The Manufacture of Early Bronze Age III Holemouth Jars and Platters from Tell es-Safi/Gath, Israel: An Examination of Shaping Techniques at the Mesoscopic Scale

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INTRODUCTION

In this pilot study, we show how a simple and low cost ceramic analytical method permits clear and rapid identification of features indicative of shaping techniques. This *mesoscopic* approach facilitates a more complete understanding of the manufacturing sequence and the organisation of production. Manufacturing techniques, skills, and technical knowledge can be used to distinguish between potting communities specialising in the manufacture of different wares and functional types (Roux 2017; Fowler 2011).

The preferred alignment of features in the fabric is an indicator of the shaping technique. The direction of pressure and degree of compression applied to plastic clay by the potter causes the minerals and voids to take up a *preferred orientation*. Different shaping techniques result in characteristic clay compression patterns are described in the literature (Figure 1; Rye 1981:58-84; Berg 2009). These compression patterns are typically viewed radiographically at the macroscopic level. Subsequent research has used high magnification analytical methods (SEM, petrography) to image the microstructures in thin-section to reveal similar compression patterns (Roux and Courty 1998: 753-61). This study expand the existing identification criteria by developing an analytical method for distinguishing *mesoscopic* signatures of forming techniques which is congruent with conventional macroscopic and microscopic analytical methods. In this study, a selection of Early Bronze (EB) III cooking vessels and serving platters from Tell es-Safi/Gath are used to demonstrate its utility (Figures 2-3).

MATERIALS AND METHODS

For this analysis, we examined rim, body and base sherds from ten holemouth jars (coarse ware) and nine platters (fine ware). Each base, body or rim sherd was thick sectioned using a Buehler Isomet 1000 precision saw to expose cross-sections perpendicular to wall surfaces. High-resolution digital images of the thick sections (1600-2400 dpi) were created using an ordinary desktop printer scanner (Epson® WF 2540). Macnification® software was used to view, measure, and enhance features in the freshly cut thick sections. A scale was included with each scan, in order to facilitate measurements of features using the calibration tool and ruler function on Macnification®. This simple procedure enabled us to quickly profile the orientation, morphology, and distribution patterns of non-plastics and voids, as well as measure coil sizes, fissures, and wall regularity.

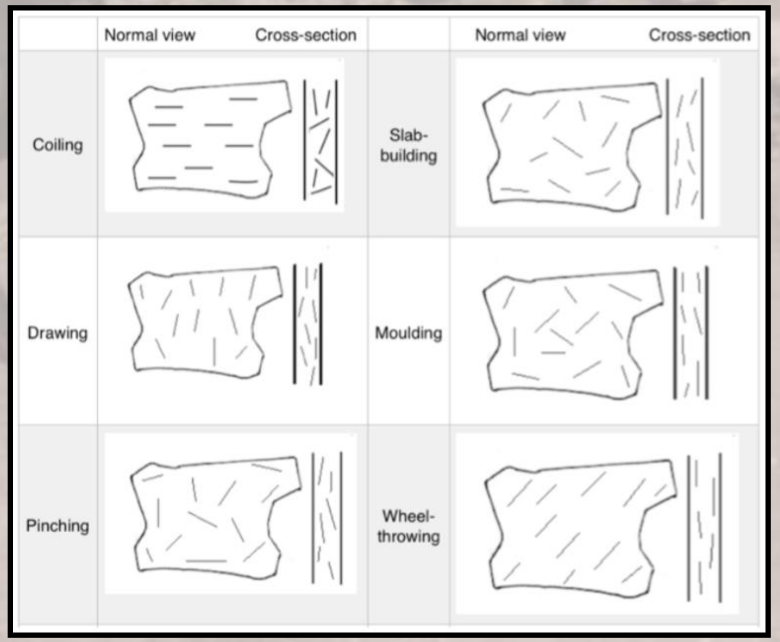
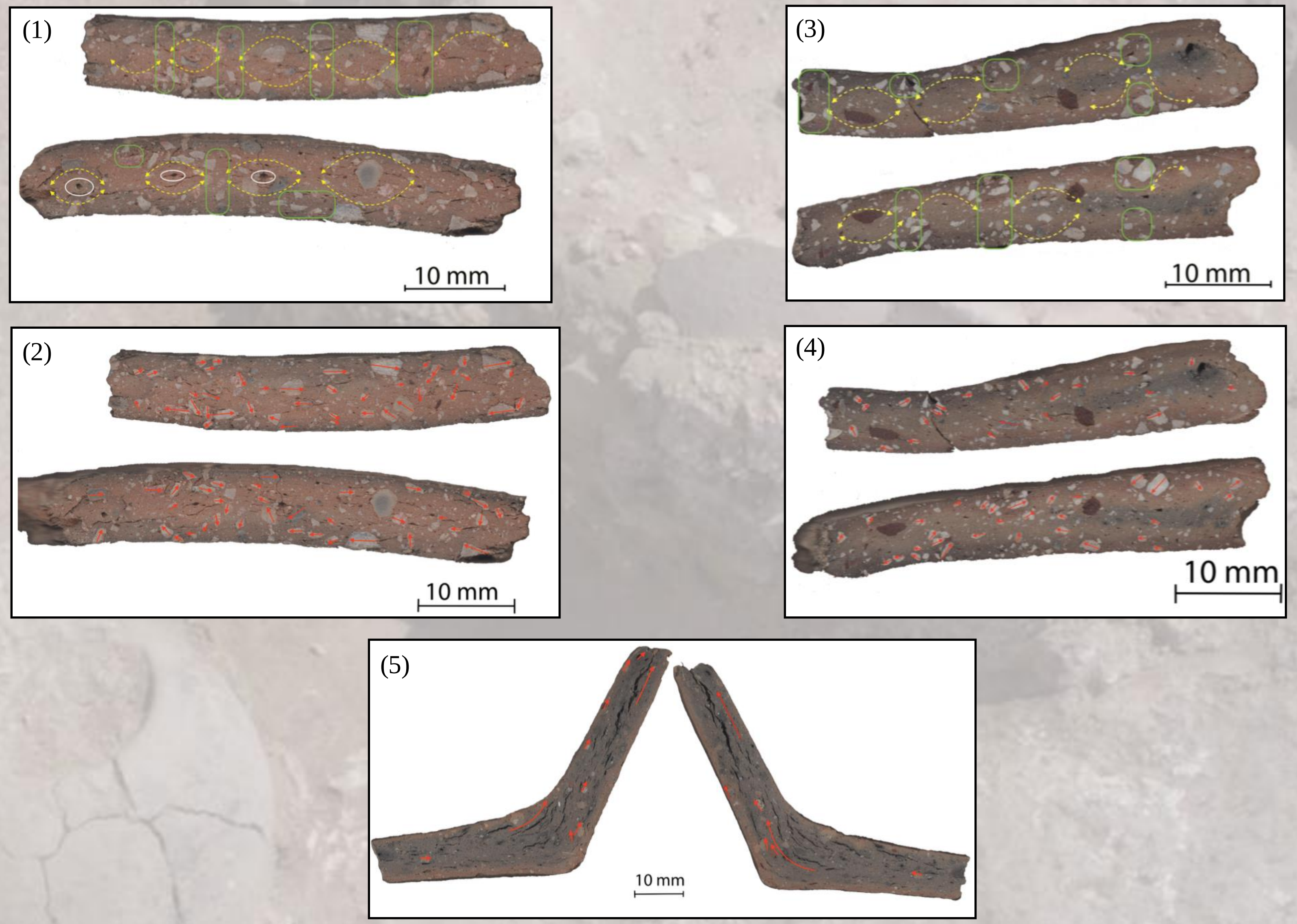


Figure 1. Schematic diagram of the preferred orientation of inclusions and voids for the main primary forming techniques identified using x-ray after Carr 1990: 17; Rye 1977; 1981:61-81.

Figure 2. Reconstructed EB III holemouth cooking-pot.

Figure 3. Reconstructed EB III platter.



Figures 4.(1-5). Mesoscopic signatures of shaping techniques, as annotated on EB III holemouth thick sections. Fig. 4.1-4 are body sherds. Fig. 4.5 is a base.

RESULTS

In this study, coils were identified when non-plastics showed orientations concordant with the folds and curved trajectories of a coil (A), which are not detectable on radiographs (Figs. 4.1-4). The distribution patterns of non-plastics formed curvilinear alignments and wavy undulations (B). Open spaces dominated by binder had edges bordered and encircled by coarse non-plastics (C). Dense clusters of non-plastics were evenly spaced across the thick section (D). In these clusters, non-plastics have aggregated with divergent orientations and mark the presence of a coil join (E). Similar alignments were visible on the platters, but the patterning was less obvious due to the sparse inclusions (Fig. 5.1). Voids from organic/fibre temper were sometimes frequent and large enough to infer a preferred orientation (F). These patterns are repeated at regular intervals.

Centrally placed voids equidistant apart in the middle of the fabric indicate the clay coils were not fully compressed when rolled out (G). The average coil size was 8.951 mm, with a standard deviation of 1.904. Hence, the overall variation is small and suggests the coiling technique was executed with a level of consistency to be expected of a skilled specialist.

Holemouth sections from the lower body (Fig. 4.5) evidenced a different shaping technique. Voids were far more abundant and oriented parallel to the vessel walls, with linear and elongated shapes, and large dimensions (H). Non-plastics tend to align in the same direction (I). These features contrast with the patterns identified on the body sherds and are consistent with the drawing technique. The stretching forces from pulling and drawing up the clay leaves stress marks, long narrow voids, that indicate application of vertical pressure (Rye 1981: 72-3).

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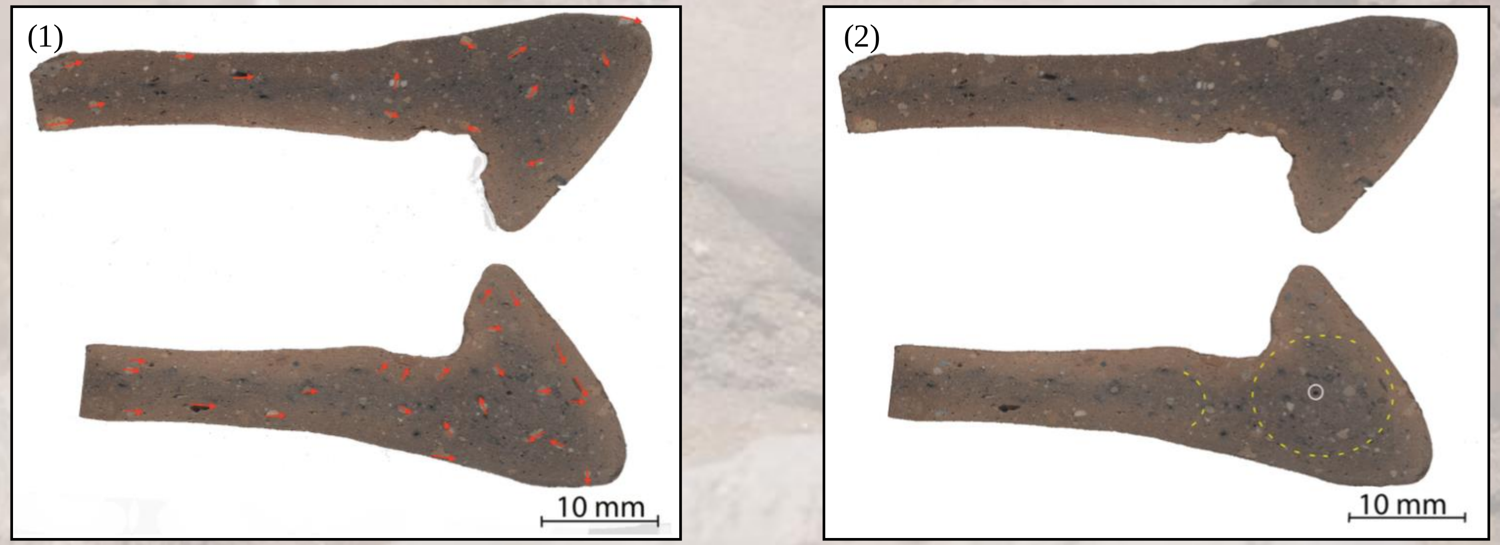
CONCLUSION

The mesoscopic approach piloted in this study offers both the same range and new information than can be obtained through conventional radiography and microscopic approaches. It is also very rapid and more economic since it provides information at a lower cost than X-ray and preparation of thin-sections. Existing thin sections can be subjected to the same analyses of grain orientation as in this study, but are more costly and time-consuming to produce. This method was more effective on the coarse ware fabrics (holemouths) due to the abundance of large elongated angular crushed chalk in the fabric, which orientates well (Figs. 4.1-5). Trace signatures were less pronounced on the fine ware platters because non-plastics were less abundant, smaller, and more rounded (Figs. 5.1-2).

The analysis revealed novel structural arrangements of features only visible in cross-section and not previously discussed in the literature on preferred orientation. This simple procedure provides a high level of detail, resolution, and full-coloured scaled images. Features and patterns in the images are less ambiguous compared to radiographs and involve far less preparation. The method proposed by this study is congruent with conventional macroscopic and microscopic approaches and expands the "very little data from archaeological sources for the recognition of pottery forming techniques of the past" (Martineau 2003: 210).



Figures 5.(1-2). Mesoscopic signatures of shaping techniques, as annotated on EB III platter thick sections.

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