

**CHAPTER SIXTEEN**  
**Results of Seven Methods for Organic Residue Analysis**  
**Applied to One Vessel with the Residue of a Known Foodstuff**  
**H. Barnard, S.H. Ambrose, D.E. Beehr, M.D. Forster, R.E. Lanehart,**  
**M.E. Malainey, R.E. Parr, M. Rider, C. Solazzo and R.M. Yohe II**

Hans Barnard, Research Associate; Cotsen Institute of Archaeology; University of California, Los Angeles; P.O.-box 951510; Los Angeles, CA 90025; USA; <wendrich@barnard.nl> to whom all correspondence should be directed and, in alphabetical order, Stanley Ambrose and Dana Beehr, Department of Anthropology, University of Illinois at Urbana-Champaign (USA); Marcus Forster, Department of Archaeological Sciences, University of Bradford (UK); Rheta Lanehart, Department of Anthropology, University of South Florida (USA); Mary Malainey, Department of Anthropology, Brandon University (Canada); Robert Parr and Robert Yohe, Laboratory of Archaeological Sciences, California State University, Bakersfield (USA); Micala Rider, Department of Anthropology, University of Arizona (USA) and Caroline Solazzo, Smithsonian Center for Materials Research and Education (now the Museum Conservation Institute, USA). Support for stable isotope ratio mass spectrometry instrumentation at the Environmental Isotope Paleobiogeochemistry Laboratory was provided by the National Science Foundation (USA), grant SBR 98-71480. We would like to thank René Cappers, Alek Dooley, Jelmer Eerkens, Kym Faull, Mohsen Kamel, Wim van Neer, Willeke Wendrich and two anonymous reviewers for their help in preparing this chapter. A shorter version of this chapter was published in the *Journal of Archaeological Science* 34; 2007: pp. 28-37.

On Thursday 31 March 2005 we organized a symposium entitled 'Theory and Practice of Archaeological Residue Analysis'. With the assistance of Dr. Jelmer Eerkens (University of California, Davis) and Dr. Ran Boytner (University of California, Los Angeles), this symposium took place in Salt Lake City, during the 70<sup>th</sup> Annual Meeting of the Society for American Archaeology as sessions 21 and 46.<sup>1</sup> The participants were asked to prepare presentations on their own research, and to report on their analysis of a residue recently cooked in a new ceramic vessel. Eleven agreed to partake in the latter and were sent a segment of the wall of a vessel in which camel milk had been cooked. The accompanying letter and model report sheet did not provide information on what was prepared in the vessel, nor did it present a list of possibilities such as in Table 1. This made the analysis more challenging than is typical of most archaeological settings as the provenance, shape and date of a pot usually offer important clues to its former use and contents. Seven participants (almost 2/3) in this 'Round robin' managed to file a report before the meeting where the source of the residue was revealed. These individual reports will be briefly discussed here, preceded by some data on camel milk and followed by a discussion on the significance of our findings for the practice of archaeological residue analysis.

#### **Birth of the 'Round Robin'**

Within the framework of a research project to investigate possible uses of Eastern Desert Ware, a corpus of 4<sup>th</sup>-6<sup>th</sup> century CE vessels found in Southeast Egypt and Northeast Sudan, one of the authors purchased two

dozen new unglazed ceramic vessels in Luxor, Egypt, in November 2003. The chosen vessels were cheap porous bowls known as 'tagen' (طاجن), with a diameter of about 12 cm and a height of 6 cm, made of Nile 'silt' (غرين) by professional potters. Such vessels are frequently used, after first being 'seasoned' (made less porous) with oil or honey, to prepare stews with fish or meat in an oven.

In the following weeks, 22 foodstuffs that could have been encountered in Eastern Desert Ware were collected and prepared in the new vessels that were left unseasoned. Organic residues from these pots were to be extracted and compared with residues found in the ancient vessels. Two pots used in an experiment on meat preservation by Dr. Salima Ikram (American University in Cairo) were added to the series while one listed foodstuff (Table 1), camel milk, could not readily be found. In December 2003, about 200 g of each available foodstuff was introduced in its own marked vessel. This was then topped off with Hayat mineral water (from Siwa Oasis, Total Dissolved Solids: 190 mg/l), wrapped in aluminum foil and allowed to sit at room temperature for 24 hours (Figure 1). The next day the whole assemblage was put in a gas oven heated to approximately 200 °C and cooked for one hour. After cooling for four hours, the contents of the vessel were checked and water was added when necessary. Each vessel was then again wrapped and cooked for another hour, after which the assemblage was allowed to sit for 24 hours at room temperature. The vessels were then emptied, rinsed with cold water and air-dried for 10 days. Finally, the vessels were rinsed to remove the fungus that had developed in many, dried for 24 hours, broken and stored in sealed plastic bags. About a month later, mid-January 2004, small parts of the vessels were

<sup>1</sup> The programs, abstracts and a preliminary report of these can be found at the project's website <http://www.archbase.org/residue/> (Barnard et al. 2007).

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ground into a fine powder to facilitate extraction of the organic residues. Around the same time camel milk was finally acquired at the camel market in Daraw (southern Egypt). This was processed, in Aswan, in the same way as the other foodstuffs, with the exception that Baraka mineral water was used (بركة from Kafr el-Arbein, TDS: 430 mg/l). Due to time constraints, however, the whole vessel was transported to California for analysis, along with small amounts of powder of the other vessels.

This quirk made it available for the exercise, first suggested by Dr. Ernestine Elster (University of California, Los Angeles) and christened 'Round robin' by Dr. Richard Evershed (University of Bristol, UK), which is the basis of this chapter. In May 2004 the vessel was machine-cut into 12 pieces, one being the base (Figure 2), after which the 11 wall fragments were distributed among the participants of our blind 'Round robin'.

No.	Synonyms	Provenance
1: beans	<i>Vicia fava</i> - فول مجروش	Zam-zam No. 1 dried beans
2: barley	<i>Hordeum vulgare</i> - شعير	farmer in Luxor
3: wheat	<i>Triticum aestivum</i> - قمح	Isis organic wheat
4: sorghum	<i>Sorghum bicolor</i> - درة	farmer in Luxor
5: dates	<i>Phoenix dactylifera</i> - بلح عجوة	Isis organic dates
6: doam nuts	<i>Hyphaene thebaica</i> - دوم	Khan el-Khalili market
7: nabq fruits	<i>Ziziphus spina-christi</i> - نبق	street vendor in Cairo
8: sugar dates	<i>Balanites aegyptiaca</i> - بلح السكر	Harraz herbs and spices
9: coffee	<i>Coffea arabica</i> - بن / قهوة	roastery in Cairo
10: goat milk	حليب ماعزي	farmer in Luxor
11: camel milk	حليب جملي	Daraw camel market
12: cow milk	حليب بقرى (pasteurized)	Labanita full cream
13: egg	بيض	Isis organic eggs
14: mutton	رقبة ضاني	Metro supermarket (Cairo)
15: camel meat	لحم جمل	Zagazig camel market
16: pork	لحم خنزير	Christian butcher in Cairo
17: veal	رقبة بتلو	Metro supermarket (Cairo)
18: fish	<i>Plectropomus maculatus</i> - ناجل	Metro supermarket (Cairo)
19: olive oil	<i>Olea europaea</i> - زيت زيتون	Borges extra vigin olive oil
20: water	TDS: 190 mg/l - مياه (حياة)	Hayat mineral water (Siwa)
21: broccoli	<i>Brassica oleracea</i> var. <i>italica</i>	Metro supermarket (Cairo)
22: beef and mutton	---	Dr. Salima Ikram (AUC)
23: beef in sheep fat	---	Dr. Salima Ikram (AUC)
24: lentils	<i>Lens culinaris</i> - عدس بني	Isis organic brown lentils
25: lupine	<i>Lupinus albus</i> - ترمس	el-Doha lupins

Table 1: List of the foodstuffs prepared in new Egyptian 'tagen' in December 2003 and January 2004 (TDS = Total dissolved solids; AUC = American University in Cairo).