal Society of New South Wales, vol. 156, part 2, 2023, pp. 304–305. ISSN 0035-9173/23/020304-02

Thesis abstract

Archaeobotanical applications of microCT imaging

Aleese Barron

Abstract of a thesis for a Doctor of Philosophy, submitted to the Australian National University

This thesis explores the ways in which the three-dimensional and non-destructive imaging technique of microCT can be applied to archaeobotanical materials to extract additional information previously inaccessible using traditional two-dimensional techniques. Across a series of eight publications, two microCT imaging protocols focusing on the imaging and analysis of two distinct types of archaeobotanical remains are presented along with archaeological case studies to which they have been successfully applied. Both protocols seek to utilise the relatively new imaging technique of microCT in order to explore the histories of some of the world's most important, yet in some cases understudied food crops including rice (*Oryza sativa*) in island Southeast Asia, sorghum (*Sorghum bicolor*) and pearl millet (*Pennisetum glaucum*) in Africa, and taro (*Colocasia esculenta*), sweet potato (*Ipomoea batatas*), and yams (Dioscoreaceae) in Southeast Asia and the Pacific.

The first protocol outlines how organic cereal tempers can be virtually extracted from inside pottery sherds through the use of microCT scanning and 3D digital segmentation techniques. These extracted digital remains can then be taxonomically identified and their domesticated status assessed using the morphological information only accessible with the penetrative X-rays of microCT. This protocol has been successfully applied to extract new rice and sorghum assemblages from previously excavated pottery sherds and their analysis has expanded our knowledge of the dispersal and early cultivation histories of these staple food crops.

The second protocol uses microCT to build the first virtual reference collection of a greatly understudied type of archaeobotanical evidence, archaeological parenchyma. This protocol was developed by imaging samples of important root crops in the Southeast Asia and Pacific region from Jon Hather's parenchyma reference collection and applying his taxonomic identification method developed in the 1980s and '90s. Here his method is updated and adapted to include the added three-dimensional contextual information provided by microCT scanning as well as the greater range of anatomical variation captured both within and between species. The microCT datasets of these reference samples will form part of the first publicly accessible, online and virtual, archaeological parenchyma reference collection, which will hopefully encourage wider adoption and application of the technique.

Both archaeobotanical microCT protocols presented here demonstrate the enormous potential of the technique to expand on our current sources of archaeobotanical evidence. The digital nature of the datasets presents the possibility of increasing analytical efficiency in the future with the

development of automated archaeobotanical analyses.

This thesis was awarded the JG Crawford Prize for HASS at ANU.

Dr Aleese Barron
Department of Materials Physics
Research School of Physics
Australian National University & School
of Archaeology and Anthropology
College of Arts and Social Sciences
Australian National University

E-mail: aleese.barron@anu.edu.au

URL: http://hdl.handle.net/1885/276139