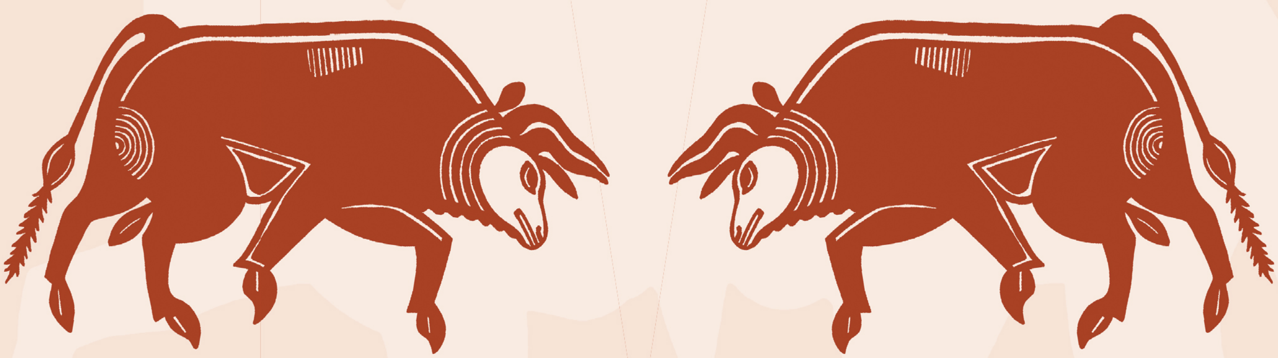
Archaeobiology 3

ARCHAEOZOOLOGY OF SOUTHWEST ASIA AND ADJACENT AREAS XIII



Proceedings of the Thirteenth International Symposium, University of Cyprus, Nicosia, Cyprus, June 7–10, 2017

edited by

Julie Daujat, Angelos Hadjikoumis, Rémi Berthon, Jwana Chahoud, Vasiliki Kassianidou, and Jean-Denis Vigne

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Group photo of the 13th ASWA[AA] meeting June 8th 2017
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Part 2: Subsistence Economies of Early and Late Complex Societies in Southwest Asia and Adjacent Areas

Part 3: Beyond Subsistence: Animals in the Symbolic World of Southwest Asia and Adjacent Areas

FOREWORD

The 13th ASWA conference was hosted by the University of Cyprus, one of the youngest of Europe's universities. In 2019, it was only thirty years since its foundation. Nevertheless, this is a thriving academic institution, which currently consists of eight faculties, twenty-two departments, and eleven research units.

In 1991, and just two years after the university's foundation, the Archaeological Research Unit (ARU) was founded by decree from the Government of the Republic of Cyprus, following the issuance of the dependent legislation by the House of Representatives. The decision to establish the ARU was based on the recommendation of the Interim Steering Committee of the University of Cyprus, which stated the following:

1. Cyprus is offered for primary research in the field of archaeology thanks to its distinctive cultural signature and history, as well as due to the fact that Cypriot archaeology and archaeological research on the island already has a distinguished tradition and international reputation;

2. The subsequent international recognition of the importance of archaeological research in Cyprus should comprise one of the first incentives for choosing the University of Cyprus as a center for postgraduate studies, and will pave the way for the exchange of students and academics between the University of Cyprus and academic institutions overseas.

The faculty members of the ARU, who are also part of the Department of History and Archaeology academic staff, have contributed immensely over the past 28 years to the achievement of the aforementioned objectives for the study and promotion of Cypriot cultural heritage through their research, their teaching, and the practical training they have been providing to students at undergraduate and postgraduate levels. The active study of other regions of the Mediterranean world have not been overlooked either, as members of the ARU academic staff have been carrying out excavations and research projects in Greece, Turkey, and France.

The members of the ARU are actively carrying out research in Pre- and Protohistoric Archaeology, Classical and Byzantine Archaeology but also Archaeometry and Environmental Archaeology, Maritime Archaeology, and Western Art. In the course of the past 28 years, the ARU has laid very stable foundations in all aforementioned specialisations of the archaeological discipline, none of which existed at academic level in Cyprus before the unit's establishment. Through their teaching at undergraduate and postgraduate levels, all members of the ARU academic staff have been contributing to the formation of a new generation of Cypriot archaeologists, equipped with all the necessary knowledge and practical experience needed to excel in this scientific field.

Over the years, the ARU has been very active in organizing international conferences and workshops. The ARU has organized over 50 international conferences, while members of the academic staff have published the proceedings of over 20 scientific meetings held at the ARU.

Thus, when Jean-Denis Vigne came to my office several years ago with the suggestion to co-organize the 13th Archaeozoology of Southwest Asia and Adjacent Areas conference I gladly accepted. The meeting in Nicosia brought together colleagues from all over the world and offered a venue where new results from the field or the laboratory could be presented and discussed. The publication of the conference proceedings enables colleagues who were unable to attend the conference to read about the latest developments in the archaeozoology of this culturally important region.

I would like to close by thanking all the members of the 13th ASWA organizing committee for all the work they have put into bringing so many scholars to Cyprus, many of them for the first time. I would also like to thank the co-editors of this volume for all the work they have put into the publication of the proceedings.

Professor Vasiliki Kassianidou
Director of the Archaeological Research Unit,
University of Cyprus
Nicosia, August 2019

EDITORS' PREFACE

Due to their location at the meeting point of the three Old World's continents—Africa, Asia, and Europe—Southwest Asia and its adjacent areas played a pivotal role in the history of humanity. They received successive waves of our species—*Homo sapiens*—out of Africa. Different processes in several areas of this large region brought about the transition to the Neolithic, and later on the urban revolution, the emergence of empires bringing with them important subsequent religious, cultural, social, and political consequences. Southwest Asia also played a major role in the interactions between East (Asia) and West (Europe) during the last two millennia. The unique importance of Southwest Asia in the history of humanity is strengthened by the, also related to its location, fact that this area is a hotspot of biodiversity, especially in mammals, which were—as everywhere in the world—tightly associated to the history of civilizations in a diversity of roles: game, providers of meat and milk, traded raw material, symbol of prestige and wealth, pets, etc.

Everywhere in the world, the biological and cultural interactions between humans and animals often remain under-evaluated in their heuristic value for understanding complex social and biological interactions and trajectories. This is why, almost half a century ago, archaeologists who were carrying out research and reflecting on such themes founded a very active nonprofit world organization named the International Council for Archaeozoology (ICAZ). This is also why the ICAZ working group "Archaeozoology of Southwest Asia and Adjacent Areas" (ASWA[AA]) was one of the first ones created within ICAZ, constituting one of the largest and most active of ICAZ's working groups.

The ASWA[AA] was formed during the 1990 ICAZ International Conference in Washington, D.C. Its purpose is to promote communication between researchers working on archaeological faunal remains from sites in western Asia and adjacent areas (e.g., Northeast Africa, Eastern Europe, Central Asia, and South Asia). It carries out its mandate mainly through the sponsoring of biennial international conferences. Since 1998, these meetings have alternated in being hosted in Europe or in Southwest Asia: Paris (1998), Amman (2000), London (2002), Ankara (2004), Lyon (2006), Al Ain (2008), Brussels (2011), Haifa (2013), Groningen (2015).

Ongoing armed conflicts and political tensions in several countries of Southwest Asia made it difficult to locate a safe and convenient place that would enable the organizing the 13th ASWA[AA] meeting in within that region. Although Cyprus is currently a member of the European Union, in (pre-)history Cyprus was embedded in the eastern Mediterranean "world." Because of its location, Cyprus was indeed at the confluence of African, Levantine, Anatolian, and Greek cultural streams and, as is common for islands, recombined them in different but always original ways all along its history. Archaeozoology recently provided one of the most convincing illustrations of the tight connection between Cyprus and Southwest Asia, demonstrating that the earliest domesticated mammals, especially cats, pigs, cattle, sheep, and goats, were introduced to the island very shortly after their first incipient domestication on the near continent, that is, during the ninth millennium BC. For all these reasons, Cyprus represented an ideal place to host the 13th ASWA[AA] conference.

Despite the illegal military occupation of part of its territory by a foreign country, the option of hosting the meeting in Cyprus was enthusiastically embraced by all members of the working group, especially because it is open to all nationalities and maintains good diplomatic relationships with a large majority of countries in Southwest Asia. These facts contributed towards the 13th ASWA[AA] meeting in Cyprus (June 7–9, 2017) becoming one of the best-attended ASWA[AA] meetings. It brought together 80 scientists coming from 25 different countries: from Southwest Asia (6 countries), Europe (14 countries), North America (2 countries), and Japan.

They presented their results in 36 oral and 32 poster presentations. They debated the long-term interactions between humans and biodiversity, about the beginning of animal domestication and husbandry, the strategies of animal exploitation from the Paleolithic to modern times, and the symbolic and funeral use of animals through time. They also greatly enjoyed the numerous social events organized, including a fantastic Cypriot mezze dinner, enhanced by a local folk-music band, and a nice excursion to the archaeological sites of Amathous, Kourion, and Khirokitia, and to the museums of Nicosia and Larnaca, which provided ample opportunities for scientific exchanges in a friendly atmosphere.

The hosting of the conference at the new campus of the University of Cyprus was another major reason to the meeting's success. This campus was a convenient and pleasant venue for such a conference, and the strong support of the University of Cyprus, as well as its valuable experience for the organization of such meetings were deeply appreciated by both the scientific organizers and the delegates. Several other partners contributed to the organization: the French archaeological mission "Neolithisation—Klimonas," which is itself strongly supported by the French School at Athens, the Cyprus Department of Antiquities, the French Institute of Cyprus, the French National Center for Scientific Research (Centre National de la Recherche Scientifique [CNRS]), and the French National Museum of Natural History (Muséum national d'Histoire naturelle [MNHN]).

The present volume brings together the texts of 18 of the 68 presentations of the meeting in Nicosia. The editorial board collected the papers and organized their review and editing. We are very grateful to Sarah Kansa (and Open Context), Justin Lev Tov, and Lockwood Press for their constant support in bringing this volume to fruition.

Julie Daujat
Angelos Hadjikoumis
Rémi Berthon, Jwana Chahoud
Vasiliki Kassianidou
Jean-Denis Vigne

1.5 | Sweating the Small Stuff

Microdebris Analysis at Tell eṣ-Ṣâfi/Gath, Israel

Annie Brown,* Haskel J. Greenfield,* and Aren M. Maeir†

Abstract

Most modern excavations intensively collect data from flotation, including both light and heavy fractions. While the light fraction (floated) is usually extensively analyzed by archaeobotanists, the heavy fraction or microdebris is often ignored or minimally examined since it requires intensive efforts at the microscopic level to recover and identify the remains. In recent years, a few studies have demonstrated the utility of intensive examination of the microdebris from archaeological sites as a means for investigating behavior on the microscopic level. When collected systematically across surfaces, the analysis of microdebris allows for the identification of different activities and deposits that are often less visible with macroscopic remains. This paper describes the goals and collection methods for microdebris analysis and presents some preliminary analysis of the microdebris from the excavations of the Early Bronze III nonelite residential neighborhood at Tell eṣ-Ṣâfi/Gath, Israel. The results demonstrate that various types of materials are deposited differentially between depositional contexts. Some types of deposits yield very little microdebris (e.g., alleyways), while others are characterized by their abundance (e.g., room interiors). Consequently, the systematic collection and analysis of contextually differentiated microdebris samples from across archaeological surfaces can help guide excavation strategies since it allows for certain deposits to be clearly targeted for intensive examination..

Keywords

Early Bronze Age, southern Levant, flotation, heavy fraction, activity areas, Tell eṣ-Ṣâfi/Gath, microdebris, microresidue analysis, neighborhoods

Introduction

Many modern archaeological excavations collect flotation data, including both light and heavy fractions (Rainville 2012, 2015; Ullah 2012; Ullah et al. 2015). While the light fraction, which floats, is usually extensively analyzed by archaeobotanists, the heavy fraction, also known as microdebris, which sinks, is often ignored or minimally examined, even though it has long been recognized to have high utility particularly for faunal remains (Payne 1972). Microdebris are the minute, microscopically visible, artifactual and ecofactual remnants embedded on and within floors that are not completely cleaned up after an activity is completed.

In recent years, a few researchers have demonstrated the utility of intensive and systematic examination of the microdebris as a means to investigate spatial behavior through microscopic analysis. Microdebris analysis is a profitable means for the study of activities distributed across surfaces. It can provide insight into past behaviors and activities, particularly in household archaeology (Rainville 2012; Shahack-Gross 2011; Ullah 2012).

The analysis of microdebris provides us with a wealth of information not always available from the larger artifacts at the site, which may have been moved from their original use location. Microdebris provide additional information on the use of spaces, attesting to activities that often remain archae-

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ologically invisible when only standard macro-level artifact collection and analysis techniques are employed (Rainville 2012). Microdebris can also provide the means to reconstruct the local microclimate and environment (Rosen 1989), offer insights on whether and which pests were present or absent (Hassan 1978a), when rooms in a house were used or abandoned (Shahack-Gross 2011), or inform on missing sources of food not retrieved by hand collection, like plants, fish, and smaller remains (Hassan 1978a; Payne 1972; Rosen 1989), and on the human behavior behind these activities (Hassan 1978b; Rainville 2012; Rosen 1989; Weiner 2010).

Microdebris are subject to the same taphonomic forces as macroremains. They can be crushed, scavenged, and weathered. However, they are also subject to additional taphonomic forces. Indeed, they are often swept or dumped into corners or against walls in active living spaces and easily trampled into the soft dirt floors. At the same time, they are less likely to be moved a substantial distance from where they were used or initially discarded. Their proximity to these sheltered locations means that they are often more protected and consequently less damaged by the various taphonomic forces affecting macro artifacts. Examining the differences between the distributions of macro- and microdebris across surfaces helps to determine the extent of cleaning activities. Furthermore, if microdebris are systematically collected across different surfaces and depositional contexts, their analysis can help to guide excavation and recovery strategies, identification where such debris is located, which deposits are worth floating, the identification of activity areas within rooms, pest distributions within rooms, and more (Rainville 2012; Rosen 1989; Steadman 1996; Weiner 2010). Consequently, this technique is very useful for the analysis of human behavior (Rainville 2001, 2012).

In this paper, the utility of microdebris analysis is demonstrated through the preliminary analysis of the data from the Early Bronze Age (EB) excavations in Area E at Tell eṣ-Ṣâfi/Gath, Israel.

Previous Studies

Long ago, Payne (1972) laid out the need for systematic collection strategies when analyzing zooarchaeological remains. He compared the efficiency and reliability of hand collection, dry sieving, and wet sieving and demonstrated that both dry and wet sieving are useful for the collection of small finds such as lithics, ceramics, and bone. When both dry and wet sieving utilized with progressively finer mesh sizes, it was discovered that hand collection was the least systematic and least consistent in recovery of especially small remains. Dry sieving yielded more consistent results but still missed substantial quantities of microdebris. Wet sieving yielded the best results for the smaller remains because the mesh is smaller and the remains are cleaned in the process, making them easier to recognize and sort. At the same time, Payne recognized that, it would be very expensive and time consuming to sift, float, and analyze the microdebris from an entire site, while it would be ideal. As a consequence, he argued that sieving should be selective, based on the research goals of the excavation. This early study of the collection methods for microdebris helped set the stage for the current methods, in general, and those used in our study in particular. Since then, many studies have compared the effect of different collection strategies on the interpretation of faunal and other types of archaeological remains (e.g., Clason and Prummel 1977; Sapir-Hen et al. 2017). As a consequence, floatation and water sieving for the collection of microdebris have become a standard recovery tool in both zooarchaeology and archaeobotany for the systematic recovery of representative biological assemblages (Dennell 1972; Legge and Hacker 2010; Shaffer 1992). However, a factor that few have considered is the level of training necessary to identify microscopic material (Ullah et al. 2015).

While all of the specialist disciplines have long examined the heavy and light fractions from floatation samples, most analysts function more or less independently of each other and produce separate specialist reports. In recent years, some have argued for a more integrated approach to microdebris analysis that considers all the different types of artifacts and ecofacts in a single analytical framework. One of the first scholars to systematically apply this approach to microdebris remains in the southern Levant was Arlene Rosen (1993). She conducted microdebris analyses on two separate sites in Israel, Tel Halif and Tel Miqne-Ekron, and found that the microdebris complemented the macroremains. Rosen concluded that it would not have been possible—or would have been very difficult—to identify the function of spaces if only the macro artifacts had been examined. She

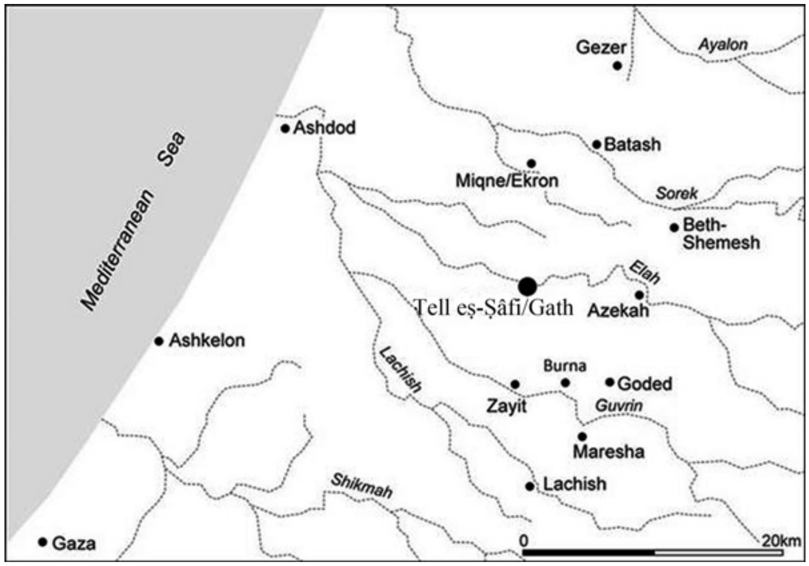

Figure 1.5.1. Map showing the location of Tell eṣ-Ṣâfi/Gath in central Israel and some nearby sites. (Photograph courtesy of the Tell eṣ-Ṣâfi/Gath archaeological project.)

shed new light on the differences between residences, different social classes, and site formation processes that occurred during and after occupation.

Rainville (2000, 2001, 2005, 2012) was the first to systematically apply microdebris analysis to spatially distributed samples across many parts of a site. She collected the heavy fraction from floatation samples taken from floors, hearths, and middens from the EB site of Titriş Höyük in Turkey. She was also the first to evaluate the spatial significance of different classes of raw material—ceramics, bone, chipped stones, mud brick, plaster, shell, charcoal, and botanical matter—for different contexts across the excavation area (Rainville 2000:291). Each of the samples was weighed, quantified, and their densities calculated and graphed. The results from the microdebris were then compared to those of the macrodebris. The analysis demonstrated that there were clear differences within and between the rooms of houses even within the same neighborhood. Cooking versus storage spaces were more clearly defined, even within the same room. The use of these rooms would have remained more elusive had only the macro artifacts been analyzed.

Ullah (2009) built upon Rainville's earlier study by including spatial analytic statistics to determine significant patterns. He employed basically the same analytic procedure as described by Rainville: collection of spatially distributed samples and calculation of frequencies of both macro- and microdebris. Ullah (2009) used an extensive set of statistical and spatial techniques to analyze distributions. He calculated the mean density of each grid as a cluster sample; entered the density data from each grid unit into a GIS program (GRASS GIS); regularized the data with spline-tension interpolation to create a density probability surface for each grid square; and, finally, converted the information from each map into Z-score units away from the mean to distinguish areas that had higher and lower artifact densities from those with average densities. He concluded from the microdebris analysis that many types of activities were performed within the houses and that certain activities were performed in specific locations: for example, food preparation occurred near the hearth, stone-tool manufacturing and use occurred in areas where there was natural light and access to the outdoors. Cleaning of the house and its floors also occurred, probably at a regular basis, with waste being swept out of the doorway. In this chapter, we present our analysis of the microdebris from the EB site of Tell eṣ-Ṣâfi/Gath.

The Site of Tell eṣ-Ṣâfi/Gath

Tell eṣ-Ṣâfi/Gath is a large multiperiod tell site with a long and rich cultural history (Maeir and Uziel 2020). It is located in central Israel. The settlement sits atop a natural large crescent-shaped hill. Tell eṣ-Ṣâfi/Gath is a large urban center, ca. 24 ha in size,

Figure 1.5.2. Balloon aerial photograph of Area E at Tell eṣ-Ṣâfi/Gath. (Photograph courtesy of the Tell eṣ-Ṣâfi/Gath archaeological project.)

of an EB III (ca. 2850–2550 BC) polity (Figure 1.5.1). At the eastern end of the tell, Area E (Figure 1.5.2), a large domestic EB nonelite quarter, has been intensively excavated since 2004. Microdebris have been systematically recovered and analyzed from the late EB III Stratum E5, which comprises three different phases (E5a, b, and c). This stratum terminates ca. 2550 BC (Greenfield et al. 2016, 2017; Shai et al. 2012, 2014, 2016).

Material and Method

To date, 27 spatially dispersed point samples—10 L of sediment each—have been analyzed. These contained 13,133 specimens (Table 1.5.1). They come from various ash layers above floors, fill layers, mudbrick collapse, installations, accumulations found on floors, and the floors themselves within and outside of the various rooms in the excavation, and from the alleyway between the buildings. Burnt (carbonized) plant remains were collected separately but are excluded from this analysis since they have not yet been quantified.

The microdebris were separated from sediments through the use of a floatation machine with separate heavy and light fraction recovery systems. Microdebris collection from Area E at Tell eṣ-Ṣâfi/Gath has been an integral part of the excavation for several field seasons. Drawing on the results of previous studies (Rainville 2000; Ullah et al. 2015), our goal was to determine if there were similar patterns at EB Tell eṣ-Ṣâfi/Gath. The goal of this paper is to present a preliminary quantification of the microdebris samples. The data from several years of excavation (2012–2015) within the three E5 strata from Area E are summarized here.

Field Collection Protocol

Excavation. The field collection methods used in this study are based on those presented by Rainville (2000, 2012) with minor changes to account for the smaller building sizes. Excavation squares of 5 × 5 m were subdivided into 1 × 1 m squares only where space permitted and where there was clear indication of a floor surface. Strategic point samples were also taken in spaces where rooms were too small for subdivision or for features of interest, for example, hearths or ash layers (Figure 1.5.3). Each sample was recorded using a total station, which determined the X, Y, and Z location. All samples from the field were collected in 10 L samples (10 L = one field bucket)

Table 1.5.1. Frequencies of EB microdebris from the E5 strata based on context from Tell eṣ-Ṣâfi/Gath.

Context type	**Bone**		**Flint**		**Mud brick**		**Pottery**		**Shell**		**Modified/ unusual stone**		**Special find**		**Total NISP**	**Total %**
	NISP	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**	**NISP**	**%**		
Accumulation on floor	2,511	64.25%	668	53.23%	1,869	70.61%	1,131	60.48%	1,579	58.85%	375	51.87%	32	68.09%	8,165	62.17%
Mud-brick collapse	294	7.52%	239	19.04%	311	11.75%	214	11.44%	259	9.65%	178	24.62%	5	10.64%	1,500	11.42%
Floor	373	9.54%	83	6.61%	365	13.79%	230	12.30%	200	7.45%	39	5.39%	3	6.38%	1,293	9.85%
Alleyway	461	11.80%	143	11.39%	0	0.00%	160	8.56%	401	14.95%	23	3.18%	5	10.64%	1,193	9.08%
Installation	246	6.29%	108	8.61%	100	3.78%	129	6.90%	244	9.09%	68	9.41%	2	4.26%	897	6.83%
Ash pit	23	0.59%	14	1.12%	2	0.08%	6	0.32%	0	0.00%	40	5.53%	0	0.00%	85	0.65%
Grand Total	**3,908**	**100%**	**1,255**	**100%**	**2,647**	**100%**	**1,870**	**100%**	**2,683**	**100%**	**723**	**100%**	**47**	**100%**	**13,133**	**100%**

Figure 1.5.3. Photograph of Square 82D in Area E from above in preparation for microdebris sampling. (Photograph courtesy of the Tell eṣ-Ṣâfi/Gath archaeological project.)

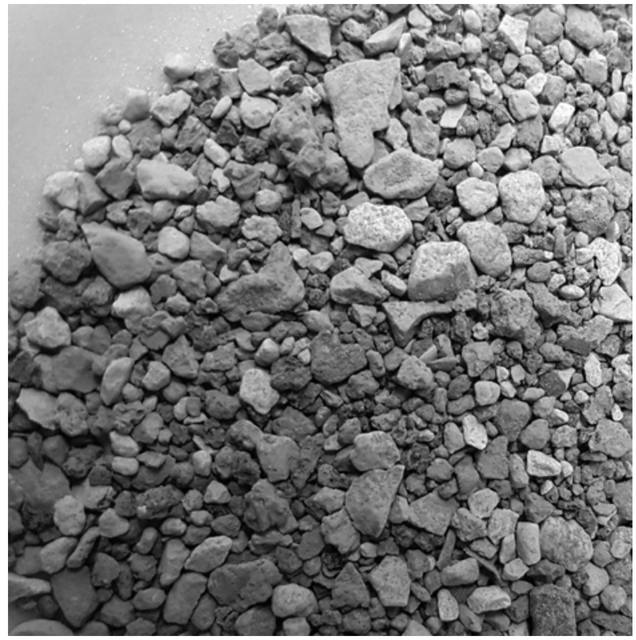

Figure 1.5.4. Photograph of unsorted heavy fraction. (Photograph A. Brown.)

from clear depositional contexts. These contexts included floors, doorways, occupational debris levels, pits, installations, and special features.

Sorting. Each soil sample was taken off-site for processing at the excavation field laboratory because of the need for a constant water source to process the sediment through the floatation machine. During the floatation process, the light- and heavy-fraction samples were separated. The light fraction floated to the surface and was analyzed separately by the project's archaeobotanists (Frumin et al. 2021). Once the heavy and light fractions had been separated, the heavy-fraction samples (Figure 1.5.4) were placed outside in the shade for a day or two to dry slowly in order to prevent damage to the specimens. Rapid drying in the sun would have caused fracturing and bleaching, leading to the degradation of specimens. This would have made it more difficult, if not impossible, to sort and identify specimens.

Field Laboratory Analysis

Once dry, the microdebris was sorted into several categories, such as stone, flint, bone, shell, unique finds, and charcoal (Figure 1.5.5). After the preliminary recording of weight and frequency, the microdebris categories were analyzed according to relevant raw material, such as ceramic, lithic, bone, and others.

Stones. Stones found in the microdebris may enter the archaeological record for many reasons. Some may have been collected as tools and are culturally modified, such as grinding stones and semiprecious stones. Others may appear in a natural state since they were used for production, such as ceramic temper and ochre, or as a fill, for example, to even out an erosional feature or to be used as floor substrate. Collection and analysis of stones are important because they may indicate the location of various activities, such as manufacturing or storage—for example, jewelry as evidence for trade—based on provenance source. The stones quantified here are those that are unusual either in shape or origin (e.g. nonlocal) and whose presence signify some kind of cultural behavior.

Shells. All types of shell materials were collected. They can be used to determine the changing local environment, subsistence, trade, adornment, and more. Due to the inland location of the site, any marine shells would either indicate trade or collection forays to the coast, while inland snails can be indicative of local plant life—for example, tree snails would be indicative of trees.

Bones. Collection and analysis of the microdebris enables a higher degree of recovery of the smaller

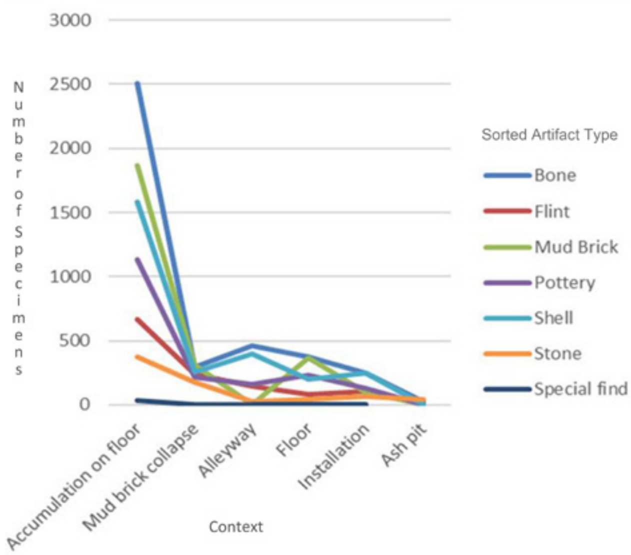

Figure 1.5.5. Line graph (based on Table 1.5.1) showing frequencies of microdebris by context. All samples are from the E5 strata within Area E.

bone elements of larger taxa, and a more representative assemblage of smaller taxa such as fish, bird, or microfauna. These enable more subtle reconstructions of subsistence, discard, and other behaviors (Payne 1972; Sapir-Hen et al. 2017).

Some of the fauna recovered in the microdebris may include intrusive species such as rats, mice, songbirds, or lizards. These can be species that are present at the site naturally but are not related to either animal husbandry or human activities in general. The presence/absence of such taxa may indicate changes in environmental conditions or human occupation at the site—or even in specific rooms—during deposition (Rosen 1993; Sapir-Hen et al. 2017). A sudden or long-term change of these species may indicate a shift in environmental conditions in and/or around the site, such as drought.

Ceramics. Ceramics recovered in the microdebris can be identified to the size of the vessel—given wall thickness—and the type of vessel. Consequently, it is feasible to infer their possible uses within the living space. It also allows for the identification of the location of orginal vessel use, particularly of those that were removed from a space after fragmentation. These can then be compared with the ceramics recovered in the macrodebris.

Mud brick. Mud-brick fragments can be quantified according to size, frequency, texture, color, etc. From these data, specific mud-brick types can be identified. By identifying the degree of weathering, one can determine whether the mud brick was slowly eroded from exposure or quickly collapsed and used to form a substrate for the next phase of construction.

Flint (Chipped Stone Tools). The frequency and variety of chipped stone tool types (cores, blades, scrapers, awls, saws, etc.) and debitage may suggest activity types, such as food production, textile production, tool production, and modification.

Carbonized material. Carbonized material includes burnt seeds, wood, and organic material. Identified carbonized material, whether in concentrations or not, can provide information on the type of materials that were burnt and consumed. These data can be used to distinguish between use and discard locations, food production areas, and storage locations/installations, for example, storerooms and granaries.

Special finds. Special finds can appear in varying frequencies within the microdebris. They include any identifiable culturally made and/or modified items, such as tool fragments, beads, game pieces, and decorations. These items can indicate many things about the site and houses. Isolated beads or concentrations of beads, for example, may represent accidental loss or purposeful storage since they were likely once part of a necklace or bracelet.

Discussion

Observation on the Data Distributions

There is a clear pattern in the distribution of microdebris between different types of depositional contexts. The highest concentration of material comes from ash accumulations that occur directly above the dirt floors and clearly relate to occupational activities (62%; Table 1.5.1 and Figure 1.5.5). These are the direct remains of activities that took place within spaces inside and outside the buildings—for example, food preparation, cleaning, and storage.

There is a substantial gap between the accumulations above floors and the next category of microdebris. Mud-brick wall and roof-collapse layers are the second highest frequency (11.42%; Table 1.5.1 and Figure 1.5.5). The microdebris from such deposits likely derive from either the mud-brick matrix—and hence from earlier strata—or from the collapse of the walls and upper floor/roof. In most cases, it is difficult at Tell eṣ-Ṣâfi/Gath to distinguish between these possibilities.

The alleyway and the physical floor makeup are the next most common categories (9.08% and 9.85% respectively; Table 1.5.1). Originally, we expected that there would be a relatively high concentration of microdebris in the alleyway since streets in many ancient cities are often used as dumping grounds for rubbish (Rainville 2000, 2005). The results of this preliminary study show that this is not the case. While the alleyway is full of macrodebris—more so than any other contemporary deposit—it is relatively clear of microdebris when compared to other depositional contexts, such as the accumulations above the floors.

The microdebris in the floor makeup is much lower than in the accumulations above the floor. Elsewhere, more material was found in the floor makeup (Rainville 2000, 2003, 2005) since this is where artifacts would end up when trampled into the floor makeup.

Installations, such as hearths, have the second smallest concentrations (6.83%), followed by ash pits from cooking and heating, which have the fewest remains (0.65%; Table 1.5.1 and Figure 1.5.6). The low frequency of remains in these deposits and likely relates to the high degree of burning since most of the makeup is ash in both types of deposits.

Implications for Interpretation

The implication of these results is that the pattern in one site is not necessarily true of all sites. For example, the larger-sized debris in the alleyway suggests that they were not simply thrown out as garbage but instead purposefully placed there possibly as fill. The larger debris is a means to stabilize the alleyway as parts of it became furrowed due to runoff and foot traffic. Debris from inside the houses, garbage, and other unused materials, including unmodified stones, are then deposited in the small pits and other irregularities in the alley and packed down with fresh dirt to level its surface. However, the dearth of microdebris from the alley may suggest that the microdebris were differentially destroyed and/or washed downslope given the alley's relatively steep slope. However, this is an unlikely explanation given that the alley is relatively flat toward the northwest, and only declines fast toward the southeast. This result can only be deduced from the microdebris data.

The situation is very different inside the buildings where the floors were relatively flat. The relatively high percentage of debris found in the accumulation on the floors suggests that floors within the buildings were poorly cleaned. When the inhabitants dump the debris onto the floor—either intentionally or unintentionally—some of that material is trampled into the ash accumulation above the floor makeup and covered with fresh ash or soil. This results in the formation of a layer of debris that appears to be floating builds up just above the floor and is separated from the floor makeup.

Conclusion

Microdebris represents the physical remains of activities that are preserved even when the macroremains are cleaned up and deposited elsewhere. They can occur inside and outside of buildings. Investigation of microdebris remains can help investigate aspects of human behavior, such as the nature of households (Antonites 2012; Rainville 2012; Steadman 1996).

By creating a standardized method for microdebris collection and analysis, it is possible to ascertain missing data from archaeological assemblages. Microdebris can not only aid in discovering production and activity sites (Antonites 2012; Rainville 2000, 2012) but may also lead to a more detailed understanding of human behavior. In addition, through the study of the microdebris from inside and outside of houses, it is possible to interpret the use of these houses: how they relate to each other within the context of the urban neighborhood and where the primary usage areas might be in and around each house. While some deposits yield more microdebris than others, all deposits are useful and need to be investigated. Those with little to no microdebris are just as important as those that contain microdebris remains.

From our preliminary results at Tell eṣ-Ṣâfi/Gath, it is evident that the focus of microdebris analysis should be on the occupational debris accumulating immediately above floors. Such deposits can be most intensively sampled since they are likely to yield higher frequencies and variety of remains. The other deposits, however, should not be ignored, but can be sampled differentially. Sampling, as part of microdebris analysis, is important since it is nearly impossible to sample equally all features and all areas at all times, particularly at large multiperiod tell sites (Sapir-Hen et al. 2017).

The accumulations found on and above the floors show the heaviest concentrations and allow for the most fruitful path to investigate spatial distribution of activities. Additional analysis of these concentrations may help to further determine the different types of activities and differences between the activity areas between and within rooms. In contrast, floor makeup deposits are the least productive and therefore should take less priority. The alleyway is unusual in the low density of the microdebris remains found, but that may result from the fact that it is an open-air yet narrow space that is subjected to winter rainfalls, resulting in the higher attrition of smaller microdebris material, leaving the macro artifacts in place.

It is impossible to subject all deposits to unlimited microdebris recovery and analysis, especially in large-scale and long-term excavations of sites such as tells. Deposits need to be sampled strategically and selectively—this is clear from a number of independent studies (Payne 1972; Rainville 2000, 2003, 2005; Sapir-Hen et al. 2017). Microdebris analysis should therefore focus on those depositional contexts likely to contain higher frequencies of microdebris. In the case of the EB neighborhood excavated at Tell eṣ-Ṣâfi/Gath, the accumulations above the floors were the most productive. Yet, it is important also to *sample* other deposits and contexts, even the spaces where nothing is expected, because empty spaces (null cells) mark the spatial limits (e.g., boundaries) of activities or where the nature of activities does not lead to microdebris deposits being created (e.g., gardening; Greenfield et al. 2005).

The analysis presented here demonstrates that it is possible to differentiate between types of depositional contexts based on the frequency and nature of microdebris and to increase our understanding of the nature of these deposits. Excavators need to create collection and analytical strategies for microdebris in order to process them efficiently and strategically, thus producing a representative sample. Strategies can change over time as new and different deposits are encountered during excavation. These can lead to an increased understanding of the processes that created deposits in a site and the behaviors behind them.

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