2018 Workshop 2: Petro-fabrics of Southern Israel AIAR, Jerusalem, Apr. 29, 2018

David Ben-Shlomo: Early Roman pottery from Hebron, Jericho, & Masada

David presented a summary of petrographic and chemical analyses (done in conjunction with Hans Mommsen) of archive jars from the two kilns from the pottery workshop at Tel Hevron/Tel Rumeidah, and other such jars from Jericho, Masada, and Qumran.

From combining petrographic and chemical analyses, four groups can be identified:

- Moza marl/HebA = Michniewicz petrographic Group II = Hebron Group 1. This is LCP PF #35): https://www.levantineceramics.org/petrofabrics/moza-marl-silt-size-dolomite-crystals. This petro-fabric was also recognized at Qumran, Jericho, and Masada.
- Terra rossa/mostly Jerusalem B = Michniewicz petrographic Group IV = Hebron Group 3. which is the same as kiln wasters from the Jerusalem International Convention Center (JICC) kilns. Note that *two* petro-fabrics are identified at the JICC kilns:
  - https://www.levantineceramics.org/petrofabrics/moza-clay;
  - https://www.levantineceramics.org/petrofabrics/moza-clay-aminadav-sand-sized-dolomite-crystals
- Moza marl with quartz sand = Chemical group HebA = Michniewicz petrographic Group III = Hebron Group 10. David noted that we do not have an LCP petro-fabric for this group, and indeed it is not clear if this is actually a separate petro-fabric or, rather, if the quartz was added by the potter, making this instead a discrete ware.
- Rendzina/alluvial, mostly X036 (no Hebron group). Is this from Jericho/northern Dead Sea?

These results are part of a larger study that has just been published: D. Ben-Shlomo and H. Mommsen, "Pottery production in Jerusalem during the Iron Age: A new compositional profiling," *Geoarchaeology* 33/3 (2018), pp. 349-363.

Dennis Braekmans: Kenyon archival material from Jericho on the LCP

Dennis presented the first results of his analysis of Hendricus Franken's thin-sections from Kathleen Kenyon's excavations at Jericho in the mid-1950s. Dennis "excavated" this archival material from the depths of the archaeological laboratory at the University of Leiden. Some of the results were published in a preliminary way in H. J. Franken's *In Search of the Jericho Potters: Ceramics from the Iron Age and from the Neolithicum* (North Holland Ceramic Studies in Archaeology, Vol. 1. Amsterdam & Oxford), but since then no further work had occurred on this material. That book contains a few small line drawings along with some fuzzy black-and-white thin-section photographs, hardly utile for study of the fabrics and technology of ceramics of Jericho from Neolithic through Iron Age times. Dennis also found some of Franken's notes

and colored pencil drawings, but not enough documentation to link the thin-sections with any published pottery from the excavations.

Dennis prepared beautiful new photographs and full descriptions of all the thin-sections, and will post them all to the LCP. He offered an initial suggestion for groupings, based solely on visible distinctions in the samples – but acknowledged that with the information currently available it is not possible to decide precisely what these groupings mean. Do differences represent distinct sources, clay preparation, firing? Are some of these groups actually wares, meaning a discrete constellation of source material, production practices, and finishing techniques with a specific chronological range?

Preliminary results:

Neolithic – 64 samples

- Neolithic 1: Quartz – Shale – Foraminifera
- Neolithic 1g: large grog particles
- Neolithic 2a-f: Carbonate based, with variations via size and additions: main, grog, fine-grained, large limestone grains
- Neolithic Terra Rossa

EB-MB-Iron Age – 6 samples

- EB-MB: Carbonate-Ferruginous-Crushed calcite
- Iron Age 3: high fired ferruginous
- Iron Age 4a + 4b + 4c: Iron, rich in quartz and calcite, some high fired and others low fired seen by low to high optical activity
- Iron Age 5: fine quartz silt, non-calcareous
- Iron Age 6a+b: shale/quartz
- Iron Age 6c: crushed calcite
- Iron Age 7: sand temper: large pieces of quartz in a completely sintered, iron-rich matrix
- Iron Age 9: mafic-basalt

Dennis ended with a few observations and questions:

- the composition of the Neolithic samples is highly variable, while the Iron Age samples seem to reflect more systematic recipes for clay preparation.
- there is a heavy occurrence of crushed calcite temper.
- later samples show a continuation of earlier recipes but without organic temper, suggesting continuity in source material but changed production practices.
- no indication in any period of shape-specific recipes. Rather the same clay types were used for different forms, e.g., bowls and cooking vessels.

The next step is to submit these to the LCP and make the descriptions a dynamic group project. Stay tuned!

Joseph Weinstein: geology, chemistry, & petrology of Qumran and vicinity

Joe Weinstein presented a summation of all available data, chemical & petrographic, from sites around the Dead Sea in both Israel and Jordan. He brought together analytical results from seminal studies by Jacek Michniewicz and Marta Balla, and proposed a model by which different analytical techniques could be combined to identify clay groupings and sources.

For a .pdf version of Joe's presentation, go here:
https://levantineceramics.files.wordpress.com/2018/05/weinstein-analyses-of-dead-sea-ceramics-lcp-workshop-4-29-18.pdf

Margreet Steiner: Speaking as an archaeologist, I have two questions for you scientists:

*How can **we** make **your** lives easier?*

- David Ben-Shlomo: sample things that you also publish, and do not expect firm answers to every question.
- Paula Waiman-Barak: the approach of sending samples to somebody should be revised. The only way to answer questions regarding workshops, provenance analysis, etc. is to have a petrographer on site with whom to have ongoing discussion.
- Dennis Braekmans: a report is just the beginning of the discussion.
- Yuval Goren: building a petrographic laboratory is not all that complicated or expensive, and students need to be trained in petrography.
- Marta Balla: I expect and need a good question. If you have a question, I can do what is needed.
- Jacek Michniewicz: Our craft is petrography and chemical analysis – but archaeologists want "flesh on the bone." This creates pressure and questions that we cannot always answer.

*How can **you** make **our** lives easier?*

- Anastasia Shapiro: when we petrographers call something a group, we should be explicit about what we mean. For me, all examples in a petrographic group share the same matrix and similar inclusions, and sometimes also a consideration of technology. This last piece is important, because for many archaeologists, the technology "piece" is less a part of defining petro-fabrics and more a consideration for defining wares.
- Aaron Brody: it would be great if on the LCP there oculd be a kind of "petrography cheat-sheet," which would offer a list of resources & explanations so that we can better parse your terminology and descriptions.

Discussion: next steps and desiderata

Dennis Braekmans: we need a clay survey of this area: drilled cores; fired briquettes; and descriptions. How can we add reference samples to the LCP?

- Andrea response: it is already possible to submit to the LCP anything made of clay, be it a vessel, a loom weight or tile, a kiln waster, mudbrick, etc. Any of these items can be added under "Submit a Vessel" or "Submit a petrographic sample," along with accompanying illustrations and explanatory text. We can do better: we can add a check-box field to Vessel and Petrographic submission that will allow geologic/petrographic reference material to be designated. Then we can make this a searchable category, and also give reference material its own browse page, so that all items so designated can be easily assembled and you can select and search within the group.

Joe Weinstein: further analysis is stymied because of lack of data, or inability to access data. Our biggest gaps are: material from the eastern side of the Dead Sea; measurements of major elements; and pottery sampled both by NAA and petrographic

- Andrea response: we can bring back a way to submit Elemental Data, with a field in which you can post an excel sheet, a URL link to other databases with information, etc.

Mario Martin petro-fabric updates

LCP PF 30: https://www.levantineceramics.org/petrofabrics/southern-coast-alluvial-clay-rounded-sand-and-angular-silt-quartz. Mario improved the description on the LCP as follows:

This petrographic group includes dark reddish-brown to dark brown, non-calcareous, silty clays. The matrix is non-active, nearly opaque (isotropic). The silt component consists mainly of (angular) quartz (8–15% of the slide area), accompanied by a considerable quantity of heavy minerals (hornblende, pyroxene and especially biotite) and feldspars (plagioclase, microcline) that also appear in fine to medium sand size (heavy minerals: up to 160 µm; feldspars: up to 260 µm).

The predominant non-plastic component is rounded to sub-rounded, fine to coarse quartz sand, forming 7–10% of the slide area. Grains have an average size of 250–320 µm. Occasional coarse grains (up to 900 µm) appear in virtually all samples. In several cases the quartz is strained (undulose extinction, subgrain re-crystallization).

Rare inclusions are calcareous sand (mainly rounded, micritic limestone), which mostly forms less than 1% of the slide area, and the exceptional angular chert. *Kurkar* and marine biogenic inclusions (shells) also occur.

- **LCP PF 31**: https://www.levantineceramics.org/petrofabrics/southern-israeli-coastal-loess **renamed** https://www.levantineceramics.org/petrofabrics/negev-coastal-loess

Why rename? Margreet Steiner pointed out that "southern Israeli" is not truly accurate, since the area also includes Gaza and, as Yuval Goren long ago noted in *Inscribed in Clay*, their petro-fabrics are very similar (see, e.g., p. 295). In that book, this petro-fabric is identified as *Loess soil with coastal sand*, which occurs mainly in the northern Negev and southern Shephelah (p. 112). After much discussion, everybody agreed on "*Negev coastal loess*" as indicating both the main zone and the primary component of this petro-fabric.

Sabine Kleiman said that in her analyses of pottery from the Shephelah, she has noted a second loess-based petro-fabric, which is different than LCP PF 31/coastal loess. After discussion, all agreed that this comprised its own petro-fabric, which we created as **LCP PF 108:** https://www.levantineceramics.org/petrofabrics/southern-israeli-loess-calcareous-clay-calcareous-sand. Sabine and Mario agreed to fill in more information on the site and also submit some samples. It will be helpful if the general information and descriptions take into account the other two Shephelah-specific petro-fabrics already on the LCP:

- **LCP PF 33**: https://www.levantineceramics.org/petrofabrics/shephelah-alluvial-clay-calcareous-sand-quartz-silt
- **LCP PF 34**: https://www.levantineceramics.org/petrofabrics/shephelah-ferruginous-clay-calcareous-sand-quartz-silt

- **LCP PF 11**: https://www.levantineceramics.org/petrofabrics/arabah-slag-tempered-clay

Mario pointed out that these are actually several petro-fabrics that all were used to make vessels with slag temper. He suggested (to general agreement) that we change this from a petro-fabric to a ware, and re-remove the petro-fabric. We now have https://www.levantineceramics.org/wares/arabah-slag-tempered-ware.

- **LCP PF 43**: https://www.levantineceramics.org/petrofabrics/african-nubian-shield-intrusive-and-volcanic-rocks. Mario updated both General Information and Description:

General Information: The common denominator of this petrographic group is the occurrence of igneous rock fragments as non-plastic inclusions. The igneous rock assemblage points to the crystalline basement of the Arabian-Nubian Shield, which in the Levant outcrops in southern Jordan, in the eastern and southern Arabah and in the southern Sinai. Certain igneous rocks also appear in the Ramon Crater bordering the Negev Highlands to the south. However, these are either basaltic or occur in very limited outcrops only (rhyolite, microquartz, syenite and gabbro); granite does not outcrop in the Ramon Crater at all (Zilberman and Avni 2004; Y. Avni, personal communication). Combining geological with archaeological data, the possible regions of provenance can be narrowed down further for Iron IIA petrographic samples. In the Iron IIA no evidence for settlement activity has been found on the plateau of southern Jordan (Bienkowski 1992a; 1992b; Herr and Najjar 2001). A near settlement vacuum characterized the Sinai during the entire Iron II (Meshel 2002: 287; Yezerski 2003). This leaves us with the Wadi Arabah and, more precisely, with its copper districts. In terms of geology, both Wadi Faynan and Timna are apt candidates (for the geology of the Faynan area, see Rabba 1994; for the Timna area,

see Segev et al. 1992 and Beyth et al. 1999). In these areas, granitoid outcrops of the Precambrian basement as well as numerous cross-cutting dikes provide ample source for the above-described rock fragments. Indeed, the latter can be found in reference thin sections of ceramic products from both the Faynan (Al-Shorman 2009: Figs. 5.7a–c, 6.1b–c, 6.6b, 6.15c–d, 7.2c; Smith 2009: 365–366, 373–374, Pl. 6.6: 1–2) and Timna (Glass 1988: 109, Samples 1125 and 1523) areas. It should be mentioned that fabrics with granitic or other related igneous-rock inclusions are attested at Negev Highlands sites of the Intermediate Bronze Age, and Goren (1996: 53–54 [‘Arkose Group’]) classified them as imports from the Faynan area. = Arabah 2 (igneous rock inclusions) in Martin and Finkelstein 2013.

Description: The clay matrix varies from non-calcareous to calcareous and non-silty to silty. Shale-rich fabrics are frequent. The common denominator of this group is the occurrence of igneous rock fragments as non-plastic inclusions, in grain sizes up to ca. 2.5 mm. These include both intrusive and volcanic rocks, mainly of felsic (granite, rhyolite) and, rarely, also of intermediate composition (diorite, andesite). In a single case, a mafic rock fragment was encountered (gabbro or coarse dolerite). Granitic rocks are most frequent, composed of quartz, plagioclase and K-feldspar (orthoclase, microcline) in varying amounts and occasionally also perthite (intergrowth of two feldspars) and myrmekite (intergrowth of quartz in plagioclase). Graphic granite was also encountered.

The igneous rock fragments are frequently accompanied by large fragments (up to 1.5 mm) of their mineral components—mainly quartz and feldspars. These minerals commonly have an angular to subangular habit (no abrasion). They also appear in the silt to fine-sand fraction of the clay mass, often escorted by accessory minerals, such as micas, which may be abundant in the matrix (micaceous fabrics), amphiboles, epidote and zircon; all of these fit well into an igneous (mainly granitic) geological environment (In several cases, the granitic rock fragments may be derived from arkosic sandstone [detrital sedimentary product] but the fact that the feldspars are frequently immature [not weathered] points to the immediate vicinity of the mother-rock). Additional non-plastic inclusions often comprise shales and calcareous rock fragments (mainly limestone, very rarely chalk) and more rarely, slag inclusions (see Petro-fabric “Arabah/slag-tempered”), chert and sandstone. = Arabah 2 (igneous rock inclusions) in Martin and Finkelstein 2013.

In closing, Mario wondered if in fact we should remove this because it is not really a petro-fabric but instead a collection of samples that have various unusual inclusions. While everybody agreed that this was so, it also seemed good to keep this as a temporary catch-all place for all such samples, and then once a good number of them have been collected here, to reconsider what to do – perhaps identify specific wares, isolate one or more “real” petro-fabrics, etc.

David Ben-Shlomo petro-fabric update:

- **LCP PF 29**: https://www.levantineceramics.org/petrofabrics/southern-coast-red-clay-rounded-quartz-sand – we combined this with **LCP PF 40:** https://www.levantineceramics.org/petrofabrics/israeli-coastal-plain-red-loamy-soil-quartz and then deleted the early entry.

Suggestions and Next steps

1. Technical help: enable download of excel spread sheet for bulk upload so that it is easier to fill it out properly and submit.

2. Margreet and Dennis have agreed to look for information on Jericho contexts and ceramics for the thin-sections already uploaded, and also see if they can find more Jericho pottery.

3. Margreet and Dennis also suggested a workshop next March in Leiden, at the Museum of Antiquities. The target would be sometime between March 9th and 17th (Andrea's spring break).

4. Dennis and Joe: consult with Yuval about Jordan Valley reference material in the BGU collection: what is there and what can be uploaded to the LCP?

5. Jacek: can you help the LCP?

- high-resolution images of published petrographic thin-sections from Qumran, specifically from scroll jars
- high-resolution images of published petrographic thin-sections from your wonderful book: J. Michniewicz and J. Młynarczyk, *Archaeometry and Archaeology of Levantine jars used in Western Galilee/Southern Phoenicia (Sha'ar-Ha-'Amakim, Tell Keisan) between the Persian and the Late Roman Period* (Poznan: Bogucki Wydawnictwo Naukowe, 2017).