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Source: *Near Eastern Archaeology*, Vol. 67, No. 2 (Jun., 2004), pp. 108-117

Published by: The American Schools of Oriental Research

Stable URL: <http://www.jstor.org/stable/4132366>

Accessed: 04-10-2017 15:18 UTC

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The Archaeology of the Daily Grind: Ground Stone Tools and Food Production in the Southern Levant

by Jennie R. Ebeling and Yorke M. Rowan

Though they are often regarded as unglamorous, awkward, static through millennia of use, and functionally self-evident, ground stone tools nevertheless constitute a substantial part of archaeological finds recovered from most sites in the ancient Near East. They can offer insights into such diverse phenomena as changes in diet and food processing techniques, mobility and residence patterns, division of labor, and specialized activities related to cultic practices to mention but a few things. Unfortunately, the exclusion of these artifacts in past archaeological publications means that an essential part of the archaeological record remains unused and, when these tools are discarded, actually destroyed by the very archaeologists who purport to save the past.

Our main sources of information for the uses of ground stone in food processing come from models and tomb paintings from pharaonic Egypt, textual references, including the Hebrew Bible, and ethnographic studies, particularly those from Australia, Africa and North America. The latter provide insight into production techniques, tool function, use and discard. Syria-Palestine provides a window into the development of ground stone food processing technology, from its origins in the Upper Paleolithic through the rise of the centralized states in the first millennium BCE. In this small but environmentally diverse region, an important resource was available for these stone tools—basalt. Although it is available in large quantities in several regions, people were sometimes willing to travel some distance to collect this volcanic igneous rock. There were locally available sources of basalt, but, as demonstrated by provenience studies, inhabitants of the Carmel region during the Epipaleolithic obtained basalt for grinding implements from the more distant basalt outcrops in the northeastern Jordan Valley, the Galilee or the Golan.¹

Much later, basalt became a prestige material for bowl production in the Chalcolithic, and only came into widespread

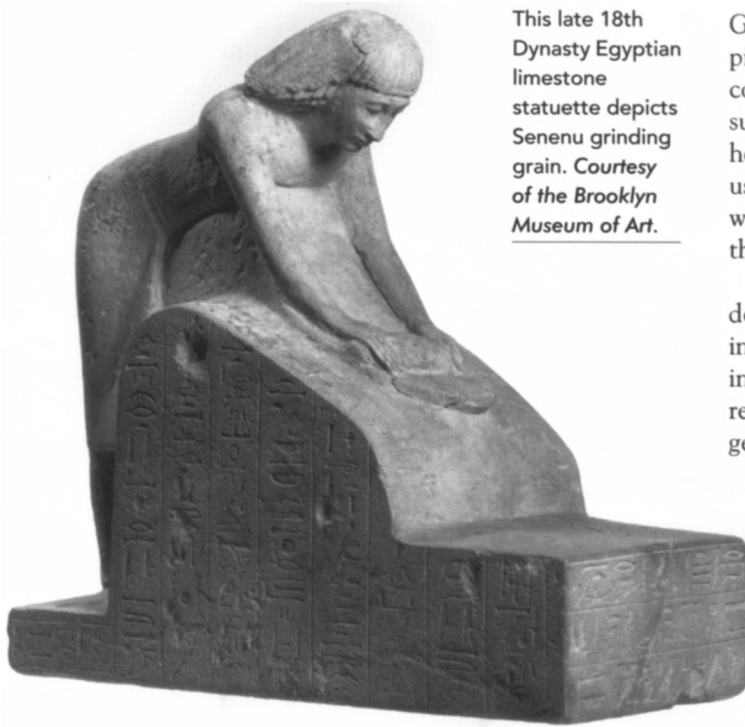
use for making grinding implements and finer vessels throughout the region during the Bronze and Iron Ages. Basalt is an ideal material for grinding grain (as well as other materials) because the vesicles maintain a rough, hard surface, and the surface attrition is minimized, lessening the quantity of grit in the final food product. Locally available rocks found in the southern Levant, in particular, limestone, flint, beachrock (coquinoidal sandstone), chalk and sandstone, were also used for grinding implements.

The proven efficiency of grinding using basalt tools may account for the persistent preference for this material. Through replicative experiments, Neri found that beachrock grinding slabs, which are found at sites in the southern coastal plain, the Shephelah, and in the northwestern Negev, yielded grain with a high average (6.4 percent) of foreign material, like stone particles, compared with basalt grinding slabs, which yielded only 0.2 percent.² Unless beachrock slabs and basalt slabs were used to process the same grain at different stages (which seems unlikely), inferior, yet locally-available, beachrock slabs were probably used in grinding activities when access to basalt was limited.

Ground Stone Terminology

In the field, few people know how to categorize and organize the ground stone assemblage, which leads to confusion that prevents their methodical collection and preservation. Even the term “ground stone,” which can refer to both the way a tool was made and the way in which it was used, does not reflect the diverse operations that produce the final artifact that archaeologists discover. Traditionally, archaeologists divide stone tools into two broad classes of artifacts, “chipped” and “ground” stone. Chipping and grinding, however, are techniques of manufacture that may be used for either class of artifacts. The production of a ground stone artifact can involve a whole host of manufacturing techniques, such as pounding, flaking, abrasion, polishing and even sometimes drilling.

The common assumption is that ground stone implements were used for grinding cereals, but ethnographic sources document the multiple functions similar tools served. Many of these tools may have been used in ways unrelated to food processing, or in addition to food processing. For instance, experimental studies of handstones indicate that these could have been used to process animal hides in addition to plants.³



This late 18th Dynasty Egyptian limestone statuette depicts Senenu grinding grain. Courtesy of the Brooklyn Museum of Art.

Grinding and pounding tools have been observed to grind pigments, sharpen or smooth tools, shred bark, grind non-comestibles such as shell, temper and clay, as well as a variety of substances for consumption such as coffee, sugar, chili, salt and herbs.⁵ In Palestine specifically, Gustav Dalman witnessed the use of mortars to process meat and onion. He also noted that wheat was first dehusked using a mortar and wooden pestle and then further processed using stone grinding tools.⁶

Morphological differences within a category of artifacts does not necessarily reflect functional differences but may instead be affected by the availability of raw materials, grinding intensity and individual preference. Laboratory analysis of the residues left on ground stone implements from widely divergent geographical ranges such as Australia, the Solomon Islands and Panama sometimes provide ambiguous data, but have identified substances such as lipids and starches from plants.⁷ Experimental studies have shown that use-wear analysis, similar to that performed on flaked stone tools, is capable of isolating different patterns of wear that correlate with the different materials processed.⁸ Nevertheless, ample indirect evidence supports the idea that grinding slabs were used to crush cereals, even before farming was practiced.⁹

Ground Stone Tools in the Hebrew Bible

Given the likelihood that the majority of the population of ancient Israel was intimately familiar with ground stone tools, it is a bit surprising that so few references to the use of handstones and grinding slabs appear in the biblical texts. According to Jeremiah 25:10, the sound of grinding stones in Judean homes was as indicative of an inhabited home as the light of a lamp and Deuteronomy 24:6 forbids the taking of a handstone in pledge of a debt, as this would be equivalent to taking away a family's means of sustenance.

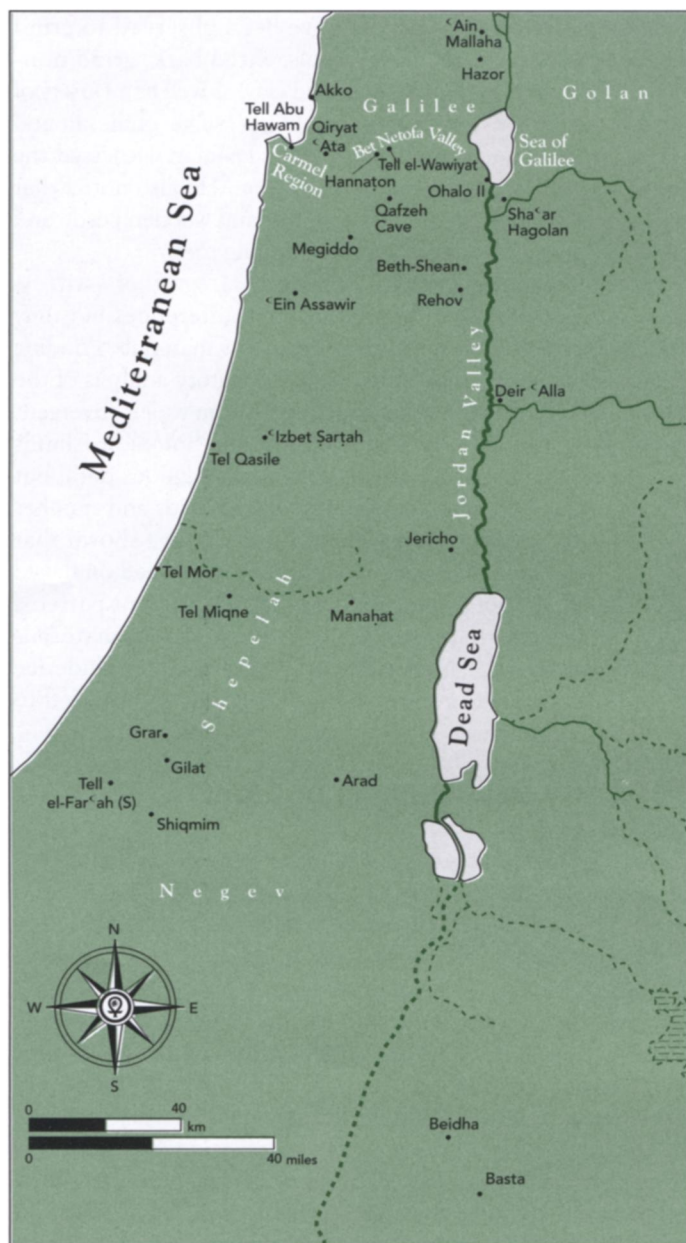
There are passages that specifically associate women with grinding stones (Exod 11:5, Isa 47:2, Job 31:10), the most colorful concerning the siege of Thebez, when Abimelech was killed by a woman dropping a handstone on his head (Judg 9:53; 2 Sam 11:21). If, as indicated by this literature, women were the most likely preparers of food in the Israelite home, the biblical writers probably did not find daily life, female-gendered activities interesting or important enough to mention often.

Although there is no archaeological evidence for them, milling houses may have operated in Judah during the Iron Age; they are well-known in the ancient Near East during this period.⁴ Judean prisoners of war were sent to work in such mills in Babylonia (Isa 42:7, Ps 107:10–16; Lam 5:13), and it appears that Samson may have been sent to one such prison in Gaza (Judg 16:21), where he spent his time grinding.

The Early Development of Ground Stone Tools

Long before small groups of humans settled into permanent agricultural villages, they were using stone in various food processing activities. Early stone grinding tools are known from the lowest Upper Paleolithic layer at Qafzeh Cave, including a shallow mortar with traces of ochre staining on the rim.¹⁰ During the Upper Paleolithic period (45,000–20,000 BP), stone was used not only for choppers and handaxes as they had been for millennia, but also to crush and grind a variety of substances. In the southern Levant, ochre is very common in Upper Paleolithic sites, and its association with grinding stones is clear.¹¹ Upper Paleolithic abraders and grinding stones, perhaps initially used for crushing ochre, may have created a “preadaptation” (a practice that confers an adaptive advantage to a later population under new conditions) that was later expanded to include grain processing. Many of these early stone tools appear to have been multi-functional, serving to grind, pound and cut a variety of edible and inedible materials. The handstone and the grinding slab, in fact, originated thousands of years before grains became the staple of populations living in the southern Levant. The discovery of barley (*Hordeum*) processing with a basalt grinding stone at the site of Ohalo II, an Early Epipaleolithic site along the Sea of Galilee, suggests that wild cereals were being used in baking around twenty thousand years ago.¹²

The earliest deep mortars are found in the southern Levant in the early Epipaleolithic, (20,000–14,500 BP), although they were a component in many Kebaran (a subdivision of the Epipaleolithic period) occupations. By the Geometric Kebaran (14,500–12,250 BP) grinding tools are a small but consistent



Map showing sites mentioned in the text.

feature of the material culture.¹³ Soon after, mortars—some even decorated—and pestles become more common at the larger Natufian sites (12,500–10,500 BP) where archaeologists document an expanding variety of species in the human diet. Natufians are known for having greatly elaborated the basic ground tool kit of mortars, pestles and grinding stones.¹⁴ The mortars from 'Ain Mallaha represent a variety that includes both large and small pedestaled examples, some of which are incised in ornate, geometric patterns.¹⁵

Although earlier researchers thought that the differences in distribution between mortars with pestles and handstones with grinding slabs reflected the exploitation of different food resources during the Natufian, current research challenges

this notion by instead suggesting that these differences are chronological, with grinding slabs and handstones more common by the Late Natufian.¹⁶ Wright argues that the increased emphasis on grinding tools arose from a need to maximize the amount of digestible food derived from the limited cultivated areas under the control of increasingly sedentary populations. By reducing sizes of particles, greater caloric content could be obtained as sedentary populations became increasingly reliant on cultivated cereals. The use of the “saddle querns”—large, deeply concave grinding slabs—may have been related to this movement toward an intensified scale of production.

Grinding slabs and handstones seem to become increasingly frequent from the end of the Natufian through the early stages of the Neolithic, a period that slightly precedes or corresponds with the domestication of cereals. During this period, the increased occurrence of severe dental attrition probably reflects the increasing carbohydrate consumption.¹⁷ Research on tooth wear of populations at the site of Abu Hureyra, Syria,¹⁸ in particular, supports this conclusion. Other evidence indicates a steep decline in the presence of mortars during the Pre-Pottery Neolithic, which may reflect a shift in plant utilization and processing.¹⁹ Particularly in the later Pre-Pottery Neolithic period, increased diversity in the ground stone artifact types is evident, with some forms reflecting greater attention to craftsmanship. In addition to the established grinding slabs and handstones, a variety of more carefully worked stone vessels become more common at the larger PPNB sites, such as Jericho, Beidha and Basta. In the northern Levant, fine vessels made from more exotic stones and exhibiting greater attention to the finishing of the vessels appear at this time. This focus on presentation, and the significance that was presumably attached to these vessels may reflect a change in their symbolic importance connected to communal events. For example, such elaboration of food vessels may represent enhanced competitive feasting.

The Neolithic through the Early Bronze Age

With tools such as mortars, pestles, grinding slabs and handstones, villagers of the later Neolithic period (10,300–4500 BCE) were well equipped to process the large amounts of grain necessary to feed their families. During the Pre-Pottery Neolithic period (10,300–7500 BCE), ground stone artifacts increase in number and form, and the basic assemblage of implements for processing grains becomes relatively standardized. Familiar ground stone forms include the larger, lower, typically stationary, grinding slab and the upper, mobile stone or handstone.

Other ground stone implements related to food production are less well understood. If pre-agricultural people used primarily mortars, and grinding slabs become common only during the early Neolithic, this could reflect a shift away from foods that were processed through pounding toward those that were ground. However, the assumption that mortars were used for nut and acorn processing while grinding slabs served solely as grain grinding implements remains to be proven. The Late Neolithic Yarmukian site of Sha'ar Hagolan, in Israel's northern Jordan Valley, has yielded both a large assemblage

of ground stone tools used in food processing and serving activities and evidence for a fully agricultural economy based on cereals.²⁰ The distribution pattern of large ground stone tools, including mortars and grinding slabs found *in situ*, suggests that food processing was carried out in open courtyards rather than in houses, indicating, perhaps, the use of certain food processing equipment by an extended family.²¹

There is a greater diversity of ground stone tool types in the Chalcolithic (ca. 4500–3600 BCE). In addition to the very common grinding slabs, handstones, and mortars, stones with perforations (“digging stick weights,” spindle whorls, and others), as well as polished pebbles and finely finished stone bowls are found at Chalcolithic sites. Bowls and pillar figurines made from basalt, the latter primarily found in the Golan, are part of the Chalcolithic ground stone assemblage. The pillar figurines, which were probably related to household ritual practices, were also used for grinding, as the wear in the shallow concavities at the top of the figurines indicates.

During the Chalcolithic, the basic grinding tools reflect locally available resources. At the Chalcolithic sites of Gilat and Shiqmim, in the northern Negev, grinding slabs and handstones are overwhelmingly made of beachrock and basalt grinding slabs make up less than one percent of each ground stone assemblage.²² At the site of Grar, only 1.6 percent of the grinding stones were manufactured from basalt.²³ In contrast, at sites in the north, closer to basalt sources, such as the sites of ‘Ein Assawir (with occupation ranging from Wadi Rabah to Early Bronze I) and Qiryat ‘Ata (Late Neolithic–Early Bronze II), the majority of handstones and grinding slabs are made of basalt.²⁴ During the Early Bronze I (3500–3000 BCE), smaller sites further from basalt sources, such as Nahal Tillah on the lower terrace of Tel Halif in the northern Negev, have very low relative



This eight-thousand-year-old basalt mortar uncovered in a building complex at the Pottery Neolithic site of Sha‘ar Hagolan is one of four mortars that were found in the big open courtyard there. *Courtesy of Y. Garfinkel, Institute of Archaeology, Hebrew University.*



A grinding installation was discovered in one of the subterranean rooms during the 1993 excavations of the Chalcolithic (4500–3600 BCE) site of Shiqmim in the northern Negev. These simple processing stations are characteristic of southern Levantine village sites over several millennia. *Courtesy of T. E. Levy, Shiqmim Excavations, UCSD Levantine Archaeology Laboratory.*

frequencies of handstones and grinding slabs made of basalt.²⁵

Middle to the Late Early Bronze Age

The basalt and phosphorite vessels of the Chalcolithic and the first part of the Early Bronze Age virtually disappear by the succeeding Early Bronze Age II, although the forms of ground stone food processing implements remain the same as before. Locally available raw materials were used to manufacture most of the ground stone implements found at Early Bronze Age Arad, for example, although some artifacts were made of imported basalt. The Arad grinding slabs were made of ferruginous sandstone probably produced at sites in the Central Negev, some mortars were made of basalt from Galilee and other artifacts, like handstones, were made of locally-available limestone and chalk.²⁶ Basalt may have been

a preferred material for the production of mortars and this preference may relate to the types of processing activities accomplished with these tools. Quantities of charred grains and seeds were found in association with many of the grinding slabs and querns found at Arad, offering direct evidence for the use of these implements to process various foodstuffs in domestic contexts. Interestingly, further analysis of several samples suggests that the Early Bronze inhabitants of Arad did not bake their grains and it is more likely that the processed cereals were eaten in the form of “soup, puree and groats.”²⁷

The ground stone assemblage found in Early Bronze Age Jericho is similar in many aspects to that of previous periods. Interesting, perhaps, is the relative abundance of mortars and vessels in Early Bronze levels (71) compared to grinding slabs (12)²⁸; this may correlate to the continuing dominance of hulled wheats during this period. Although many of the stone types were not recorded, it has been shown that the origin of a sample of the grinding slabs (“saddle querns”) from Jericho was found to be sources close to the Dead Sea, which gives some clue as to the distribution networks for raw basalt material or finished stone tools at the site.²⁹ A new function for ground stone tools, olive oil pressing, may have been discovered at Tel Yarmuth, located southwest of Jerusalem, where several basalt grinding slabs and limestone mortars sunk into the floor were found.³⁰

The collapse of urbanization at the end of the Early Bronze Age (ca. 2200 BCE) may have resulted in changes in, if not a total halt to, the distribution network of basalt tools that had been established in Early Bronze II. Unfortunately, the lack of published ground stone assemblages frustrates an attempt to



These two basalt bowls (bottom left) were found one inside of the other and upside-down in the Late Bronze Age “Mycenaean” Tomb at Tel Dan. This late Bronze Age tomb, with its quantities of Mycenaean pottery, gold and silver jewelry, bronze swords, and ivory boxes, indicates a prosperous fourteenth-thirteenth century occupation in the vicinity. *Biran and Ben-Dov (2002: fig. 2.96); courtesy of the Nelson Glueck School of Biblical Archaeology, Hebrew Union College.*

understand changes in the exchange interactions during this time. At Early Bronze IV Beer Resisim, one grinding slab was found in every excavated domestic structure; these and other stone processing implements found at the site were made of locally-available limestone along with some Nubian sandstone.³¹ This may demonstrate the tendency to utilize locally-available resources during periods of urban collapse or instability.

Middle to Late Bronze Age

Attempts to establish a chronological sequence of ground stone tools from the Middle and Late Bronze Ages (2000–1200 BCE) and the Iron Age (1200–586 BCE), even where careful analytical methods were applied, have been largely unsuccessful. A major problem is the lack of botanical material from excavated Bronze and Iron Age sites, especially the large, multi-period tell sites excavated in the first half of the twentieth century. Although there are some exceptions, it is usually impossible to associate a specific stone artifact with the remains of grains, seeds, olive pips and other botanical material recovered during excavation. The intensive excavation of Middle and Late Bronze Age urban centers like Hazor, Megiddo and Beth Shean (located near basalt flows) during the last century has produced large assemblages of ground stone artifacts, some of which have been carefully published. This material is problematic, however, because it is not necessarily representative of ground stone tool use in villages and other small settlements where much of the population lived throughout these periods. Corrections to this skewed perspective have begun through some recent specialist reports of ground stone tools from smaller sites.

One new vessel type, the tripod bowl, or mortar, appears in the southern Levant at the beginning of the second millennium. Although they are known as early as the third millennium from sites in Syria, vessels and mortars with three legs or feet appear at sites in the southern Levant in the Middle Bronze and are common throughout the Iron Age. Use-wear and residues examined on some of the excavated examples indicate that they were used in food processing.

It appears that the morphology of many ground stone tools remains conservative through the Bronze and Iron Ages. Milevski concludes from his study at Manahat, as did Dorrell at Jericho,³² that the length of grinding slabs are generally double their width, although this is difficult to verify because the great majority of excavated grinding slabs are found broken and incomplete. From the published evidence, it appears that basalt, especially vesicular basalt, remained the preferred material for certain ground stone implements from the Middle Bronze II through later periods; this is demonstrated by the presence of certain types of basalt grinding implements at sites some distance from basalt sources. At Late Bronze–Iron Age Deir ‘Alla, in the Jordan Valley, for example, the majority of the strategically-designed tools, specifically, grinding slabs, pestles, and mortars, were made of imported basalt and andesite, while the majority of the expedient handstones were made of local sandstone.³³ Among the tools found in Middle Bronze to Hellenistic contexts at Tel Mor, a site located a much greater distance from basalt sources than Deir ‘Alla, the majority of the vessels, mortars, grinding slabs and elongated (or “two-handed”) handstones were made of imported basalt, while most of the expedient handstones, hammerstones (“pounders”) and perforated objects were made of locally-available limestone, flint and beachrock.³⁴

This pattern is not seen at all sites, however. At Manahat, ground stone artifacts derived primarily from Middle Bronze Age contexts are usually fashioned from the locally available rocks: sandstone, quartzolite, limestone and flint. Only about five percent of the total published ground stone assemblage was made of non-local basalt, and the remainder was made of local resources. Artifacts made of basalt are largely limited to the small, easily transported artifacts such as pestles (the only artifact class dominated by basalt rather than local rocks) and “rubbers.” Only one grinding slab was made of basalt, and no mortars or basins were of basalt.³⁵

As yet, very little evidence for the production of ground stone tools in the southern Levant during the Bronze Age has been documented, but it has been suggested that Hazor and Beth Shean were the likely production and distribution centers of basalt grinding equipment.³⁶ Recent studies have shown that basalt from the area of the Sea of Galilee was indeed used to make ground stone tools found as far away as Jerusalem and Tell el-Far‘ah South and in Late Bronze Age contexts at sites in Cyprus.³⁷ Beth Shean controlled the production and distribution of basalt implements during this period, which may have been exported via Akko or Tell Abu Hawam.

Gender and Food Production

Perhaps one of the reasons why ground stone tools have been overlooked in the past is because they are often associated with domestic labor and women’s work, which is often given less value than activities associated with men. The image of women grinding plants and men either working in fields (if sedentary society) or hunting (if hunter/forager) has long dominated images depicting ancient subsistence. But empirical problems with this conceptualization abound. Modern ethnographies are probably poor analogies for sexual divisions of labor in the past because virtually all communities studied by anthropologists are incorporated into world economic and political systems, and most have been for centuries. Such linkages with modern states create wage labor pressures and decreasing economic autonomy for women, a condition that prehistoric populations would not confront.

Other indirect, but oft-cited, sources of evidence for ground stone tool use in the past—such as iconographic representations from Egypt and the biblical text—are problematic as well. The sex of the grinders depicted in Egyptian servant statues is sometimes unclear and sometimes clearly male (as in the illustration on page 109). Biblical references that refer specifically to ground stone tools used in food processing activities are few, and at least two suggest that men carried out these tasks, even if under duress (Judg 16:21–22; Lam 5:13).

Direct evidence for women’s use of ground stone tools in food processing activities might be found in the analysis of female skeletal remains. Studying a Natufian and Pre-Pottery Neolithic skeletal population from the site of Abu Hureyra in Syria, Molleson identifies skeletal changes and musculoskeletal stress markers resulting from a host of new activities, including kneeling on the ground. She suggests that, based on impressions and bony ridges on metatarsals and phalanges (toe bones), the foot was frequently held in such a position that the toes were curled up. Based on comparisons of patterns between the sexes, she posits that grinding was primarily done by women and girls.³⁸ This position probably resulted from the grinding of grain using the combined upper and lower stones similar to that seen in the Egyptian model. By the early Neolithic, men and women exhibit some similar increases in bilateral upper body muscles activity and a possible trend to less sexually segregated labor patterns than found in the previous Natufian population.³⁹



A grinding installation found in a ninth century house at Tel Rehov (2003 season) shows how these processing areas were set up during the Iron Age. The lower grinding stone is located on a raised earthen platform and set at a diagonal angle. The heavy upper stone was found *in situ*. The installation is surrounded by a plastered clay parapet wall used to collect the flour. *Courtesy of A. Mazar, Institute of Archaeology, Hebrew University. Photo by J. Camp, Tel Rehov Expedition.*

Many Middle and Late Bronze Age ground stone implements are found in houses and associated courtyards. Roofed areas may have been preferred for grinding food as indicated by finds from Middle and Late Bronze Age Manahat, where 54.4% of grinding slabs were found in rooms while only 18.2% were found in courtyards.⁴⁰ Many ground stone tools have also been unearthed in cultic contexts, including temples and tombs.⁴¹ This phenomenon, which is known in earlier periods, shows that the presence of ground stone tools in an archaeological context is not necessarily indicative of domestic production, and it suggests that even these mundane tools had widespread symbolic and sacred functions during the second millennium BCE.

The Early Iron Age to the Persian Period

During the Iron Age I (1200–1000 BCE), a period characterized by major population shifts and changes in settlement pattern, the presence of artifacts made from imported basalt at Philistine sites raises interesting questions about the nature of ground stone distribution networks. At Tel Miqne-Ekron, for example, eighty-five percent of the Iron I assemblage was made of basalt indicating that basalt was still the preferred material for grinding slabs and handstones.⁴²

A basalt grinding slab found in the main room attached to the Stratum XII temple courtyard at Tel Qasile, another Philistine site, may demonstrate that material imported from basalt-rich areas in the north was used to make high quality implements for the preparation of sacred meals.⁴³ Iron Age Qasile has not produced other basalt tools, however, and the reuse of an Early Bronze Age basalt mortar found in an eleventh century context may suggest, instead, that the grinding slab was a similarly recycled tool.

The archaeological context of ground stone tools in early Iron Age highland villages may bear witness to the social interactions that accompanied food preparation. At ‘Izbet Šarṭah, in the Central Hills, most of the grinding slabs and handstones were found in excavated rooms of the so-called “four-room houses,” not in courtyards, which led the excavator to conclude that cereal processing took place primarily in roofed areas as in earlier periods at Manahat. Seven of the fourteen ground stone tools found in Stratum III—three grinding slabs and four handstones—were found together in one room, which “is the most central and largest of the northern rooms and may have been the household work centre.”⁴⁴ At least one grinding slab was found in the four-

room houses of Strata II–I demonstrating that each family unit had its own toolkit.

Ground stone tools are also known from Iron I village sites in the Lower Galilee. In the Bet Netofa Valley, a large assemblage of ground stone tools, especially grinding slabs and handstones, were found at Iron I Tel el-Wawiyat. This small, unfortified village site may have functioned as a way station under the control of nearby Hannaton in the Late Bronze Age,⁴⁵ and possibly as a grain-processing center for this important city through the Iron I period as well.

There is more variety in the types of stone vessels known from Iron Age contexts. In the tenth century BCE a new type of tripod bowl that features a central leg or support attached to three or four outer legs by horizontal bars appears to be characteristic of Phoenician material culture in this region at this time.⁴⁶ Although several examples of this subtype of tripod bowl have been found from second millennium contexts, they are only found in quantity in the early Iron II period.

At Hazor, over two dozen “wasters” of various vessel types (including ring-base, tripod, and pedestal bowls and mortars) were found in Iron II contexts, indicating that Hazor may have been a center for basalt implement manufacture and distribution.

Several grain processing installations have recently been identified in ninth century BCE contexts at Tel Rehov. Each lower grinding stone was placed on a raised earth platform and a low plastered wall was constructed around the installation to facilitate the collection of flour. Handstones were found in close association with these grinding installations, along with other artifacts related to the production and storage of foodstuffs. The ground stone tools from Iron II contexts in the City of David suggest a preference for certain tools in basalt (most clearly grinding slabs and handstones) seen at other sites in earlier periods. Although there is no evidence for the import of basalt tools during the Late Bronze and Iron I periods, sixty percent of the ground stone tools found in tenth century contexts were made of either fine-grained or vesicular basalt. The largest number of ground stone tools from any period is found in eighth century contexts; basalt objects comprise twenty-one percent of the assemblage and the majority are made of locally-available limestone and chalk.⁴⁷ Despite small sample sizes and the incomplete collection methods practiced at this excavation, the data seem to reflect the preference for certain tools in basalt (most clearly grinding slabs and handstones) seen at other sites in earlier periods.

The same grinding slabs and handstones that we have seen in previous periods remained in use through the sixth century BCE. Olynthus mills, thought formerly to appear in the southern Levant at the end of the Iron II, actually do not enter the region until the Persian period (ca. 539–332 BCE).⁴⁸ These grinding machines represented an intermediate stage in technological development between the grinding slabs of earlier periods and the Pompeian mills introduced into the southern Levant during the Late Roman Republican period. Grain was poured through a slot in a mobile upper stone that was moved over a lower stone using an attached wooden rod. The use surfaces of both upper

and lower stones were incised with grooves in various patterns that allowed for more efficient grinding. Even though this technology was eventually replaced by Pompeian mills, those large, hourglass-shaped basalt machines that appear in quantity in Roman sites, and later rotary hand mills, the grinding slabs, handstones and other tools in use for millennia continued to be used in the southern Levant into the last century.

Grinding Toward the Future

Ground stone artifact analyses complement other specialist studies in archaeological interpretation, but these artifacts have untapped potential in the understanding of food production. In many cases, the potential of ground stone has been recognized in archaeological projects in this region, particularly where they may have shed light on the manufacture of prestige goods, but the collection methodology and storage problems presented obstacles to systematic study.

A number of studies dealing with ground stone assemblages in general, as well as detailed site specific studies with methodical approaches have happily appeared in recent years. A greater awareness that ground stone studies provide potential data, particularly for analysis of subsistence economies, has led to the routine inclusion of ground stone in excavation reports. Future analysis and publication of this material will increase our knowledge of food production that remain elusive to us, despite their fundamental importance in the daily lives of ancient people.

Acknowledgments

We would like to thank Christina Brody for providing us with invaluable information on ground stone cleaning, labeling and storing. Michal Artzy, Yosef Garfinkel, Thomas E. Levy, and Amihai Mazar graciously provided illustrations of material from their excavations. We also wish to thank Jane Peterson and Nigel Goring-Morris for their valuable comments on earlier drafts of this article.

Notes

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