Figure 7.21. Figurines from other sites in the Ejutla Valley that were collected during the regional survey.

Lambityeco, as well as at Ejutla (Table 7.6; Carpenter et al. 2012, 391; Feinman and Nicholas 2012, 245), albeit in different proportions that in part reflect access to specific fiber resources. Larger and medium spindle whorls are more appropriate for spinning coarse fibers, such as from the fronds of maguey, which is an abundant genus in eastern Tlacolula, whereas the smaller whorls would have been used on cotton and other fine fibers. What stands out about the Ejutla whorls is the number associated with one house and the formality of the whorls compared to the other sites. The Ejutla household had twice as many spindle whorls as any residence at the other sites. In addition, most of the whorls at those sites are the abraded variety made from repurposed vessel fragments, even on the lower terraces at El Palmillo where some ceramic production was carried out, whereas most of the spindle whorls at Ejutla are modeled (see Table 7.4). Spindle whorls are only one of a number of tools, including a range of bone tools (Feinman et al. 2018b), that were used to process fiber into thread. All of these were recovered with frequency from all three Tlacolula Valley sites (Feinman and Nicholas 2012, 2016b). Possibly due to lack of access, the Tlacolula fiber workers more often made their own more expedient whorls from ubiquitous ceramic sherds. The residences at the top of El Palmillo had greater proportions of modeled disk whorls (~30%). Whether those whorls were made elsewhere at El Palmillo or were traded from a site like Lambityeco, where there also were higher quantities of modeled whorls, is unknown, but in a trace element analysis of Classic period pottery in the Valley of Oaxaca (Minc et al. 2015), approximately 18% of utilitarian pottery sampled from El Palmillo was produced farther to the west in the central part of the Tlacolula Valley. Although the ceramic objects produced by the Ejutla potters were exchanged beyond their barrio and to their closest neighbors in the southern end of the valley, they do not appear to have been exchanged as far as the eastern arm of the valley (Minc et al. 2015).

7.3. The Pit Kilns

As we were finding evidence of shell working in and around the house and middens, we were also finding multiple indicators of ceramic production, as outlined in section 7.1. The close proximity of the production debris to the house tied both of those activities to the residents of the prehispanic structure. Yet although more than half of the pottery wasters at Ejutla were from gris paste vessels (see Table 7.2), which require a reducing (low oxygen) atmosphere, we had no remains of obvious kilns, like the

Figure 7.22. Café medallions and molds (two in upper left).

Figure 7.23. Amarillo cylinders with a depressed or appliqued band below the rim.

Figure 7.24. Other unusual amarillo vessels at Ejutla have a band of small slanted ovals (top), broad panels of crosshatching (center), and other carved designs (bottom).

Figure 7.25. Potsherds from one carved amarillo bowl that was found broken in situ (the two sherds on the right are from different but similar vessels).

Figure 7.26. Spouted jars from Ejutla that are similar to ones on high-status residences at El Palmillo.

two-chambered updraft kilns at Atzompa and Monte Albán (Payne 1982; Winter and Payne 1976). Those more formal kilns were built of stone and mortar and had separate chambers for the fire and the wares, and the Ejutla pit kilns were not like the updraft kilns at Atzompa (Mendoza Escobar 2014), Monte Albán (Winter and Payne 1976), or Macuilxochitl (Faulseit et al. 2016; Winter et al. 2007). Other less substantial firing features at Monte Albán were simple updraft kilns dug into the bedrock (Markens and Martínez López 2009), and elsewhere in Oaxaca indirect-firing kilns have two horizontal chambers separated by a flue or wall (Flannery and Marcus 1983, 299; Whalen 1981, 97). Given the ubiquity of pottery in Mesoamerica, archaeologically documented kilns are rather rare (e.g., Payne 1970; Santley et al. 1989; Stark 1985). In their absence, Mesoamerican archaeologists have generally relied on other material correlates of pottery production, such as anomalous densities of potsherds and specific ceramic types, clay concretions, ash lenses, and wasters (e.g., Feinman 1980, 1982; Krotser 1987; Redmond 1979; Stark 1985), to identify loci of production. These criteria, however, are indirect measures that are subject to equifinality, such that each cannot be taken alone as a definitive indicator of ceramic production (Feinman

Figure 7.27. Unusual and rare ceramic forms include sahumador rims and handles with animal effigies (top rows), brazier supports (bottom left), an animal support (bottom center), and a fine-paste ceramic object shaped like a phallus (bottom right).

Table 7.5. Ceramic production indicators at Ejutla, Lambityeco, El Palmillo, and the Mitla Fortress.*

Category	Ejutla house	El Palmillo lower (per house)	El Palmillo middle (per house)	El Palmillo upper (per house)	Mitla Fortress (per house)	Lambityeco M165
Ceramic rims and diagnostics	57092	14666	15805	18636	8494	27000
Figurines (excavation only)	2005	111	139	168	188	1770
Fig wasters	215	8	7	10	4	9
Other wasters	778	105	42	38	26	80
Total wasters	993	113	49	49	30	89
Total molds	74	13	16	1	5	12
Molds for figurines	17	1	2	–	3	11
Moldes	74	3	1	1	1	12
Concretions	1035	8	5	3	1	4
Spindle whorls (ceramic)	109	15	15	37	12	40
% urns in café paste	40.0%	12.1%	5.9%	9.9%	0.3%	7.4%

* For El Palmillo the listed amounts are the average for the residences in each site sector; for the Mitla Fortress they are the average for 3 residences.

Table 7.6. Spindle whorls of different sizes at Ejutla (excavation and survey), Lambityeco, El Palmillo, and the Mitla Fortress.

Context	Large (>29 g)	Medium (8–29 g)	Small (<8 g)	Indeterminate	Total
Ejutla excavation	–	19	83	7	109
Ejutla regional survey	–	2	10	–	12
El Palmillo	19	102	71	2	194
Lambityeco	3	35	17	–	55
Mitla Fortress	6	17	13	–	36
Total	28	175	194	9	406

and Balkansky 1997; Stark 1989). Although a range of archaeological indicators are recoverable to identify pottery production, the case is always stronger when we can marshal multiple lines of evidence.

What we did find under the middens and even below the house were shallow pits that the ancient Ejutleños had dug into the soft bedrock (see Figure 4.1). There were no stone or adobe walls associated with these bedrock features, but, as we outlined briefly in chapter 4, they had other characteristics that indicated they were used to fire pottery. The features were slightly asymmetrical, with a narrowing of the depressions into what appears to be a stoke pit, or mouth, to add fuel and ventilate the kiln (see Figures 4.19–4.21). The levels below the middens that were in direct association with the bedrock pits held a more restricted artifact complex, largely limited to ash, ceramic wasters, clay concretions, a few rock cobbles, burnt bedrock, and potsherds. The layers of ash, charcoal, and burnt bedrock could be from other firing activities, but the shape of the features, the quantities of wasters, spacers, large broken but unused vessels that appear to have been used as kiln furniture, and high quantities of specific vessel forms in and around the firing features pointed to ceramic production, using the bedrock depressions as pit kilns. In addition to the large number of defective sherds and pottery byproducts, many broken but unused ceramic vessels and the most abundant ceramic varieties—especially molded figurines, sahumadors, comals, and certain types of reduced (gris) bowls—were more localized in and adjacent to the pit features than were other ceramic categories (Feinman and Nicholas 1994).

The pit features and surrounding deposits at Ejutla also had high quantities of amorphous clay concretions (Figure 7.28). Similar ‘amorphous clay lumps’ or ‘numerous fire-hardened fragments of loam’ (with grass imprints) in pit deposits containing dense layers of ash, charcoal, ceramic wasters, and figurines at the Peñitas site in Nayarit, Mexico, have been interpreted as the remains of an impermanent earthen cover or roof that was placed over the firing pits (Bordaz 1964). Sheehy (1992, 768–69) argues that ephemeral firing features at Tlajinga 33 at Teotihuacan may have served as pit kilns, as described in ethnographic accounts of potters in South Asia (Rye and Evans 1976, 165–66); the term has since been applied more broadly (e.g., Heacock 1995; Rice 1987, 158). These are not true ceramic kilns, in that they do not separate the fuel from the wares (e.g., Rhodes 1968, 11). Rather they are a less costly option for intermittent producers.

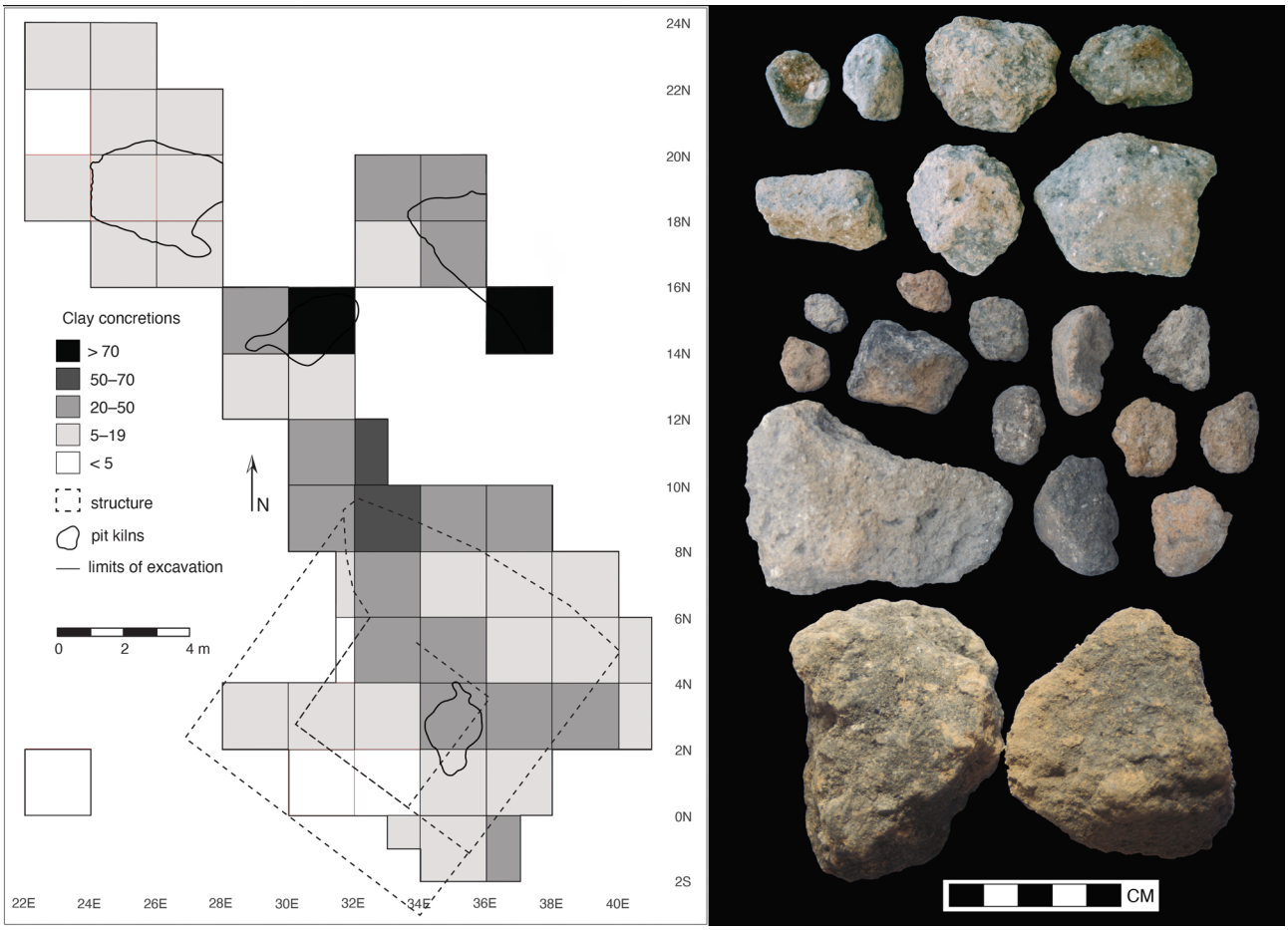

Figure 7.28. Clay concretions and map of clay concretion distributions in the excavated area.

Based on the nature of the firing features at Ejutla and their associated artifactual remains, the Ejutla potters used these depressions as pit kilns to fire pottery.

Reduced grayware vessels are prominent in the prehispanic ceramic tradition of the Valley of Oaxaca (Caso and Bernal 1965), and they are the dominant ware in the Ejutla ceramic collections (including pottery wasters). But based on the nature of the full excavated ceramic assemblage from Ejutla, the site's potters did not have the control over firing in pit kilns that would have been expected with updraft kilns (Balkansky et al. 1997, 150–51). The paste of many sherds had more or less sharp boundaries between the surface and the core, indicating they were fired in a poorly controlled firing atmosphere in which maximum temperatures were sustained only for short periods of time (Balkansky and Crossier 2009; Rice 1987; Velde and Druc 1999). Misfired sherds were common. For example, most figurines were oxidized café, but a small number appear to have been reduced accidentally. Similar inconsistencies in coloration were evident for most of the forms produced by the Ejutla potters. We found multitoned and fire-clouded vessels with regularity (see Figure 7.11). Frequent firing errors of these sorts are the likely consequence of direct-fuel firings, as would occur in pit kilns, where fuel and vessels are not completely separated (Vitelli 1993, 207).

There also were relatively high quantities of café pottery in the Ejutla excavations (~40%) compared to the other Classic period contexts we excavated (Table 7.7). The El Palmillo lower terraces (the context with the pit kiln) also had slightly higher quantities of café pottery. In addition, Classic period effigy vessels in Oaxaca are most often made of gris paste, but a much higher proportion in Ejutla are café (see Table 7.5). Café vessels are generally low fired in aboveground and open firings (Balkansky and Crossier 2009). Depending on the control of air flow, they also could be fired in pit kilns.

7.4. Ceramic Firing: Experimental Analyses

To broaden our interpretive understanding of the archaeological firing features at Ejutla, we had an experimental pit kiln constructed and fired at the outdoor archaeology laboratory at the University of Wisconsin in Madison (Balkansky et al. 1997; Feinman and Balkansky 1997). There is no contemporary analog to pit firing in the Valley of Oaxaca. Today's artisans in several pottery-producing villages use updraft kilns to fire their wares (Atzompa and Coyotepec) that are transported to markets throughout the region, whereas in the remote village of San Marcos Tlapazola, in the eastern arm of the valley, the potters open-fire brownware (café) comals and bowls that are marketed much more locally (Feinman et al. 1992;