Figure 9.6. Carved stone with bird imagery found just outside the eastern wall of the structure.

and the flecks come from the resharpening of dulled blades, the working of blades into microdrills and other small tools for perforating shell beads and pendants, and the crafting of small ornaments including nose plugs (see Figure 9.4 center).

By weight and quantity (per liter of soil), the density of all the microartifacts generally exceeds the figures reported by Widmer (1991; see also Widmer 2019) for a suggested lapidary and shell-working area at Teotihuacan (Feinman et al. 1993). The recovery of these microartifacts in the heavy fraction from floor deposits provides support for the working of these materials inside the excavated house (Feinman et al. 1993; Middleton 1998, 213–14). Although larger artifacts of most of these materials are not particularly abundant in the collections associated specifically with the structure, all were found in the nearby dense midden. For comparison, similar samples taken from a deposit associated with ceramic firing contained many small fired concretions and a greater quantity of small bone fragments than were found within the house, but only a single obsidian flake and no shell (Feinman et al. 1993, 38–39).

9.2. Bone Working

We recovered a range of bone tools, ornaments, and worked bone debris at Ejutla, made from both human and other animal remains that are present in the faunal assemblage. Given the availability of the raw materials, the widespread occurrence of most of the same basic tool forms at El Palmillo, Lambityeco, and the Mitla Fortress, and the limited quantities of worked bone debris, the tools and ornaments recovered in this Ejutla house appear to

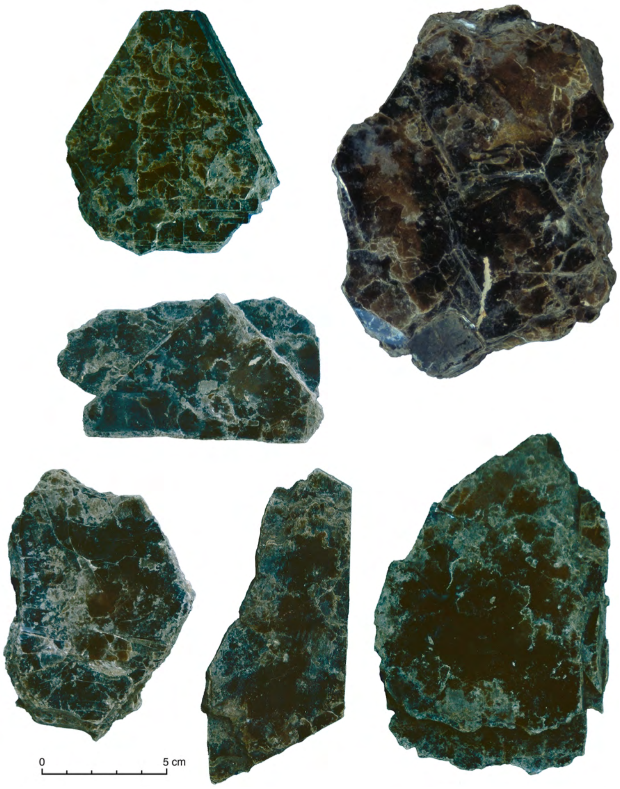

Figure 9.7. Thick sheets of mica from a cache in the north room of the structure.

have been made on site for use in other crafts or activities, and most were not produced for exchange (Feinman and Nicholas 2004a, 2007a; Feinman et al. 2018b).

The most common bone tool forms at the four Classic period sites correspond to general descriptors employed at other Mesoamerican sites—awls, perforators, needles, battens, pressure flakers, and disks (Feinman et al. 2018b; Middleton et al. 2002; see also Coe 1959; Kidder 1947; Kidder et al. 1946; MacNeish et al. 1967; Willey 1972; Table 9.3). The quantities and proportions of specific tool forms in each domestic assemblage we excavated vary by site and even household, indicating that distinct sets of activities were carried out to different degrees in individual houses (Feinman and Nicholas 2012; Feinman et al. 2018b, 55–57, table 5). At Ejutla, the two most abundant bone tools are awls and needles (Figure 9.8 center and top, respectively, Table 9.4). The awls were made principally of deer or human bone (or unidentified large mammal), while the taxa of the needles could not be determined. Battens and perforators are present in low numbers (Figure 9.8 bottom left); we also found one pressure flaker made from deer antler and one shuttle (for weaving) (bottom right).

Although some bone tools, especially awls but also perforators, are multipurpose implements used for a variety of tasks (Feinman et al. 2018b), most of the tools have been linked to elements of fiber working and textile production (e.g., Chase et al. 2008; Feinman and Nicholas 2004a; Halperin 2008; Manzanilla 2006; Middleton et al. 2002; Pohl 1994), for which we have evidence from other tools, such as stone raspadors for processing maguey fronds to extract fibers (Hester and Heizer 1972) and ceramic spindle whorls. Whereas raspadors are few at Ejutla, there are many small ceramic spindle whorls (and one of stone, see Figure 9.4 bottom left) that were likely used to spin lightweight fibers, such as cotton or fine maguey. Some of the formal spindle whorls made on site (see chapter 7) may have been traded to neighboring communities, but the presence of tools like battens, needles, and the shuttle indicate that at least some members of the excavated house also engaged occasionally in spinning and weaving. It may have been possible to grow cotton in the Ejutla Valley in areas where the water table was high, such as along the Atoyac River in southern Ejutla (Feinman and

Table 9.2. Comparison of select stone materials and tools at four Classic period sites.

Object/material	Ejutla	El Palmillo	Mitla Fortress	Lambityeco
onyx/marble	67	32	2	7
greenstone	27	41	5	6
crystals	153	62	–	18
mica	191	4	5	29
chert microdrills	169	1	–	–
other microdrills	10	–	–	–
total perforators	431	90	6	20
onyx drill core	35	–	–	–
other drill core	6	–	–	–
onyx plaque/whistle	8	–	2	–
onyx bowl	3	–	–	–
other stone bowl	5	–	–	–

Table 9.3. Principal bone tool categories in Classic period Oaxaca.

Category	Description
Awl	Long, sturdy tool with one broad end that tapers to a well-defined point or more rounded, blunt tip. Typically crafted on a large mammal long bone, often a deer metapodial. Often fire-hardened to increase durability. Divided into two groups based on size.
Perforator	Long, slender tool with sharply pointed tip. Tool may be smoothly finished with circular cross section or crafted from flat section of bone with less finished edges.
Bloodletter	Long, slender tool that is similar in form to a perforator but is more finely made, more fragile, or comes to sharper point than most perforators. May be highly polished or decorated, often found in special contexts. Includes shark teeth and sharpened animal teeth.
Needle	Long, slender, straight tool with a pointed tip and an eye for stringing on the opposite end. All edges smoothed. Has circular or slightly flattened cross section.
Batten	Long, wide, and relatively flat tool with smoothed edges and blunt tapered ends. Typically made from a mammal long bone, often a tibia.
Disk/spindle whorl	Slightly curved circular implement with a central perforation. Typically crafted from cranial bone, most often human.
Shuttle	Slightly curved tool with smoothed edges and a perforation near one end. Typically crafted from shafts of long bone or rib.
Pressure flaker	Sturdy, solid tool with tapered tip that often has edge damage. Typically an antler tine. Frequently fire-hardened to increase durability.
Chisel	Triangular or wedge-shaped tool with one beveled end.

Figure 9.8. Bone tools include needles (top), awls (center and bottom left), shuttle (bottom right), and fire-hardened antler tip (above the shuttle).

Nicholas 2013, 118; see also Saindon 1977). The Ejutla region also was an entry point where lowland products like cotton entered the Central Valleys of Oaxaca (Ball and Brockington 1978).

The bone awls, deer antler pressure flaker, and perforators could have been used to work the shell. Bone and antler have a hardness similar to shell on the Mohs scale (Foreman 1978), and several of the awls and perforators had been burnt for hardening (Feinman et al. 2018b, 38, figure 2). The awls and antler would have been appropriate tools for roughly shaping beads by applying pressure or indirect percussion, and the perforators, used with abrasives and water, for drilling holes for suspension in neckwear (e.g., Foreman 1978).

The Ejutla craftworkers also worked bone into ornaments (see Table 9.4), including small beads, pendants (one is a perforated dog incisor), rings, and polished rectangles, or placas (Figure 9.9 top). Approximately half of the modified bone (38 of 86) was too fragmentary to determine form or function (Figure 9.9 bottom). Many are long bone fragments with polished surfaces and/or cut edges that could be unfinished or broken tools, including one burnt human long bone (Figure 9.9 center). Several turtle carapace fragments show clear working, including drilling and cut marks; a few of them may be unfinished, broken ornaments (Figure 9.10). But rather than crafting large numbers of bone ornaments from postcranial bone, the perforated dog tooth points to a potential source of raw material (similar to whole small gastropod shells) for making ornaments that only required perforation.

Dogs were the most abundant animal taxon at Ejutla (both MNI and NISP) (see chapter 5), raised principally as a high-quality food source. Yet the dog remains at Ejutla are heavily overrepresented by cranial units, almost entirely due to loose teeth, particularly canines. In a natural

Table 9.4. Worked bone by taxon at Ejutla.

Category	Bird UID	White-tailed deer	Domestic dog	Human	Turkey	Turtle	UID	UID large	Total
Ornament	**–**	**–**	**3**	**–**	**–**	**1**	**7**	**3**	**14**
bead	–	–	2	–	–	–	1	–	3
bead blank	–	–	–	–	–	–	3	–	3
pendant	–	–	1	–	–	1	–	–	2
polished rectangle	–	–	–	–	–	–	1	2	3
ring	–	–	–	–	–	–	2	–	2
smoothed rectangle	–	–	–	–	–	–	–	1	1
Tool	**–**	**4**	**–**	**1**	**1**	**1**	**14**	**5**	**25**
awl	–	3	–	1	1	–	3	2	10
batten	–	–	–	–	–	–	1	1	2
needle	–	–	–	–	–	–	7	–	7
needle/perforator	–	–	–	–	–	–	1	–	1
perforator	–	–	–	–	–	–	2	1	3
antler pressure flaker	–	1	–	–	–	–	–	–	1
shuttle/batten	–	–	–	–	–	–	–	1	1
Worked bone	**1**	**1**	**3**	**1**	**1**	**4**	**22**	**13**	**38**
abraded	–	–	–	1	–	–	–	–	1
beveled edge	–	–	–	–	–	–	–	1	1
cut marks	1	1	3	–	1	3	8	11	28
comb	–	–	–	–	–	1	–	–	1
drilled	–	–	–	–	–	–	1	–	1
engraved	–	–	–	–	–	1	–	–	1
grooved	–	–	–	–	–	–	1	–	1
modified	–	–	–	–	–	–	–	1	1
polished	–	–	–	–	–	–	4	–	4
unknown	–	–	–	–	–	–	8	–	8
Total	**1**	**5**	**6**	**2**	**2**	**6**	**43**	**21**	**86**

Figure 9.9. Bone ornaments on the top row (left to right) include perforated dog incisor, bone ring, bone plaque, and polished bone fragments. Rest of bone, including human long bone, has cut marks and other evidence of working.

Figure 9.10. Cut and worked turtle shells.

assemblage 9.5% of a dog's teeth would be canines, but at Ejutla they are 34% of all loose teeth (Middleton et al. 2002, 241). No other taxon at Ejutla shows this pattern, so clearly something unusual was happening with dog canines. It seems likely that the high number of dog teeth associated with the Ejutla household does not reflect subsistence activities alone but resulted from other uses of dog remains.

There are a number of possible explanations for the abundance of loose dog teeth at Ejutla. One possibility is that, because teeth are highly durable, they are the skeletal part that is most often preserved after weather, traffic, and scavengers have destroyed most other skeletal units or reduced them to unidentifiable fragments (e.g., Hamblin 1984, 114). But no other taxon at Ejutla exhibits such an overrepresentation of loose teeth. Another possible explanation is that dog teeth are sufficiently large to be consistently recovered by screening, yet deer teeth, even larger, are underrepresented relative to other elements, and jackrabbits, with smaller teeth, are evenly represented (Middleton et al. 2002, 242). A third possibility is that dog teeth, especially canines, were preferentially collected and curated by the members of this household. We also recovered loose dog canines in quantities three to four times higher than they naturally occur in a dog's dentition at El Palmillo, Lambityeco, and the Mitla Fortress (Feinman et al. 2018b, 54), a pattern previously noted by Hamblin (1984, 114) at the Maya site of Cozumel, where she recovered several perforated canines. Widespread curation of dog canines implies that dogs had an importance beyond their use as a source of meat (Hamblin 1984; Pohl and Feldman 1982).

Perforated dog canines are not uncommon ornaments and have been found at sites across Mesoamerica (e.g., Ekholm 1944, 484; Garber 1989, 53, figure 17; Hamblin 1984, 114; Kidder 1947, 57, figure 81a; Moholy-Nagy 2008, 73, figure 213a and 1b; Pollock et al. 1962, figure 41h; Willey 1972, 239, figure 201a and b; 1978, 171, figures 169j and 171 right; Willey et al. 1994), including more than 95 canines from a tomb at Kaminaljuyu in Guatemala (Kidder et al. 1946, 155, figure 161e), in which the canines had likely been strung into a necklace. Low numbers of perforated dog canines have also been found in Oaxaca, at Formative period sites (Drennan 1976, figure 73; Flannery and Marcus 2005, 216, figure 10.2g, 383; Joyce 1991, 759) and at other excavated Classic period sites—El Palmillo, the Mitla Fortress, and Lambityeco (Feinman et al. 2018b, 52–54, figure 13l–o).

Yet at Ejutla, dog teeth, especially canines, are a larger proportion of all dog remains than at the other sites, and we suspect they were curated as unfinished ornaments that were intended to be strung into necklaces with shell ornaments also made on site (Feinman et al. 2018b; Middleton et al. 2002). Across Mesoamerica perforated animal teeth were strung in this manner with other ornaments, including shell and bone beads and even human teeth (e.g., Garber 1989, 53; Kidder 1947, 57; Pollock et al. 1962, figure 41a–i; Thompson 1939, 179–80). Tooth-shaped ornaments have also been carved from a variety of materials, particularly shell (e.g., Coe 1959, 58, figure 52b; Ekholm 1942, 109, figure 21f; Siliceo Pauer 1925, 210–11).

The perforated dog tooth at Ejutla is an incisor (see Figure 9.9, top left); both canines and incisors perforated for suspension have been found elsewhere, including in burials in Central Mexico, where they were strung together on a necklace (e.g., Vaillant 1931, 314). This low ratio of finished ornaments to unfinished ornaments or raw material at Ejutla is similar to the recovery rate for complete versus in-process marine shell ornaments (see chapter 8; Feinman and Nicholas 1993, 1995c, 2000). Such ratios are not unexpected in a production context for exchange. Undoubtedly the loose teeth originated as food waste, but they—especially the canines and incisors—were likely curated and/or acquired for ornament production.

9.3. Tools of Production at Ejutla

The stone assemblage at Ejutla comprises many of the tools that have been identified as effective for working shell into ornaments (chapters 5 and 8); they have also been proposed to have a role in lapidary work (e.g., Melgar Tísoc et al. 2010, 2018). In the Ejutla stone assemblage, tools of obsidian, basalt, chert, and quartz parallel in form stone tools described elsewhere in Mesoamerica as having been used to work shell or for lapidary tasks. Tools of these four stone materials are abundant at Ejutla, especially obsidian blades. Implements of obsidian undoubtedly were used for many varied tasks. But the patterns at Ejutla contrast with those noted at El Palmillo, Lambityeco, and the Mitla Fortress in several ways. These differences extend to other stone materials as well and offer support for our supposition that stone tools of all of these materials were used at Ejutla to work the shell (Table 9.5).

Obsidian blades are a common tool in most Classic period stone assemblages in Oaxaca, yet the quantity of blades used by the residents of this one house in Ejutla far surpasses the number of blades associated with any one residence we excavated at El Palmillo, the Mitla Fortress, or Lambityeco, even the more elaborate residences, and the abundant blades at Ejutla may have been procured, at least in part, to work the shell (Feinman et al. 2013, 2018c; Nicholas et al. 2022; see also Martínez López and Markens 2004; Melgar Tísoc et al. 2010, 2018). Given the very low number of cores (12 from 4 different obsidian sources), most of the obsidian arrived in this house as blades (see Table 5.5). Whether the blades were knapped from the core elsewhere at the Ejutla site or before the obsidian reached Ejutla remains a question. Most obsidian blades in Ejutla were especially heavily worn down from cutting another hard material, like shell (see Lewenstein 1987) (Figure 9.11), and much of the obsidian microdebitage in and around the house likely came from repeated resharpenings of the worn blades. In general, the obsidian blades from Ejutla tend to be more heavily worn and used than the obsidian recovered at the other three sites where we excavated.

In contrast to the obsidian, the assemblages of chert and basalt at Ejutla are dominated by high amounts of reduction debris from the manufacture of tools. Given the high amounts of reduction debris around the house and in the midden, the householders worked local chert into a variety of flaked tools, bifaces, perforators, and microdrills, and they made abraders, grinding tools, and large flaked tools from basalt, as well as a variety of other

Table 9.5. Comparison of counts and weights of four principal stone materials at Ejutla and three other Classic period sites.

Material count and weight	Ejutla (1 house)	El Palmillo (8 houses)	Mitla Fortress (3 houses)	Lambityeco (1 house and plaza)
quartz	2735	125	3	20
obsidian	2819	3350	2305	1256
obsidian weight (kg)	1.22	1.65	1.44	0.60
chert	11188	51696	4129	508
chert weight (kg)	11.72	1505.38	100.48	8.72
basalt	6138	276	71	77
basalt weight (kg)	71.99	68.75	27.15	41.25
obsidian piece average weight (g)	0.43	0.49	0.62	0.48
chert piece average weight (g)	1.05	29.12	24.34	17.16