III. TECHNOLOGY AND GEOLOGIC SOURCES OF OBSIDIAN ARTIFACTS FROM CERRO DE LAS MESAS, VERACRUZ, MEXICO, WITH OBSERVATIONS ON OLMEC TRADE*

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As a part of the continuing study of Mesoamerican obsidian being conducted at the University of California, Berkeley, we have recently analyzed a small collection of artifacts from the site of Cerro de las Mesas, Veracruz, Mexico. The site is located near the Rio Blanco, south of the city of Veracruz (see map in Stirling, 1941:283). It was partially excavated by a National Geographic Society-Smithsonian Institution expedition in 1941. The major discoveries at the site were briefly published by Stirling (1941); the ceramics, a remarkable jade cache, and other pieces have been described by Drucker (1943, 1952, 1955). From the 1941 excavations, 16 obsidian specimens were collected and are now in the United States National Museum. Unfortunately, this material lacks detailed provenience data. Drucker (1943:5) refers to the occurrence of "prismatic flakes" in the deposits at Cerro de las Mesas; these apparently were not saved or have been lost, as no examples of this artifact form are in the collection.

Technological Analysis

Of the 16 specimens in the collection, 14 are polyhedral blade cores, one is a large worked blade and the last is an unmodified waste flake.

Cores. These specimens have been sorted according to categories established by Hester, Jack and Heizer (1971) in their study of Tres Zapotes obsidian cores. The Cerro de las Mesas cores are only briefly described here, since they conform closely to those described from Tres Zapotes.

Ten cores have ground striking platforms. Three of these specimens are wedge-shaped and show crushing on the distal end; perhaps they were held in a vise or rested on an anvil while being worked (cf. Crabtree 1968: 453). Hinge fracturing of blades appears to have caused the discard of most of the cores. Since so few data are available on ground platform cores in Mesoamerica, dimensions of each piece are given below:

Length	Maximum Width	Platform Diameters: Maximum	Minimum
85	20	12	12
81	33	33	14
71	26	25	7
66	25	22	20
64	12	6	6
61	20	18	11
56	19	18	10
55	16	15	10
50	18	18	9

Table 1. Dimensions of Cores with Ground Platforms. All measurements are in millimeters.

* We would like to thank Dr. Clifford Evans of the U.S. National Museum for arranging the loan of the Cerro de las Mesas obsidian collection.

Two cores have truncated platforms. One is cylindrical and is truncated both proximally and distally, with no subsequent blade removals using the newly created platforms; length, 53 mm., maximum width, 13 mm. The second specimen has been proximally-truncated, but again no blades were removed; the piece has been heavily battered. Length, 61 mm., maximum width, 25 mm.

One specimen is a distal fragment of a blade core; the fracture was possibly caused by a large pumice inclusion near the center of the piece. The final specimen is a battered core. Heavy battering is present both proximally and distally, and along the sides. The piece probably saw secondary use of a hammerstone.

Large Worked Blade. The specimen is a very large blade showing bifacial modification. The dorsal surface has two median ridges, and has been extensively flaked near the distal tip. There is a 50 mm. area of rough dulling along one edge of the tip, possibly resulting from the use of the piece as a knife (cf. Semenov 1964; Hester 1970). Irregular retouch or trimming is found along most of both lateral edges on the dorsal face. A patch of nodular cortex is retained on this face.

On the ventral (bulbar) face, there is irregular trimming along both lateral edges. The proximal end (base) of the piece has been thinned by the removal of six narrow longitudinal flakes. This technique is very similar to that found on thinned blades reported from Tres Zapotes (Hester, Jack and Heizer, 1971).

This large blade was no doubt removed very early in the core-blade process, when a large, roughed-out blade core was being worked (cf. Graham and Heizer 1968:104; Hester, ms.). Similar large specimens found at the site of Papalhuapa, Guatemala, were blanks later modified into bifacial tools. (Graham and Heizer 1968, Pl. 3).

Length of the piece is 172 mm., maximum width, 64 mm., and maximum thickness, 24 mm.

Unmodified Waste Flake. This is an irregularly shaped flake, with a simple prepared striking platform.

X-Ray Fluorescence Analysis

The 16 obsidian artifacts from Cerro de las Mesas, Veracruz, Mexico, have been analyzed for the trace elements Rb, Sr, Y, Zr, and Nb by semi-quantitative (rapid-scan) X-ray flourescence technique (see Hester, Jack and Heizer 1971). Based upon these analyses the source of the obsidian from which each artifact was manufactured has been identified. The three sources, all in east-central Mexico, are (1) Zaragoza, Puebla; (2) Pico de Orizaba,Veracruz; and, (3) Guadalupe Victoria, Puebla (types D, E, and G, respectively, of Hester, Jack and Heizer 1971). The results are tabulated here:

Sample No.	Obsidian Sources: Type D	Type E	Type G	Artifacts
1		X		core
2	X			"
3		X		"
4		X		"
5		X		"
6		X		"
7		X		"
8		X		"
9		X		"
10	X			"
11		X		"
12		X		"
13		X		"
14		X		"
15			X	flake
16	X			large blade
Totals	3	12	1	

Table 2. Cerro de las Mesas obsidian artifact sources.

Based on the small artifact sample analyzed here, we can postulate that the major obsidian source for the site of Cerro de las Mesas was the Pico de Orizaba locality in Veracruz (type E). The obsidian industry at the site, as reflected by this sample, is technologically similar to others reported from the area (cf. Hester, Jack and Heizer 1971).

Our data from sites in the Tabasco and Veracruz lowlands suggest an emerging pattern in which the obsidian industries at major sites are dominated by materials from one particular obsidian source. The major source for Cerro de las Mesas is Pico de Orizaba, for Tres Zapotes, it is Zaragoza, Puebla (Hester, Jack and Heizer 1971), for San Lorenzo, it is Guadalupe Victoria, Puebla (Cobean et al 1971), and at La Venta, it is two yet-unknown localities (Hester, Jack and Heizer 1971). These three sites all have substantial Olmec occupation; Cerro de las Mesas is, of course, not an Olmec site.

A great deal has been written about trade in commodities and luxury goods in Mesoamerica in Preclassic times. Most of this writing has been speculative for the simple reason that practically nothing is known about what items were being transmitted from a specific area to another at known points in time. Thus, to speak of a "Jade Route" protected by garrisons of Olmec troops is premature when we do not know where the jade source or sources lay, or what the direction of trade was. Discussions of "trade networks", "Olmec pochteca," and "Olmec missionary-trade colony groups" all seem to be based on the Postclassic Aztec model, an extrapolation which has been critically reviewed by Parsons and Price (1971).

At the same time there is no question that the Olmecs of the Gulf lowland area, and particularly those who built and used the La Venta center, either travelled widely or were in contact with people who did so. The green serpentine, schist, jade and magnetite-ilmenite which have been recovered in some cases in considerable quantities from La Venta point to large-scale procurement from the Paleozoic metomorphic zone of the Sierra Madre del Sur in Oaxaca and/or Chiapas lying about 100 miles south of La Venta (see Williams and Heizer 1965: Map 3). The specific spots where these materials were secured have not been looked for, but it is highly probable that the area indicated will prove to be the source region. The La Union Quaternary volcanic area just south of Teapa was a source for the rocks used for metates and manos at La Venta, as well as for some of its sculptures (Williams and Heizer 1965: 8-9). The Cerro Cintepec, just southeast of Lake Catemaco in the Tuxtla Mountains, provided boulders from which many of the San Lorenzo site sculptures and most of the La Venta sculptures were fashioned (Ibid; Map 2, passim). Thus, an arc drawn 100 to 150 miles around the La Venta pivot probably will prove to have produced most if not all of the varieties of stone used at La Venta. Whether this zone also contains the still unlocated obsidian sources from which the La Venta people secured the bulk of their obsidian we do not know, but we expect that it was. La Venta trade, therefore, whether or not it may have involved "networks", "pochteca" or "ports of trade", seems to have been a pretty provincial matter as far as we can now tell. The La Venta population may have managed all of this prospecting, mining and transport by themselves, so that long-walking professional traders and distributive markets were not needed.

Elsewhere in the lowland Olmec area there are hints that a similar regionalism obtained if we judge by Cerro Cintepec as the main source of the stone from which the monuments at Laguna de los Cerros were made. Tres Zapotes drew on the nearby El Vigia for most of its large stone, but Stela C from that site which is made of the Cerro Cintepec rock provides an intriguing hint that the now missing portion(s) of this interesting sculpture may be found someday in one of the more easterly lowland Olmec sites (Heizer and Williams 1965:16). The implication of this particular sculpture, as well as the La Venta duplicate of the sculpture found by Blom and La Farge on the summit of San Martin Pajapan volcano (Clewlow 1970), is that there may also have been trade in monuments between Olmec centers.

With reference to obsidian we are not yet in a position to suggest very much as regards its function in Olmec trade. The main La Venta geologic sources (Types B and C) have not been located. The green obsidian from Pachuca (Cerro de Navajas), Hidalgo, produced about one-eighth (12.3%) of the 295 La Venta artifacts analyzed, and in decreasing order are artifacts made of obsidian from Pico de Orizaba (5.1%), Guadalupe Victoria (3.6%) and Zaragoza(1.8%).

At San Lorenzo if we take the total analyzed sample of 201 pieces and ignore time, 30.8% derive from the Guadalupe Victoria source, 19.3% are from Guatemala (El Chayal and Ixtepeque deposits), 6.5% from Pachuca, and 1% from Pico de Orizaba (see Table 3), 22.3% of San Lorenzo obsidian artifacts derive from sources not identifiable by Cobean et al (1971).

When La Venta and San Lorenzo obsidians are compared we see that the people of each site placed main dependence upon different primary sources, and only a very small amount of Guadelupe Victoria obsidian which was the chief

source of artifacts at San Lorenzo is present at La Venta. The main La Venta sources (Types B and C, comprising 43.5% and 27.5% of the total sample from the site) are unrepresented at San Lorenzo.

We have preliminary indications that La Venta Type C obsidian is derived from a Guatemalan source, perhaps that of San Martin Jilotepeque, Depto. Chimaltenango. However, no definitive statements can be made prior to further analyses. If this should prove to be the case, it would not be surprising since San Lorenzo drew 193% of its obsidian from the Guatemalan area. In view of the partial contemporaneity of the San Lorenzo and La Venta site occupations (Berger, Graham and Heizer, 1967; Coe 1970) their relative nearness (about 50 miles), the sharing of certain nearly-identical kinds of monumental sculpture (table-top altars and colossal heads), and the mutual use of Cerro Cintepec stone for large sculptures, it is most surprising to find the two sites did not secure obsidian from the same sources by means of what was almost certainly exchange rather than direct procurement.

Tres Zapotes obsidian was derived for the most part (93.1%) from the Zaragoza source. This type of obsidian is barely present (1.8%) at La Venta, and unreported for San Lorenzo. While much of the Tres Zapotes obsidian must be later than Olmec (La Venta-San Lorenzo periods), nevertheless it is practically certain that the Olmec population of Tres Zapotes got their obsidian from Zaragoza. So we have a third example of site-obsidian source correlation for Olmecs.

We believe that the apparent exclusiveness of these several populations as regards the main kind of obsidian each one used would tell us a lot about how lowland southeastern Mexican Olmec culture operated, but we cannot interpret its meaning at this time. Several possible interpretations can be suggested:

1. Tres Zapotes Olmecs, La Venta Olmecs and San Lorenzo Olmecs were population-territorial units across whose borders there was little or no trade in industrial materials such as obsidian.

2. Tres Zapotes, La Venta and San Lorenzo are non-contemporary sites and the occupants of each of these sites had extra-territorial trade relationships with different peoples who were in a position to supply obsidian in quantity from supply sources each controlled.

3. Tres Zapotes, La Venta and San Lorenzo were, as generally believed, essentially coeval, and the Olmec occupants of each site preferred one type of obsidian to the practical exclusion of any other. In these terms the small amounts of non-preferred obsidian types represented at each site merely indicate inter-city exchange of an industrial material which was rated as of inferior quality, or at least of some non-preferred sort as judged by whatever standards prevailed at the time.

The three possibilities set forth above do not cover all of the possible

explanations for the somewhat surprising (at least to us) distributions shown in Table 3, but of these three we are inclined to accept the first as the most probable. Before anything can be settled as far as Olmec trade in obsidian two things are needed: 1), the unknown sources of artifacts from La Venta, San Lorenzo and Tres Zapotes should be discovered and analyzed, and; 2), obsidian from an additional major lowland Olmec site such as Laguna de Los Cerros should be analyzed. With such a body of information the pattern of obsidian trade which now is difficult to reconstruct should become reasonably clear.

The trans-lowland trade routes of Aztec times running from the Basin of Mexico southeasterly through Tochtepec and across the Veracruz-Tabasco lowland area via Coatzacoalcos, Cimatan, Potanchan and Xicalango where the choice of route was offered between the land-river route across southern Yucatan and the Peten via Tayasol, Nito and Naco, or the circum-Yucatan coastal sea route (Chapman 1957; Cardos 1959; West, Psuty and Thom 1969: Fig. 32) scarcely seem to fit even what little we know of Olmec trade. By this statement we mean to say that main trade routes from the altiplano or the upper Veracruz area are not suggested by the distribution of obsidian types in Olmec sites. Obsidian exchange does not seem to have followed a diffusion route which cut across the lowland Olmec districts whose "capitals" were at Tres Zapotes, Laguna de los Cerros and La Venta,* and none of these large sites seems strategically located in such a way as to control trade traffic.

This is not to say that in Middle Preclassic times there was no long-distance trade in which the La Venta and San Lorenzo Olmec participated because the green Pachuca obsidian and Guatemalan highland obsidian was reaching these sites. But how important obsidian was as an exchange commodity, and whether it was an incidental item or principal substance in trade, we really do not know. Until we can answer such questions we might make more solid advances by speculating less about pochteca-like professional traders, ports of trade, sumptuary goods, and the like, because there is always a possibility that someone will take such hypothesizing seriously.

* Drucker (1961:70) suggests the possibility that "communications difficulties of the day may have limited the efficient exercise of authority" and for this reason the major Olmec sites are spaced at fairly equal intervals--proceeding from west to east, Tres Zapotes and Laguna de los Cerros are 33 km. apart; Laguna de los Cerros and San Lorenzo are 40 km. apart; La Venta and San Lorenzo are 55 km. apart measured in airline distances.

	Tres Zapotes	San Lorenzo	LaVenta	Cerro de las Mesas
No. specimens analyzed	865	201	295	16
Pachuca source	.2%	6.5%	12.3%	- %
Zaragoza source	93.1	-	1.8	19.0
Pico de Orizaba source	.7	1.0	5.1	6.0
Guadalupe Victoria source	1.4	30.8	3.6	75.0
Guatemala sources:				
El Chayal	-	13.4	-	-
Ixtepeque	-	5.9	-	-
Unknown sources				
*Types A, A', B, C, C', D and E.	-	22.3	-	-
+Type B	1.5	-	43.5	-
+Type C	.5	-	27.5	-
+Type F	1.7	-	-	-
+Other	.9	-	-	-

Table 3. Sources of Artifact Obsidian from Four Southeastern Mexican Sites.

The La Venta and San Lorenzo columns do not total 100% because a few extraneous sources were not included.

* Of Cobean et al, 1971.

\+ Of Hester, Jack and Heizer, this volume.

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