Spatial Representation of Heavy Fraction Collection and Analysis from Tell eṣ-Ṣâfi/Gath, Israel

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Introduction

Tell es-Safi/Gath is a large multi-period tell site with a long and rich cultural history located in central Israel atop a large crescent shaped hill. In the Early Bronze Age (**EB**) III (2900-2500 BCE), it is a large urban regional centre (c. 24 hectares in size). At the eastern end of the tell (Area E), a large domestic EB non-elite quarter was intensively excavated (2004-2017).

Micro-debris were systematically recovered and analysed from the late Early Bronze III (Stratum E5a-c – c. 2600 BCE) to identify human activity patterns. The debris included pottery, animal bones, stone tools, jewelry, and other materials used daily that are often missed with traditional recovery techniques. These items were dropped, left or built up on the floor's surface and can be used to reconstruct activity areas on floors. In this poster, we conduct a spatial analysis of the micro-debris using ArcGIS from one house through its successive phases (C-A/earliest to latest) of use to reconstruct the use of floors and spaces. The plans (Figs. 3-8) show results in the eastern half of the building, as evolves from an open courtyard into two rooms.

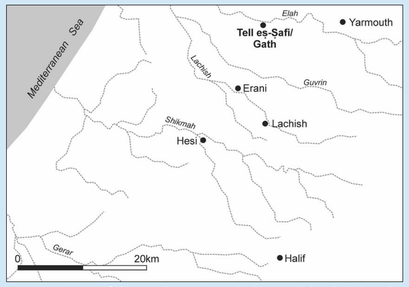

Figure 1. Map of the southern Coastal Plain and Shephelah with the location of Tell es-Safi/Gath (Greenfield et al. 2016)

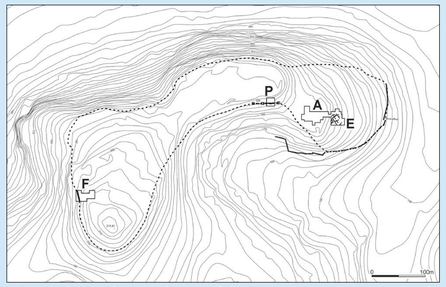

Figure 2. Map showing the size of the EBIII occupation and extent of excavation areas. (Greenfield et al. 2018)

Heavy Fraction

Method

During excavation, 10L samples across floors and accumulations above floors were collected from 1m by 1m squares.

Data

The data used for this analysis consists of 42 samples. These samples were hand sorted in the field laboratory and consist of over 20,000 individual specimens.

Spatial analysis data

The data represented here were collected and recorded in the field during the excavation season. Both point (x, y, z) and spatial (boundary) information was collected. These data were entered into ArcGIS and hot spot analysis was conducted on each of the material types to see patterns of material distribution on and accumulation above floor contexts. Hot spot analysis identifies statistically significant clusters of high values (hot spots) and low values (cold spots).

E5c Building 17E82D08

Area E had several phases of architectural remodeling during the Early Bronze Age (Greenfield et. al. 2017). The last EB building phases correlate to the E5a, E5b, and E5c. Hardpack dirt floors were the most common floor matrix, though during the E5a, there was a stone paved floor in this building. Figures 3 and 4 represent where the sampling strategy for heavy fraction became more standardized and refined through the early years of excavation which yielded more samples from later excavated strata.

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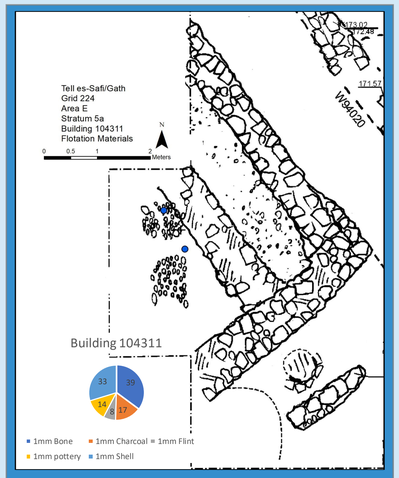


Figure 3. The locations of heavy fraction samples from Building 104311 and frequency of material type, stratum E5a

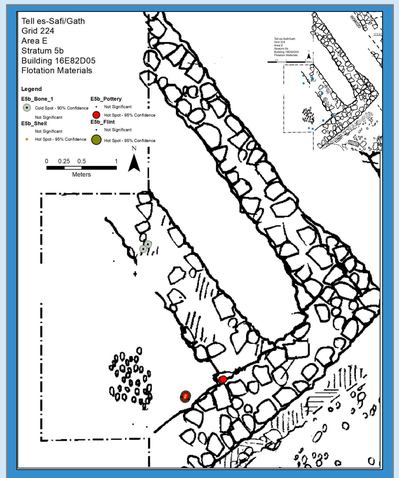
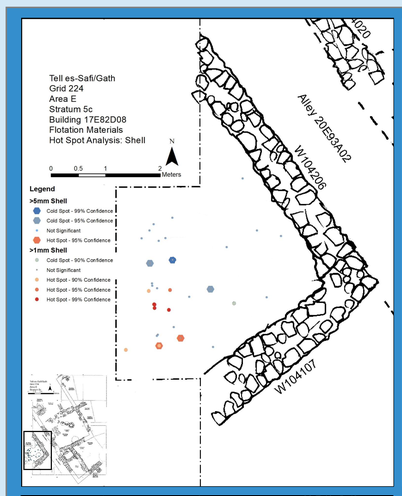
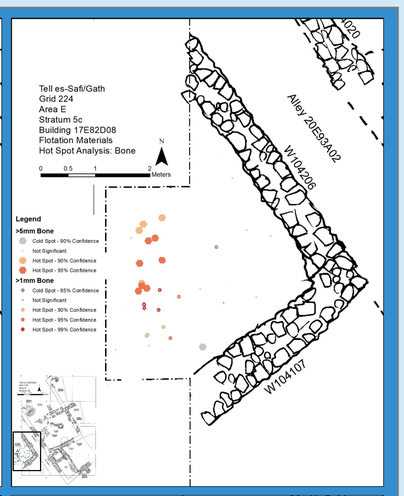
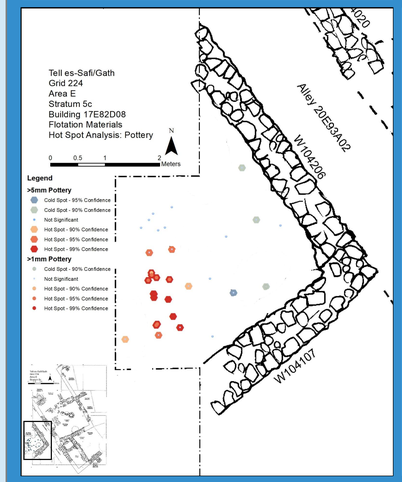


Figure 4. The locations and hot spot analysis of heavy fraction samples from Building 16E82D05, stratum E5b







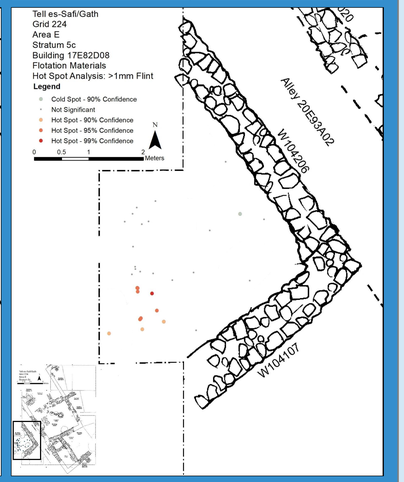


Figure 5 (upper left). The hot spot analysis of the shell from the heavy fraction samples of Building 17E82D08, Stratum E5c,.
Figure 6 (upper right). The hot spot analysis of the bone from the heavy fraction samples of Building 17E82D08, Stratum E5c.
Figure 7 (lower left). The hot spot analysis of the pottery from the heavy fraction samples of Building 17E82D08, Stratum E5c.
Figure 8 (lower right). The hot spot analysis of the flint greater than 1mm in size from the heavy fraction samples of Building 17E82D08, Stratum E5c.

Results

The small number of samples from the floors of the E5a (Fig. 3) phase (n=2) was too few to conduct statistical analyses on the heavy fraction data. Samples must be collected systematically across rooms even where is no evident hot spots.

The hot spot analysis for the E5b (Fig. 4/ Building 16E82D05) shows the distribution of samples as well as hot and cold spots. The 23 samples from the E5b phase appear to have a cluster of material along the southwestern wall. Here, hot spots for both sizes of flint, pottery, and shell appear. There is also a cluster of statistically low frequencies of >1mm bone along northern section of the partition wall. These samples were not taken systematically, possibly creating bias in the results.

The 42 samples from the E5c allow for statistical analysis (Figs. 5-8/Building 17E82D08). The hot spot analysis shows the distribution as well as hot, cold, and insignificant samples for shell, bone, pottery, and flint. Each map represents the material collected from both sieve sizes (>5mm and >1mm), except flint as the >5mm flint had no statistically significant results.

Pottery, flint, and shell of all sizes have high value clusters in the western half of the building, perhaps representing a working area. In contrast, bone fragments >5mm are densest in the NW, while fragments >1mm are clustered in the SW part of the building.

Figure 9. An aerial photo of Area E, North is right.

Figure 10. Field photograph of Building 16E82D05, Stratum E5c.

Conclusion

Since few samples were collected from the E5a phase, it is difficult to infer activity areas or area usage from the heavy fraction alone.

The larger sample collection from the E5b phase allows preliminary analysis showing hotspots along the SW wall of Building 16E82D05. These results are biased due to the heavier sampling near the walls with few samples taken in the interior of the building.

With the larger number of samples from the E5c phase, a number of hot spots based on different material types (bone, shell, pottery, and flint) can be identified. They indicate that the western half of the space was more intensively used since more material was found there. The greater fragmentation of bone in one part may indicate differential use of the space.

The hot spot analysis possibly signifies that the western half of the room was intensively used as a workspace in E5c even though there is no evident installations. In E5a-b, the large room was subdivided and used partly as a storage area and only the western room was intensively used as an activity area. The preliminary analysis conducted suggests that heavy fraction analysis can shed light especially in spaces where no evident installations are observed.