these large shells at Ejutla. At Ejutla, large gastropods account for 30% of the shell assemblage, with only 3.5% finished or unfinished ornaments compared to 20% in the Conjunto Plataforma Norte Lado Poniente. *Spondylus* and *Chama*, both as unworked shells and as ornaments, also may have arrived at Monte Albán by way of Ejutla.

Surveys and excavations in the Valley of Oaxaca have found few sites with high-intensity shell working. Shell was recorded on the surface of only 20 sites during surveys in the Valley of Oaxaca (out of 2700, including Monte Albán; Kowalewski et al. 1989). The relative abundance of surface shell was greater in the southern parts of the central valleys, 21 out of 423 sites in Ejutla (Feinman and Nicholas 1992, 1993) and 8 out 120 sites in the Sola Valley (Balkansky 2002; Nicholas and Feinman 2002). At most sites only one or two pieces of shell were noted.

Only at Monte Albán and Ejutla have dense surface scatters of marine shell been recorded and then (through subsequent excavation and analysis) shell working documented. Although shell ornaments and broken debris are not rare finds in our excavations at El Palmillo, Lambityeco, and the Mitla Fortress (Feinman and Nicholas 2009, 2011b, 2016b) or those of colleagues elsewhere in the valley (Feinman and Nicholas 2007e), the quantities are generally very low, and there is no evidence of shell working at any level of intensity. Shell ornaments generally are more abundant in higher-status contexts but have been found in non-elite houses (Feinman and Nicholas 2009, 2011b) and in child burials (González Licón 2009; Feinman and Nicholas 2007e).

In spite of high-intensity shell ornament production at Ejutla, there was only one bead in the tomb and only a few other finished shell ornaments in the house, including the two carved pendants (see Figure 8.27). This household and the local community were not consuming most of the shell ornaments made by the Ejutla craftworkers, in contrast to artisans at the Xalla palace at Teotihuacan (Velázquez Castro et al. 2019) or the Maya sites of Aguateca and Tikal (Inomata and Emery 2014; Moholy-Nagy 2008) or at Monte Albán, where finished ornaments were a far larger component of shell assemblages. So, for whom were the Ejutla artisans making the ornaments? Consumers at Monte Albán are one reasonable answer. Given that shell ornaments are most frequently found in elite contexts at Monte Albán and other sites in the valley, including El Palmillo, where we excavated low- and high-status houses, it does not seem likely that the large quantity of shell ornaments made in Ejutla were traded only to nearby communities, all of which were much smaller than Ejutla. One could presume that at least some of the ornaments were crafted for higher-status individuals who lived closer to the site's core in the center of the modern town, where we mapped a ceremonial complex of mounds during the regional survey. Nevertheless, although we were able to collect pottery as we investigated the heavily damaged mounds and surrounding areas, we did not recover a single piece of shell, much less any ornaments. Sourcing studies of obsidian and mica help define prehispanic networks and routes that appear to provide some conceivable answers.

8.7. Obsidian and Travel Routes to the Pacific Coast

In 2012 we started sourcing the obsidian from our excavations using portable XRF (X-ray fluorescence), and now we have sourced more than 20,000 pieces of obsidian from more than 50 archaeological sites in the state of Oaxaca (Nicholas et al. 2022). There are no obsidian sources in the entire state of Oaxaca, so all obsidian arrived via long-distance exchange (Figure 8.38). We found that obsidian was moving long distances as early

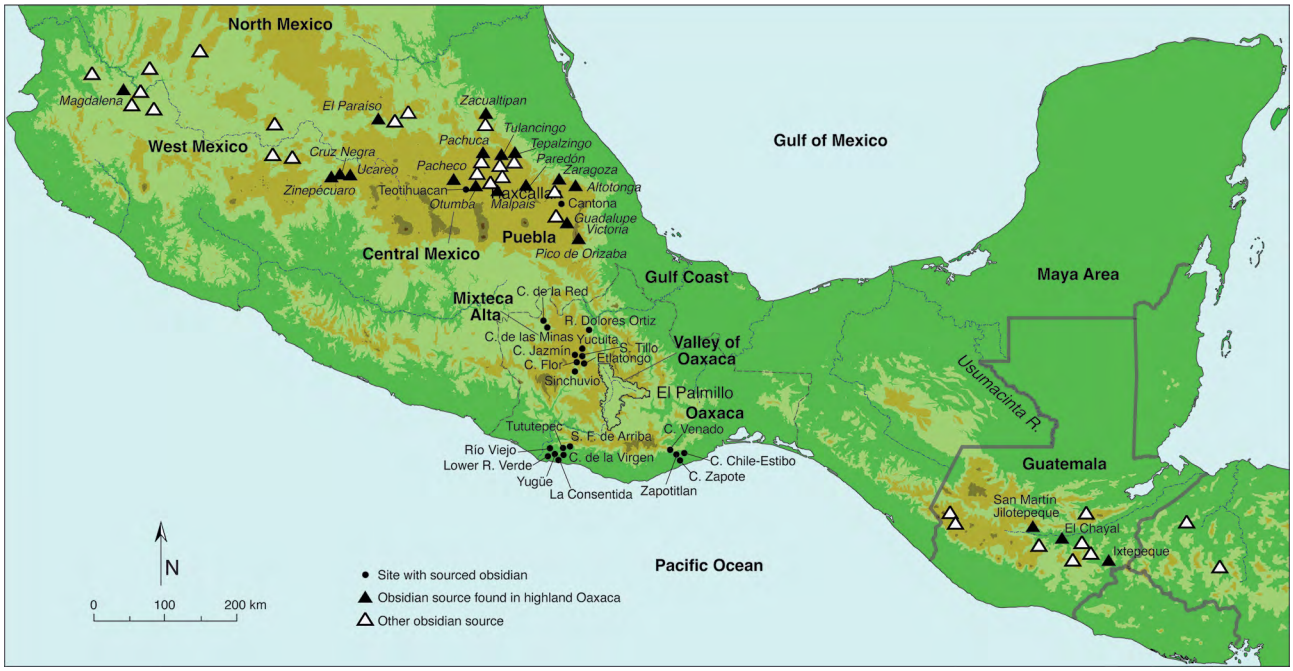

Figure 8.38. Map of Mesoamerican obsidian sources and sites with sourced obsidian (see Figure 8.39 for sites in the Valley of Oaxaca).

as (and likely prior to) the Formative period (Feinman et al. 2022). During the Classic period, when we have the largest sample from sites in Oaxaca, obsidian from a range of sources entered the Valley of Oaxaca along different routes; Pachuca obsidian from Central Mexico entered through the northern arm of the valley, Zaragoza obsidian from Puebla through the eastern arm, and Ucareo obsidian from Michoacan in West Mexico from the south (Figure 8.39; Feinman et al. 2018c; Nicholas et al. 2022). Overall, we identified obsidian from eight different sources in the Ejutla assemblage, so that occupants of this household were linked to a number of different economic networks.

Obsidian from West Mexican sources generally was never as abundant in the Valley of Oaxaca as the Central Mexican or Gulf Coast sources were, yet during the Late Classic period, more than a quarter (28%) of the obsidian at Ejutla was from the Ucareo source in Michoacan, even though Ejutla is more distant from Ucareo (as the crow flies) than are the northern or central parts of the valley, where Ucareo obsidian was much less common (Table 8.11) (Feinman et al. 2018c; Nicholas et al. 2022). The high percentages of Ucareo obsidian associated with Late Classic contexts (Río Viejo, Lower Río Verde) on the southern coast of Oaxaca and in the Mixteca Alta to the west of the Valley of Oaxaca provide evidence of a

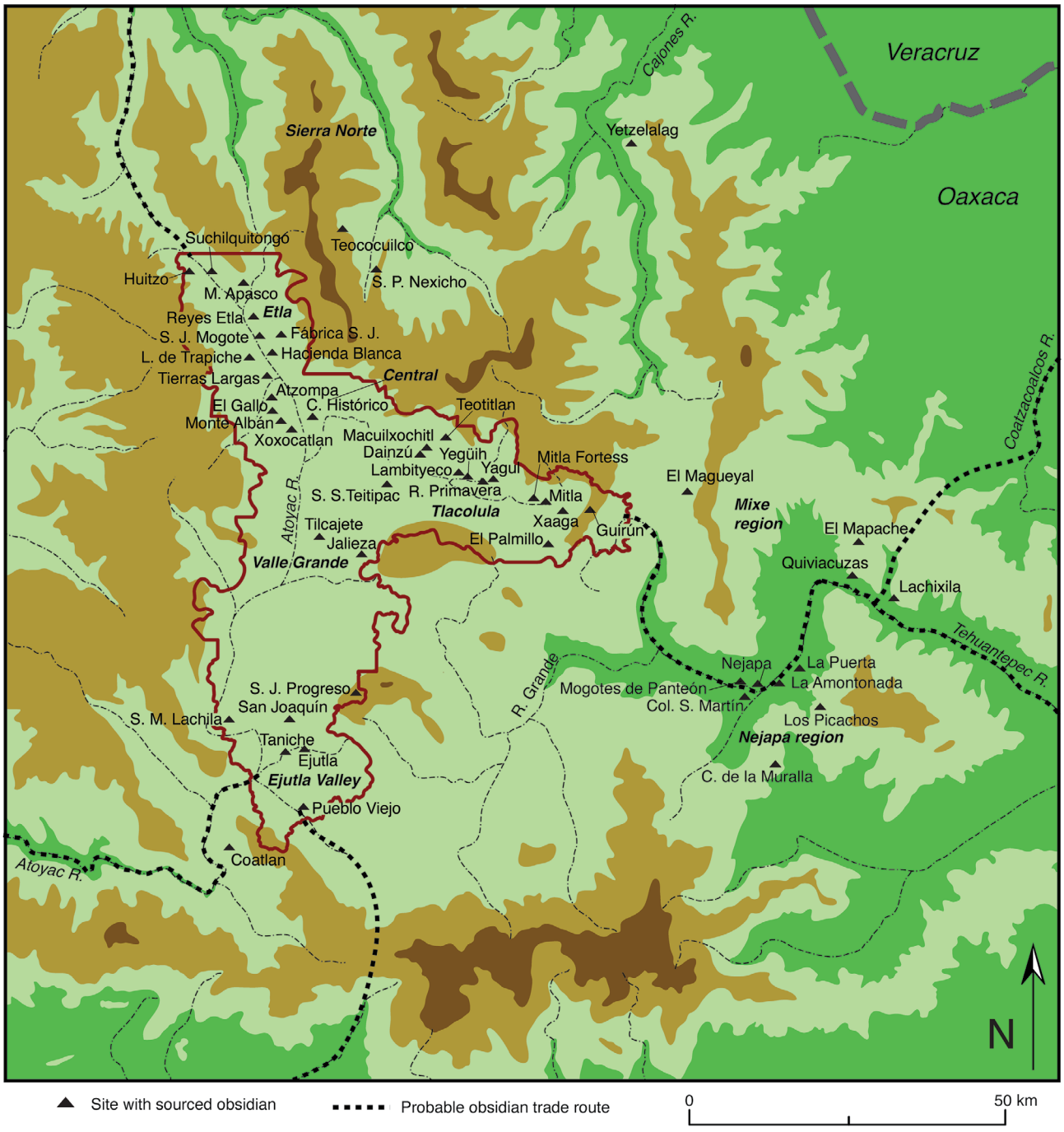

Figure 8.39. Map of highland Oaxaca showing sites with sourced obsidian and the three principal routes into the valley from the north, east, and south.

Table 8.11. Sourced obsidian* at Late Classic period sites in Oaxaca.

Site	Zone	# pieces	# sources	ZP	GP	PV	MH	PP	SH	TH	PH	ZH	OM	UM	CG	IG	SMJ	Unknown
Cerro de las Minas	Mixteca Alta	21	5	10%	14%	–	–	–	24%	–	–	–	19%	33%	–	–	–	–
El Mapache	Mixe	32	4	72%	–	19%	–	–	3%	–	–	–	–	6%	–	–	–	–
Lachixila	Mixe	185	5	90%	–	3%	–	1%	–	–	–	–	1%	5%	–	–	–	–
Quiavicuzas	Mixe	6	2	67%	–	33%	–	–	–	–	–	–	–	–	–	–	–	–
Atzompa	Valley—Central	515	9	66%	7%	3%	–	1%	11%	<1%	–	1%	2%	10%	–	–	–	1%
Ej-Ej-Sj-6	Valley—Ejutla	2	2	50%	–	–	–	–	–	–	–	–	–	50%	–	–	–	–
Ejutla	Valley—Ejutla	1842	8	52%	2%	1%	–	2%	8%	–	–	1%	5%	28%	–	–	–	–
El Gallo (Monte Albán)	Valley—Central	47	6	19%	60%	2%	–	2%	9%	–	–	–	–	6%	–	–	–	2%
El Palmillo	Valley—Tlacolula	1949	11	78%	–	2%	<1%	<1%	8%	<1%		1%	6%	4%	<1%	<1%	–	<1%
Jalieza	Valley—Valle Grande	102	9	75%	2%	1%	–	1%	13%	1%	–	2%	2%	3%	–	–	–	–
Lambityeco	Valley—Tlacolula	1183	9	75%	1%	–	<1%	<1%	9%	<1%	–	<1%	7%	7%	–	–	–	<1%
Loma de Trapiche	Valley—Etla	4	3	50%	–	–	–	25%	25%	–	–	–	–	–	–	–	–	–
Tilcajete (Los Mogotes)	Valley—Valle Grande	60	5	8%	15%	2%	–	–	67%	–	–	–	8%	–	–	–	–	–
Macuilxochitl	Valley—Tlacolula	1008	11	75%	1%	4%	–	2%	9%	<1%	<1%	<1%	6%	3%	<1%	–	–	<1%
Mitla Fortress	Valley—Tlacolula	225	7	68%	–	<1%	–	–	27%	–	–	<1%	2%	2%	<1%	–	–	–
Monte Albán	Valley—Central	3514	12	46%	3%	<1%	–	4%	25%	<1%	–	<1%	4%	17%	<1%	<1%	<1%	<1%
Oc-Sjp-Sjp-129	Valley—Ejutla	15	2	73%	–	–	–	–	–	–	–	–	–	27%	–	–	–	–
Reyes Etla	Valley—Etla	1	1	–	–	–	–	–	100%	–	–	–	–	–	–	–	–	–
Fábrica San José	Valley—Etla	38	7	8%	3%	3%	–	29%	40%	–	–	–	16%	3%	–	–	–	–
Xoxocotlán (4 Mogotes)	Valley—Valle Grande	30	5	47%	–	20%	–	3%	27%	–	–	–	–	3%	–	–	–	–
Nejapa Viejo	Nejapa	1	1	100%	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Lower Río Verde	Lowland Oaxaca	11	5	–	9%	18%	–	–	9%	–	–	–	9%	55%	–	–	–	–
Río Viejo	Lowland Oaxaca	37	4	8%	–	–	–	–	27%	–	–	–	3%	62%	–	–	–	–
San Francisco de Arriba	Lowland Oaxaca	1	1	–	–	–	100%	–	–	–	–	–	–	–	–	–	–	–

*ZP = Zaragoza, GP = Guadalupe Victoria, PV = Pico de Orizaba, MH = Malpaís, PP = Paredón, SH = Sierra de Pachuca, TH = Tulancingo, PH = Tepalzingo, ZH = Zacualtipan, OM = Otumba, UM = Ucareo, CG = El Chayal, IG = Ixtepeque, SMJ = San Martín Jilotepeque

route from West Mexico to the Pacific Coast of Oaxaca. Geospatial modeling has predicted the presence of a high-traffic route from the coast to the Mixtec highlands (White and Barber 2012, 2692). Sea trade along the Pacific Coast from West Mexico to Oaxaca as early as the Late Classic also brought a variety of goods to Huatulco, a major port for long-distance trade on the coast south of the central valleys (Ball and Brockington 1978, 112). Whether the West Mexican obsidian arrived on the coast by land or by sea, it most likely entered the Central Valleys of Oaxaca via Miahuatlán, a port of trade at the southern end of the valley system that participated in the Mixteca-to-coast trade network (Ball and Brockington 1978).

Based on geospatial modeling, high-traffic movement into the Valley of Oaxaca is predicted, with these routes converging at Monte Albán (White and Barber 2012, 2694). In spite of Oaxaca's mountainous topography, an abundance of materials from more distant parts of Mesoamerica were brought to Monte Albán and neighboring settlements in the Valley of Oaxaca, including marine shell from the Pacific Coast and obsidian from many sources (Nicholas et al. 2022). The shortest routes to Monte Albán from the coast were from the south (White and Barber 2012, 2686–87), in the direction of Ejutla. Purely in terms of travel time, the least costly routes were through the Ejutla or Sola Valleys, with one of the expected most highly trafficked routes passing through Ejutla (Figure 8.40).

Colonial-era ethnohistoric records from Oaxaca provide independent corroboration that the high-traffic corridors generated by the modeling do approximate the location of routes used during the prehispanic and colonial era for movement and exchange. The modeling also aligns with other archaeological evidence that the highest-traffic route between Monte Albán and the Pacific Coast passed through the Ejutla and Miahuatlán Valleys (Ball and Brockington 1978). Routes through Sola were more arduous (e.g., Bevan 1934). It is likely that West Mexican obsidian and Pacific Coast shell entered the Central Valleys of Oaxaca through Miahuatlán and then were traded north to Ejutla and eventually Monte Albán and elsewhere in the Valley of Oaxaca. Although the proportion of Ucareo obsidian in the assemblage at Monte Albán is much lower than at Ejutla, the city is the only other site in our sample from the valley with any significant amount of Ucareo obsidian (Feinman et al. 2018c; Nicholas et al. 2022), and as we have seen, Monte Albán obtained significant quantities of Pacific Coast shell. The other known prehispanic shell-working site in highland Oaxaca is Miahuatlán, which is along the predicted route to the coast and also has lots of obsidian (unfortunately unsourced), some of which was recovered mixed with shell fragments and debris (Brockington 1973; Markman 1981).

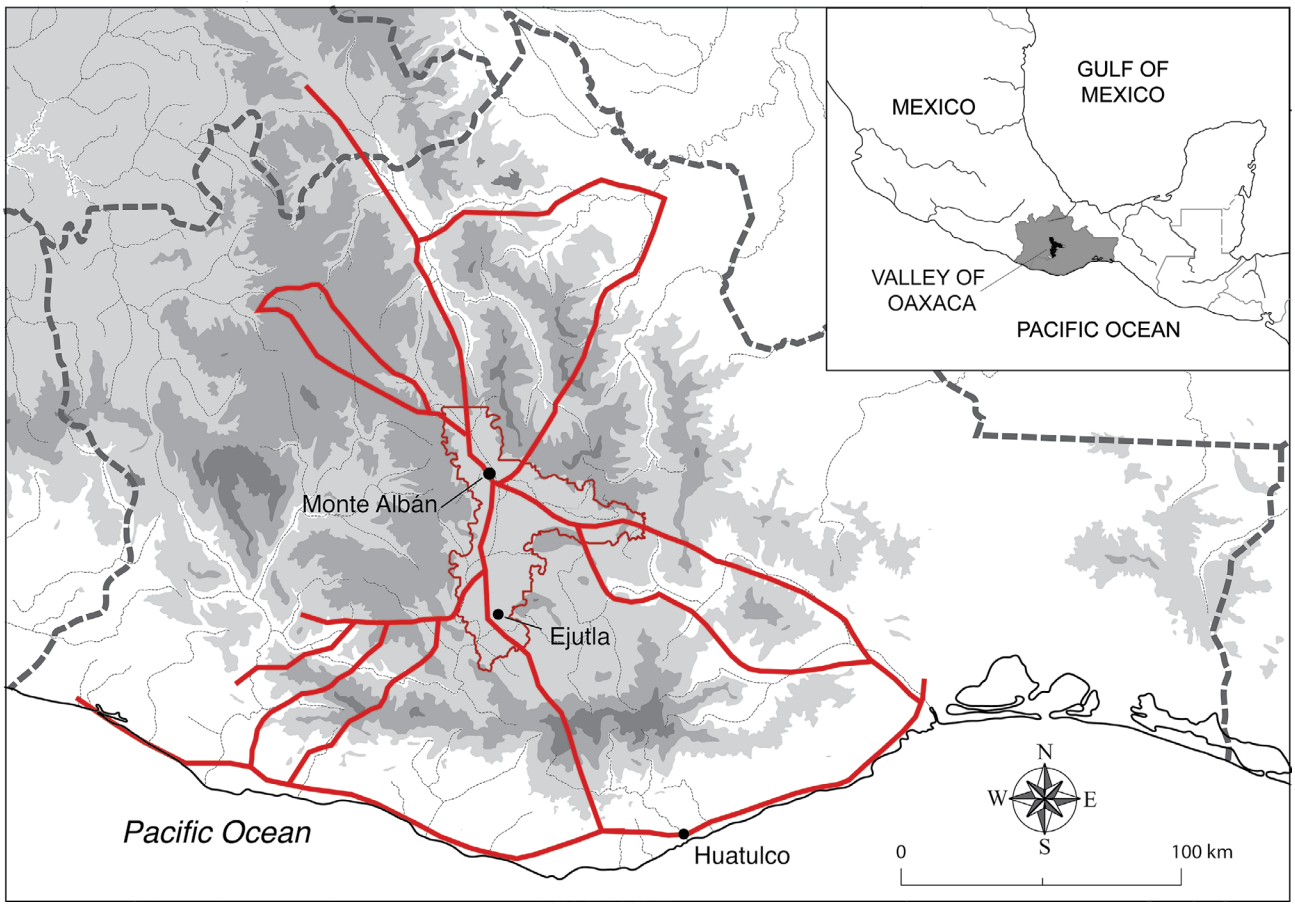

Figure 8.40. Map of Oaxaca showing high-traffic routes (routes from White and Barber 2012, figure 11), including route to Monte Albán from the Pacific Coast that passes through Ejutla.

Borah (1954, 25–28) used colonial records to sketch a similar route from Huatulco (on the Pacific Coast) through the Miahuatlán and Ejutla Valleys into the center of the valley during the 1500s (Figure 8.41). According to Borah (1954, 25), "[t]he additional road from Huatulco to Miahuatlán and Oaxaca City … probably followed one of the more important trails by which the Zapotecs found their way to the Pacific coast." Drawing on archaeological evidence, Ball and Brockington (1978) proposed that this route was in existence by the Late Classic period. That two of the only documented shell-working sites in the Central Valleys of Oaxaca are located in Miahuatlán and Ejutla attests to the importance of this route for bringing marine shells into the Valley of Oaxaca, and possibly beyond. Ejutla has a long history as an important commercial location, serving as a transit center for coastal and other agricultural products entering the valley system (Barrera 1946, 85–86; Beals 1975, 128). Into the twentieth century, the Ejutla market—one of eight major markets in the valley system (Beals 1975, 47; Diskin 1976, 51; Malinowski and de la Fuente 1982, 70)—had the highest percentage of vendors who served as middlemen, buying local produce in bulk to sell or bringing in goods from distant places (Diskin 1976, 59–60), practices indicative of the region's position as a gateway between the highland valleys and the mountains and coast to the south (Feinman and Nicholas 2013, 19; Malinowski and de la Fuente 1982, 84).

Historically, the Valley of Oaxaca was a center of trade routes connecting Central Mexico (to the north) and the Isthmus and beyond (to the south) (Malinowski and de la Fuente 1982, 70). The sixteenth-century route from Central Mexico to Oaxaca—probably along part of a main Aztec route—and then to the Pacific Coast passed through a series of valleys and basins, including the Central Valleys of Oaxaca, that, while longer, was much easier to navigate than the broken, mountainous terrain between Central Mexico and the Pacific Coast near Acapulco (Borah 1954, 25, 28). Another attraction for this route from Central Mexico was productive activities and natural resources in the Central Valleys of Oaxaca (Borah 1954, 25). Which brings us to mica.

One raw material that was imported to Teotihuacan from Oaxaca is mica. There are multiple sources of mica in the Central Valleys of Oaxaca that are distributed from the northern arm of the valley south to Ejutla and Miahuatlán. Large quantities of mica have been recovered from Monte Albán, especially on the North Platform (Rosales de la Rosa 2021, 241; Winter et al. 2002, 632–33). Although

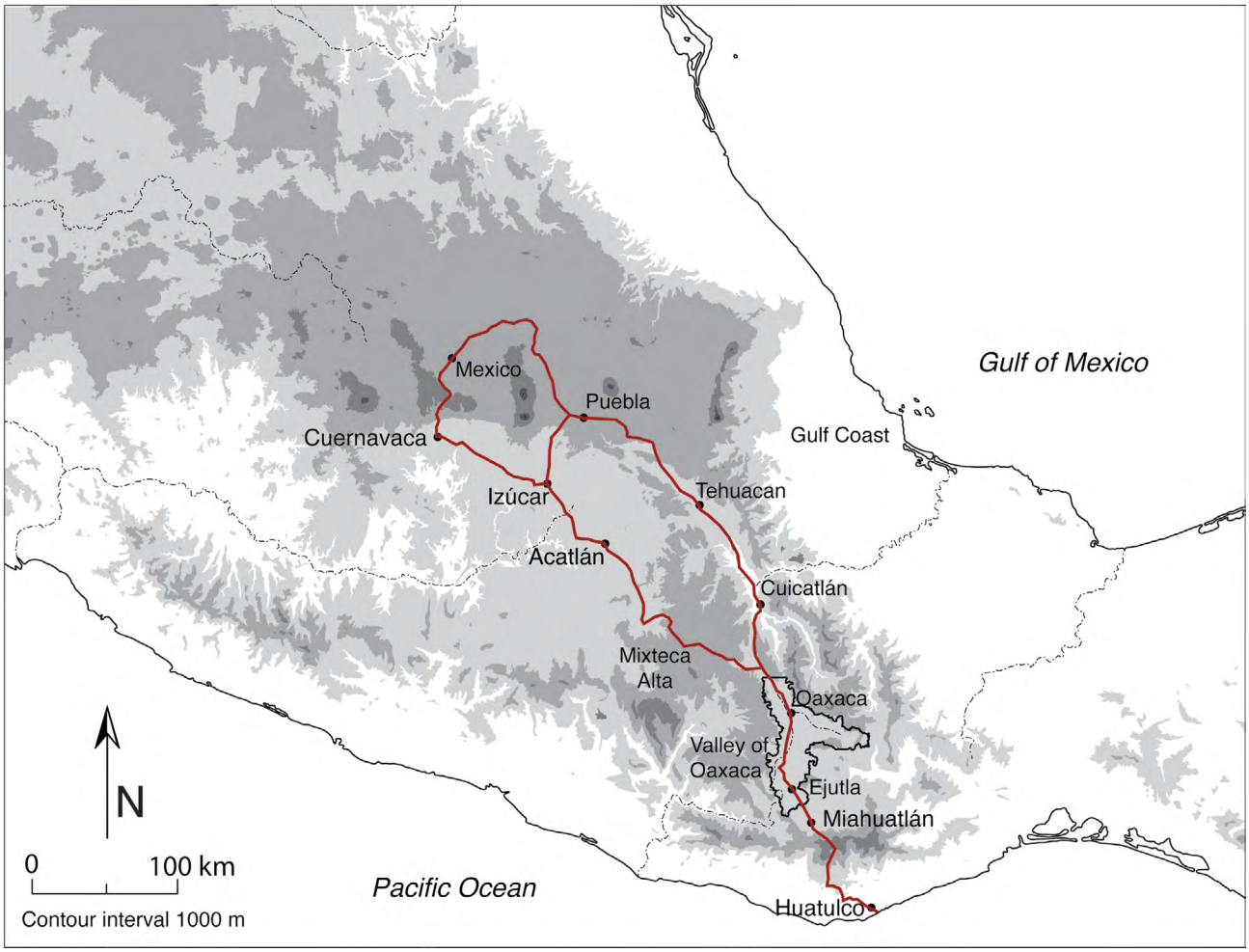

Figure 8.41. Map of colonial route from the Pacific Coast to Central Mexico (route from Borah 1954, 27) that passes through Miahuatlán, Ejutla, and the center of the Valley of Oaxaca.

there are no mica sources near Teotihuacan, mica has also been recovered from multiple residential compounds at that city, but especially dense concentrations were uncovered at the Xalla palace, where it was crafted into lapidary objects (Manzanilla 2017; Manzanilla et al. 2017; Rosales de la Rosa 2019, 2021). To determine the source of the mica, Linda Manzanilla and her team (Manzanilla et al. 2017, 2019) used neutron activation to analyze 18 archaeological samples, mostly from Teotihuacan and the North Platform at Monte Albán, and 9 mines, all from Oaxaca, including 2 from near Monte Albán and 4 from Ejutla. The composition of all of the archaeological pieces from both Teotihuacan and Monte Albán matched the samples from several mines in Ejutla (Figure 8.42). Although the analytical sample is small and more testing is needed, none of the archaeological mica came from the other mines in Oaxaca, including those near Monte Albán. And one sheet of cut mica from Teotihuacan (Manzanilla et al. 2017, figure 7) closely resembles one of the pieces of mica in the pit in the floor of the excavated house in Ejutla (see chapter 9). Although no archaeological pieces from the Ejutla site were analyzed in this study, the majority of pieces from the excavations were biotite mica, likely from the same mine (M11) that was included in the neutron activation analysis (Manzanilla et al. 2017, 25). A plausible scenario is that the mica was exchanged through networks that brought it from Ejutla to Monte Albán and then on to Teotihuacan, along with other goods, such as Pacific Coast shell.

With mica from mines in Ejutla documented on the North Platform of Monte Albán, and West Mexican obsidian likely reaching Monte Albán along similar networks that passed through Ejutla, it seems likely that at least some Pacific Coast shell, worked and unworked, also reached Monte Albán through Ejutla. Ejutla is located on several principal trade routes along which Pacific Coast shell and other coastal goods moved into the highlands. Whether shell from Ejutla might have been minimally processed, blanks, or finished ornaments is unknown, but there is nothing about the shell assemblage at Monte Albán, either the kinds of ornaments or how they were made, that precludes those possibilities. Of course, obsidian from other sources reached Monte Albán through different networks, as did shell from the Atlantic, and we have never suggested that all shell at Monte Albán came from Ejutla (contra Melgar Tísoc et al. 2010, 2018), only that we cannot rule out that Monte Albán obtained some shell from Ejutla (see Feinman and Nicholas 1995c, 2000).

During the Classic period, there was a considerable volume of coastal-to-highland marine shell exchange (e.g., Kolb 1987). Worked shell was abundant in the 'Oaxaca barrio' at Teotihuacan (Millon 1981, 227; Starbuck 1975, 150), where the predominant species was *Chama echinata*, a key species at both Ejutla and Monte Albán that apparently was less abundant elsewhere at Teotihuacan (Starbuck 1975, 150–51). Since mica from mines in Ejutla made its way to Monte Albán and then Teotihuacan, it also is not a stretch that some Pacific Coast shell also reached the Central Mexican metropolis along the same route. As Borah (1954) noted, the route from the coast through Ejutla and the Central Valleys of Oaxaca on to Teotihuacan was the easiest, if not the shortest, route from the Pacific Coast to Central Mexico (see also Carballo 2013).

Given the preponderance of evidence for domestic production in Oaxaca (e.g., Feinman 1999; Feinman and Nicholas 2000, 2004a, 2012), production and distribution could not have been easily controlled by central authorities, and producers and consumers likely engaged in other mechanisms of transfer, like marketplace exchange (see chapter 6; e.g., Feinman and Nicholas 2010, 2012; contra

Figure 8.42. A mica mine in Ejutla.

Melgar Tísoc et al. 2010, 2018). Markets appear to have been established early in the history of Monte Albán (Feinman et al. 1984; Nicholas and Feinman 2022), with goods arriving in the city from near and far (Nicholas et al. 2022). As illustrated, one of the least-cost routes to Monte Albán and the center of the valley from the Pacific Coast was through Ejutla. The Ejutla shell workers were among the only craft specialists in the valley who engaged in the high-intensity crafting of shell ornaments (bulk luxuries) for exchange, so it is likely that at least some Pacific Coast shell that passed through or was worked into ornaments in Ejutla reached Monte Albán along with mica from the Ejutla district and Ucareo obsidian that arrived in the Central Valleys of Oaxaca from the south along with Pacific Coast shell. The mica, and possibly some Pacific Coast shells, eventually could have reached Teotihuacan in Central Mexico. Specialized production in a domestic context was linked into exchange and transfer networks that traversed the western half of the prehispanic Mesoamerican world (Blanton and Feinman 1984).

9

Lapidary, Bone, and Tools of Production

Shell working and ceramic production were the principal, but not the only, craftwork activities of the Ejutla household. They were not even the only kinds of specialized economic production, as lapidary work also appears to have been carried out for exchange. Although the members of the excavated household produced shell ornaments and certain ceramic products at fairly high levels of intensity for exchange beyond their immediate household or community, they made lapidary items seemingly at lower frequency and intensity. Dog teeth, and some bone, were also modified, possibly for inclusion in neckwear with beads of shell. In addition, they made bone tools, spun fiber, and wove cloth. But these latter production activities were likely mostly or entirely for the consumption of this household.

In this chapter, we focus on these other secondary crafts and practices along with the tools of production. We start with the evidence for lapidary craftwork and the evidence of cross-craft technology (Shimada 1996, 2007). Specifically, we discuss hollow tubular cane drills that were used to shape both shell and stone materials. We follow with a consideration of the worked bone, including ornaments as well as tools that have been employed for weaving (Feinman et al. 2018b). We close the chapter with a discussion of the stone tools that the Ejutla artisans made to work the shell and lapidary materials. Some of these tools are discussed and depicted in chapter 5, as their use cannot be tied solely to craftwork, and they were likely used for other domestic tasks as well, including agricultural activities. Here we focus on their use for working lapidary stone and shell. Other tools are mentioned in section 8.4 in conjunction with shell-working techniques. In section 9.3 we provide additional information on the tools themselves.

9.1. Lapidary Craftwork

Among recovered artifacts in the middens and the house are numerous stone ornaments, unfinished lapidary objects, small carved stones, and semiprecious raw materials and production debris, including flakes of greenstone, mica, and large quartz crystals (Table 9.1). One of the most abundant lapidary objects are cylindrical drill cores or plugs. Most of these small cylinders are onyx, although a few are limestone or unidentified stone (Figure 9.1). The drill cores are generally between 1 and 3 cm long, with diameters of 10–12 mm. They were cut with a hollow tubular drill (Foshag 1957, 54–55; Holmes 1919, 350–51; Rau 1869, 393) made from cane, applying the same tools and technology that was used to obtain shell disks. The diameters of the drill plugs match those of the shell disks that were cut with tubular drills (Figure 9.2). Some plugs still have the characteristic lip at their base, while the base of others is rough and unsmoothed. The tops of several drill cores bear tubular cut marks showing where a prior level of drill cores had been removed; others have one concave side showing where an adjacent plug had previously been removed. None of the drill plugs were worked into ornaments but instead are the remnants from using tubular cane drills to hollow out stone blocks into rounded bowls (e.g., Diehl 1983, 101–02). There are no complete (or even partially complete) finished stone bowls in the assemblage of any size, only eight very small fragments that most likely represent failed attempts. Most of them were cut from the same material as the recovered drill plugs. One tiny piece of onyx microdebitage was recovered from the house floor, tying the working of onyx to the Ejutla household (Feinman et al. 1993, 38; Middleton 1998, 213–14). This use of 'intersecting technologies' (Earle 1994, 455; Hagstrum 1992) to produce very different items further supports the inference that this Ejutla household was involved in several craft activities, or 'multicrafting.'

Most of the drill plugs were found in the dense midden or near the house, but 10 were collected from the surface in the area south of the excavated house, in the same area where there was dense shell debris and other possible houses. We suspect multicrafting was practiced by many households in this part of the Ejutla site, but the proportion of their time devoted to different crafts and the levels of intensity at which they worked likely varied from the house we excavated.

Other objects of onyx include flat, mostly rectangular plaques, flakes, and chunks of unworked material (Figure 9.3). Several plaques have at least one nicely cut edge, but only one of them appears to have been finished into an ornament. This ornament has a trapezoidal form, with all four edges smoothly abraded. One top corner is broken; the other corner has a small carved notch on the top and another longer one on the side just below the top, possibly to hold string for suspension. The possible pendant is approximately 4 cm long. The nearly complete scarcity of other onyx ornaments compared to debris is similar to the pattern for shell, with much more debris than finished or partly finished artifacts, indicating these ornaments also may have been made for exchange and thereby had been transferred from this context.

Semiprecious stones in the Ejutla assemblage include beads and larger unworked chunks of greenstone and other nonlocal material (Figure 9.4). Most of the beads