

# LONG-DISTANCE TRADE UNDER THE AZTEC EMPIRE

## *The archaeological evidence*

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### Abstract

This article presents archaeological data on Late Postclassic long-distance trade in central and northern Mesoamerica. Aztec trade goods from the Basin of Mexico (ceramics and obsidian) are widespread, while imports from other areas are much less common, both in the Basin of Mexico and elsewhere. The artifactual data signal a high volume of exchange in the Late Postclassic, and while trade was spatially nucleated around the Basin of Mexico, most exchange activity was apparently not under strong political control. The archaeological findings are compared with ethnohistoric sources to further our knowledge of the mechanisms of exchange, the effect of elite consumption on trade, and the relationship between trade and imperialism.

Ethnohistory makes it clear that long-distance trade was an important institution in Aztec society. Exotic goods from all over Mesoamerica were offered for sale in the Tenochtitlan marketplace, the professional *pochteca* merchants traded extensively both inside and outside of the Aztec empire, trade was closely linked to Aztec imperialism, and exotic luxury items played crucial sociopolitical roles in Aztec society (see, for example, Berdan 1978, 1982, 1987b). But what are the material manifestations of this extensive and culturally important system of exchange? In spite of numerous methodological and conceptual advances in the archaeological analysis of prehistoric trade and trade goods (e.g., Earle and Ericson 1977; Hirth 1984; Nelson 1985; Zeitlin 1982), archaeology has so far made almost no contribution to our knowledge of Aztec trade. A recent review of archaeological studies of the Aztec economy (Smith 1987d) was able to include little discussion of long-distance trade, and recent treatments of Late Postclassic exchange by archaeologists (e.g., Drennan 1984a; Sanders and Santley 1983) rely upon ethnohistory, quantitative reconstructions, and comparisons with earlier periods, avoiding any discussion of archaeological evidence for Late Postclassic exchange.

There are two reasons for the lack of attention to material evidence for Aztec trade: (1) the existing data are widely scattered, much of it in obscure publications; and (2) most of the evidence is of poor quality, consisting simply of statements that particular trade goods were found at a site. This article assembles much of the scattered evidence for Aztec long-distance exchange in order to see what it can tell us about Late Postclassic economics. While a general lack of contextual data for individual finds hampers interpretation of the socioeconomic significance of trade goods, sufficient information is available to make a number of inferences about Aztec trade that go beyond the data available from ethnohistory.

My emphasis here is on the *archaeological* evidence for Aztec long-distance trade, and I make rather limited use of the abundant ethnohistoric data on Aztec exchange. I believe that before useful correlations can be made between archaeology and ethnohistory, we need to analyze each data set separately (for this approach, see Charlton 1981; Smith 1987a, 1990; South 1977). In this article the term “Aztec” refers to the peoples and culture of the Basin of Mexico in the final centuries of the Prehispanic era. The analysis is limited to the Late Postclassic period, represented in the Basin of Mexico by the Late Aztec phase, ca. A.D. 1350–1520 (Sanders, Parsons, and Santley 1979).

### AZTEC TRADE GOODS OUTSIDE THE BASIN OF MEXICO

#### Ceramic Exports

*Aztec III Black-on-Orange ceramics.* This is a common decorated ceramic type manufactured in the Basin of Mexico during the Late Aztec phase (Griffin and Espejo 1950; Parsons 1966; Sanders, Parsons, and Santley 1979:471ff; Tolstoy 1958). The fine, hard, orange Aztec paste coupled with the distinctive “Tenochtitlan” style thin black line decoration make this an easily recognizable ceramic type, and this is the single most abundant Aztec tradeware found outside of the Basin of Mexico. The most common exported forms are tripod plates, shallow bowls, and small spinning bowls. Although possible local imitations of this ware have been reported from a few areas outside of the central Mexican highlands (Bernal 1948; Barbara Stark, personal communication), the distinctiveness of the Aztec orange paste implies that published reports of Aztec III are

indeed Aztec imports and not local versions of the ware. I have never seen any examples of "local imitation" Aztec III in ceramic collections from central Mexico. The related types Aztec I and Aztec II Black-on-Orange date to the Early Aztec phase (ca. A.D. 1150–1350) and are not considered in this article.

*Texcoco Fabric-Marked salt vessels.* These ceramic bowls and basins were used to manufacture and transport salt from the saline lakes in the Basin of Mexico (Charlton 1969; Sanders, Parsons, and Santley 1979:57ff, 172ff; Tolstoy 1958). Sherds are easy to recognize from their crumbly fine pink-to-orange paste and rough, fabric-marked surfaces. In contrast to most other ceramic categories, we can infer with confidence the material transported in these vessels and hence the economic purpose of the exchange. While these ceramics are quite abundant in Postclassic contexts in Morelos, they are rarely reported from other areas outside of the Basin of Mexico; this is probably due to the utilization of alternative salt sources (e.g., Sisson 1973).

*Guinda or redware ceramics.* This category represents a family of highly polished redware ceramics, often decorated with black and/or white designs; it is sometimes referred to as "Aztec Polychrome" or as "Texcoco Black-on-Red," "Texcoco Black-and-White-on-Red," and so forth (see Parsons 1966; Sanders, Parsons, and Santley 1979:467–473; Tolstoy 1958). While some varieties of these ceramics clearly comprised trade-wares in the Late Postclassic period, they must be treated with caution for two reasons. First, these ceramics span the Middle and Late Postclassic periods. With the exception of a few distinctive varieties, most examples of this category cannot yet be confidently phased. Thus the simple occurrence of Postclassic polished redwares does not imply any connection with Late Postclassic exchange systems.

Second, these ceramics are relatively abundant not only in the Basin of Mexico, but also in Morelos, southern Puebla, and possibly southern Hidalgo and the Toluca Valley; hence, it is likely that they were manufactured in some or all of these regions (see discussion in Smith 1983:307ff). If this turns out to be the case, then the simple presence of redwares does not necessarily indicate trade with the Basin of Mexico. For this reason, the spatially neutral type name of "Guinda" (see DuSolier 1949:35) is preferred over such designations as "Texcoco Black-on-Red." This situation is in urgent need of investigation through petrographic and chemical characterization studies coupled with stylistic analysis to determine the number and location of manufacturing areas or sites.<sup>1</sup> The distribution of Late Postclassic Guinda ceramics is discussed in this article, but the data are kept separate from the distribution of the categories already discussed.

*Other types.* Xochimilco Polychrome is a class of painted jars and basins probably manufactured in the southern Basin of Mexico (see Séjourné 1970:Figure 6; 1983:257–263). These are found at Late Postclassic sites in Morelos, but have not been reported elsewhere outside of the basin. Current work on Late

Postclassic ceramics from the sites of Cuexcomate and Capilco in western Morelos indicates that some artifacts of the following classes are Aztec imports, although most examples are locally made: long-handled "frying-pan" incense burners, sometimes known as "Texcoco Molded/Filletted"; figurines; pitchers; *copas* or cups; and *comals*. These cannot be quantified until the analysis stage of the Postclassic Morelos Archaeological Project is completed (see Smith et al. 1989).

### Ceramic Distribution Data

The spatial distribution of Aztec ceramics outside of the Basin of Mexico is plotted in Figure 1; site names and citations are provided in Table 1. These data indicate that imported Late Postclassic Aztec ceramics are relatively widespread in northern and central Mesoamerica. Forty-six locations are noted, and many of these (circles with crosses in Figure 1) represent surveys where a number of individual sites have Aztec ceramics. Finds are particularly dense in the Toluca Valley, Morelos, and Guerrero, but a good number of sites on the Gulf Coast and in the highlands down to Oaxaca also have Aztec ceramics.

The simple occurrence of an imported ceramic, however, tells us almost nothing about the nature of the exchange system responsible for its transport or about the socioeconomic significance of the import in its local setting. In order to address these questions, the first requirement of the distribution data is that they be expressed in quantitative form. When we examine the distribution of *quantified* Aztec ceramics outside of the Basin of Mexico, we must work with a much smaller data set consisting of 12 sites. These finds are plotted in Figure 2, with the frequencies and citations provided in Table 2. In all cases, the frequencies represent separate counts of Aztec and Guinda sherds as percentages of all sherds; in a few cases I have included only definite Late Postclassic levels from stratigraphic pits (these are indicated in the notes to Table 2).

Several observations may be made on these data. Basin of Mexico imports and Guinda are far more common in the west (Morelos, Toluca, and Guerrero) than in the east; the mean percentage values for Aztec and Guinda sherds are 2.73% and 2.12%, respectively, for the west and 0.53% (excluding Quauhtochco) and 0.60% (excluding Quauhtochco and Coxcatlan) for the east. This pattern is due largely to the effect of distance, as indicated in Figure 3. Clear patterns of monotonic decrease are expressed by these data, and the curves (which were fitted by hand) resemble an exponential decay curve (see Renfrew 1977:75).

Several sites in the Figure 3 plots violate the pattern of monotonic decrease; that is, they have higher or lower frequencies of Aztec and/or Guinda ceramics than is expected given their distance from the Basin of Mexico. Considering the Aztec ceramics first, the low frequency at Calixtlahuaca (site 2) is surprising. One would expect higher frequencies if Aztec ceramics signal greater interaction between the Toluca Valley and the adjacent Basin of Mexico. Aztec ceramics are well represented in at least one Late Postclassic site from this area, Tlacotepec, but these are whole vessels from burials in one small area of the site excavated by Frederick Starr in 1905 (see McVicker 1987). However, these burials may pertain to an immigrant group from the basin (McVicker 1987), leaving the low frequency of Aztec ceramics at Calixtlahuaca unexplained; perhaps political or ethnic factors are involved. The high value for the Teloloa-

<sup>1</sup>Current research by the author and Susan Goodfellow in Morelos, and by Mary Hodge and Leah Minc in the Basin of Mexico, has initiated the investigation of the regional configuration of production and distribution of the Guinda ceramics of Postclassic central Mexico.

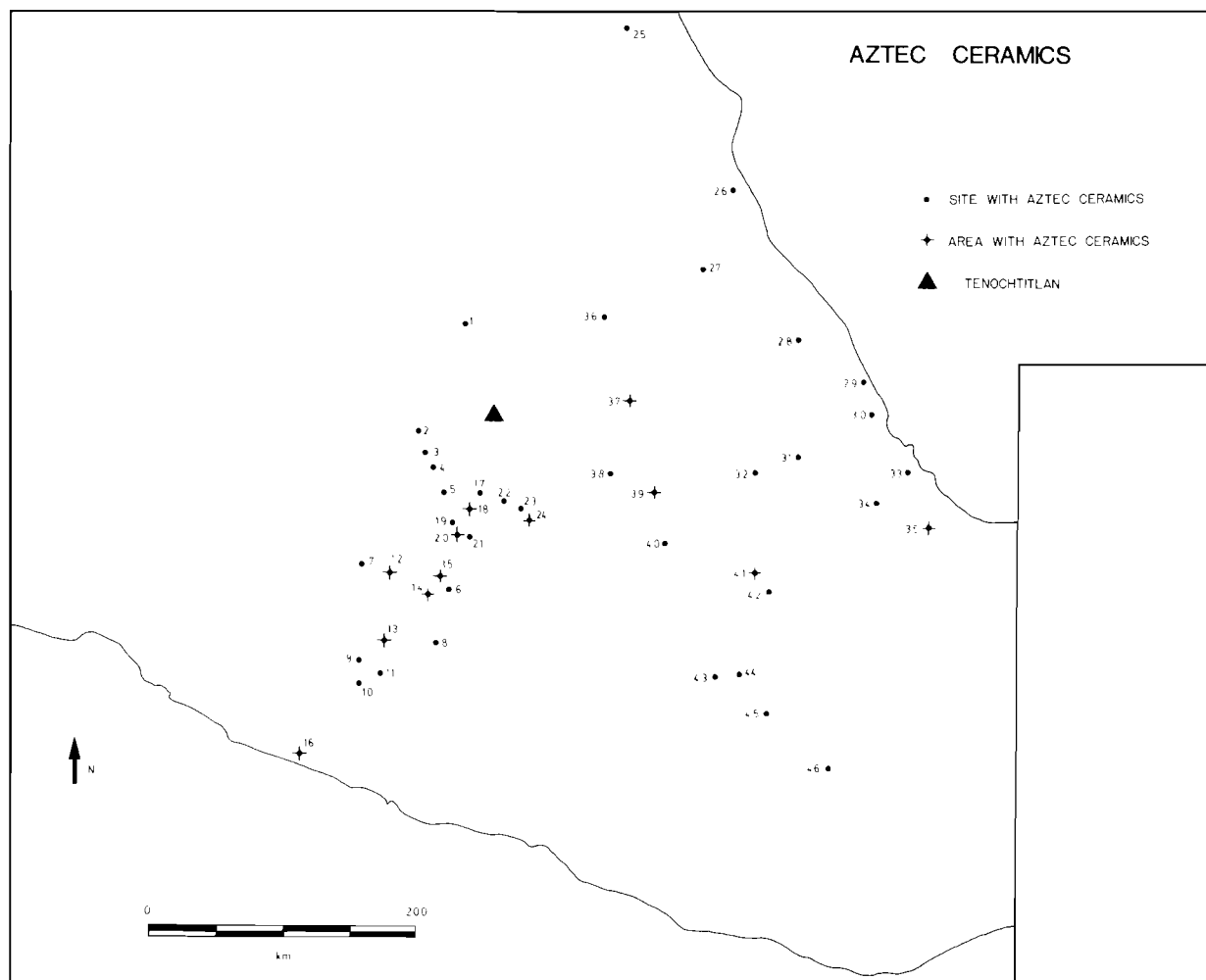


Figure 1. Distribution of Aztec ceramics outside of the Basin of Mexico (see Table 1 for site names and citations).

pan survey sites (location 12) is probably due to Lister's (1947) sherd collection methods, which apparently emphasized decorated and exotic wares; this has the effect of inflating the percentages of Aztec III Black-on-Orange, the only Basin of Mexico import reported. The largest anomaly in the distribution data is the site of Quauhtochco. Over 15% of the ceramics in Medellín Zenil's extensive test pitting at this site are incensarios of the type Texcoco Molded/Filleted (counted here as an Aztec import), suggesting some sort of strong relationship with Basin of Mexico ritual practices. The frequencies of Aztec III (5.2%) and Guinda (4.6%) are also excessive for such a distant site, and there is undoubtedly something unique about Quauhtochco's interaction with the Basin of Mexico. From Medellín Zenil's report (1952), we might suggest the presence of a population of migrants from the Basin of Mexico at this fortified site. The clear Mexica style of the central temple, pointed out by Umberger (1987b), supports such an interpretation. As discussed below, the archaeological data on Quauhtochco fit well with available ethnohistoric documentation on the site's role in the Aztec empire.

The frequencies of Guinda ceramics are very similar to those of the definite Basin of Mexico imports at most sites (Table 2),

and the Guinda fall-off curve is quite similar to the Aztec curve (Figure 3). This suggests that the two kinds of ceramics may have been distributed through similar mechanisms of exchange, perhaps lending support to the interpretation that most of these ceramics originated in the Basin of Mexico. It is also possible that some or even most of the distant Guinda ceramics were manufactured in Morelos or southern Puebla, and were then moved through the same exchange system as the Aztec ceramics. The very high frequency of Guinda at Coxcatlan Viejo (site 42) is difficult to account for. These ceramics may have been manufactured locally, or perhaps Coxcatlan had some special exchange relationship with the Aztecs.

The next task beyond quantified distribution plots in the investigation of archaeological trade networks involves a consideration of the nature of the specific archaeological deposits that yield trade goods (e.g., middens vs. fill, or houses vs. temples) and inferences on their socioeconomic contexts (e.g., rural vs. urban, or elite vs. commoner; see Plog 1977). At this level, our sample of relevant Late Postclassic data drops to near zero. If we eliminate surface collections (Teloloapan sites, Coxcatlan Viejo) and excavations with little documentation of context (Calixtlahuaca), we are left with mostly test pits (Malinalco,

**Table 1.** Aztec ceramics outside of the Basin of Mexico

Code	Place	Types <sup>a</sup>	Citation
<b>1. West</b>			
1	Tula	A	Acosta 1956–1957; Griffin and Espejo 1950:152
2	Calixtlahuaca	A, G	García Payon 1956–1957a
3	Tlacotepec	A, G	Starr Collection, Field Museum
4	Teotenango	A, G	Vargas 1975:260–264
5	Malinalco	A, G	Galván 1984; García Payon 1956–1957b
6	Tepecoacuilco	A	Barlow 1948:92
7	Oztuma	A	Lister 1947
8	Xochipala	A	Schmidt 1986:112
9	Huautla	A	Weitlaner 1948:77
10	Sta. Elena	A	Ibid.
11	Yestla	A	Ibid.:79
12	Teloloapan Area	A	Lister 1947
13	Mezcala/Tetela Area	A, G	Rodríguez B. 1986:168
14	Cocula Area	A, G	Cabrera C. 1986:193ff
15	Iguala Area	A	Greengo 1971
16	Costa Grande	A	Lister 1971:628
<b>2. Morelos</b>			
17	Cuernavaca	A, B, G	M. Smith 1987a; unpublished notes
18	Cuexcomate, Capilco	A, B, G	M. Smith, unpublished notes
19	Coatlan	A, B, G	Mason 1980
20	Chalma Area	A, G	Hirth, unpublished notes
21	Puente de Ixtla	A, G	M. Smith, unpublished notes
22	Yauhitepec	A, G	Ibid.
23	Ahuchuepan	A, G	Ibid.
24	Southeast Morelos	A, G	M. Smith and K. Hirth, unpublished notes
<b>3. East</b>			
25	Pánuco	A	Griffin and Espejo 1950:152
26	Tuxpan	A	Ibid.
27	Zacate Colorado	A	Medellín Zenil 1960:166
28	Paxil	A	Ibid.:160
29	Quiahuiztlan	A	Ibid.
30	Cempoala	A	Ibid.; García Payon 1971:540
31	Quauhtochco	A, B, G	Medellín Zenil 1952:81
32	Orizaba Mines	A, B, G	Stocker and Cobean 1984:86
33	Mictlancuauhtla	A	Medellín Zenil 1960:138
34	Cuetaxtlan	A	Ibid.
35	La Mixtequilla Area	A, B, G	Stark n.d.
36	Tulancingo	A	Muller 1956–1957
37	Río Zahuapan Area	A, G	Snow 1966
<b>4. Southeast</b>			
38	Cholula	A, G	Geoff McCafferty, personal communication; Muller 1978:123
39	Cauhtinchan Area	A	Sisson 1984
40	Tepexi el Viejo	A, G	Gorenstein 1973
41	Tehuacan Valley	A, B, G	MacNeish, Peterson, and Flannery 1970:227
42	Coxcatlan Viejo	A, B, G	Sisson 1973
43	Tamazulapan Area	A, G	Byland 1980:167
44	Coixtlahuaca	A, G	Bernal 1948–1949
45	Chachoapan, Yucuita	G	Lind 1987:12
46	Monte Alban	A	Blanton 1978:103

<sup>a</sup>Ceramic types: A, Aztec III Black-on-Orange; B, Other Late Aztec Basin of Mexico types; G, Guinda (polished redwares).

Cuernavaca, Tepexi Viejo, Tehuacan, Coixtlahuaca) whose value for socioeconomic interpretation is quite limited. Lind's (1987) excavations at Yucuita and Chachoapan are useful, but the elite Mixtec households participated in Aztec trade networks to a very limited extent. Medellín's excavations at Quauhtochco

yield contextual data, but they were still limited to a few trenches. For detailed contextual control of Aztec tradewares, we will have to await Sisson's full publication of his excavations in the Tehuacan Valley (Sisson 1973, 1974) and completion of my own work at Postclassic sites in Morelos (Smith et al. 1989).

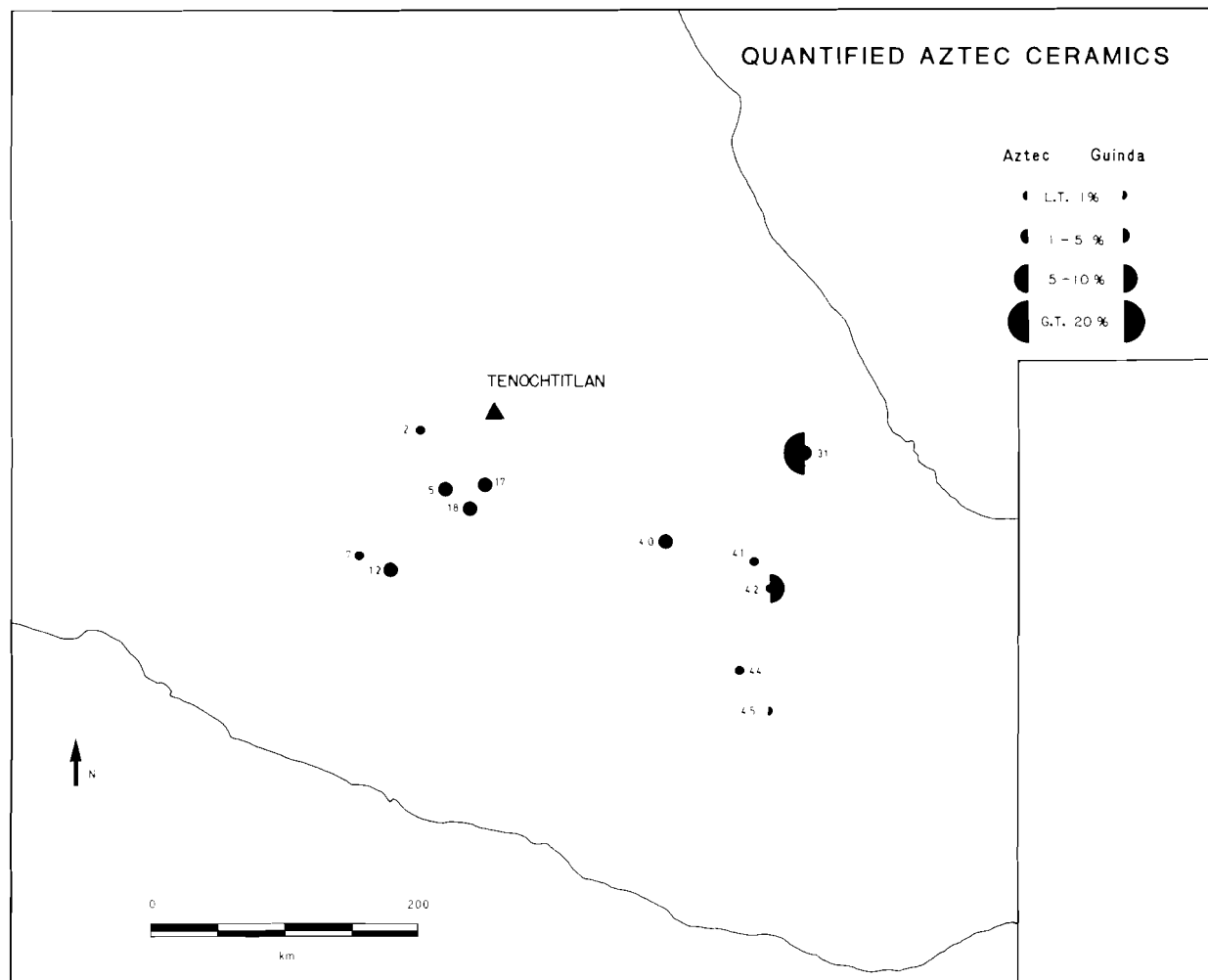


Figure 2. Map of the frequencies of Aztec ceramics from quantified deposits (see Table 2 for site names and citations).

### Obsidian Exports

*Pachuca source-area obsidian.* The distinctive green obsidian from the Pachuca source area (Charlton and Spence 1982) had a wide distribution throughout northern and central Mesoamerica throughout most of the Prehispanic epoch. For this analysis, only green obsidian found in secure Late Postclassic contexts is considered directly relevant to Aztec trade systems. Some of these data are reviewed in Spence and Parsons (1972), Charlton and Spence (1982), Spence (1985), and Smith, Sorensen, and Hopke (1984).

*Other obsidian from the Basin of Mexico.* Because of the difficulty (if not impossibility) of accurately sourcing gray obsidian without chemical characterization studies, artifacts from the Otumba and Paredon source areas (Charlton and Spence 1982) are not readily identifiable in contexts outside of the Basin of Mexico. However, neutron activation of obsidian artifacts from Morelos indicates that material from these sources was traded out of the basin during the Late Postclassic period (Smith, Sorensen, and Hopke 1984).

### Obsidian Distribution Data

The distribution of Pachuca (green) obsidian in Late Postclassic contexts outside of the Basin of Mexico is quite different from the distribution of Aztec ceramics. Figure 4 shows the locations of sites with Late Postclassic Pachuca obsidian; site names and citations are provided in Table 3. Frequencies of this obsidian are related to distance in only the roughest way: the closest sites (all in Morelos) have very high percentages of green obsidian, most over 95%, while the most distant sites (in the Maya zone) have only a few artifacts each. Beyond these gross patterns, distance is not at all a good predictor of the amount of Pachuca obsidian that will be found in Late Postclassic sites.

These data suggest that the green Pachuca obsidian must have had some special cultural significance relative to obsidian from other sources. Obsidian is generally rarer in southeastern Mesoamerica than in the central highlands, but there are several sources in Guatemala that were heavily exploited throughout the Prehispanic epoch. The low frequencies of Pachuca obsidian and its presence in ceremonial contexts like burials and caches (e.g. Berlin 1956:140ff; Proskouriakoff 1962:369ff) suggest a symbolic or ritual use rather than a utilitarian use in

**Table 2.** Percentages of Aztec ceramics at foreign sites

Site	Total Sherds	Basin of Mexico				Distance to Tenochtitlan Km
		Total %	Bl/Or %	Other %	Guinda %	
2 Calixtlahuaca <sup>a</sup>	115,643	0.2	0.2	—	0.1	58
5 Malinalco <sup>b</sup>	2,345	3.1	3.1	—	2.3	69
7 Oztuma <sup>c</sup>	154	0.6	0.6	—	0.6	150
12 Teloloapan Area <sup>c</sup>	2,829	3.7	3.7	—	1.3	142
17 Cuernavaca <sup>d</sup>	725	4.7	1.2	2.5	4.3	59
18 PMAP Sites, Early <sup>c</sup>	9,553	2.6	0.7	1.8	2.3	74
18 PMAP Sites, Late <sup>c</sup>	24,814	2.1	0.6	1.5	1.8	74
31 Quauhtochco	14,822	20.7	5.2	15.5	4.6	233
40 Tepexi Viejo <sup>f</sup>	1,405	1.1	0.7	0.4	1.4	162
41 Tehuacan Valley <sup>g</sup>	47,585	0.6	0.1	0.5	0.5	230
42 Coxcatlan Viejo <sup>h</sup>	47,173	0.3	0.1	0.2	10.1	246
44 Coixtlahuaca	6,324	0.1	0.1	—	0.4	269
45 Yucuita/Chachoapan	8,737	—	—	—	0.1	305

<sup>a</sup>There may be some mixing of Middle and Late Postclassic deposits here, since Aztec II sherds are also reported.

<sup>b</sup>These figures are from Galván's excavations in the modern town of Santa María Malinalco. The excavations are described in Galván (1984), and the ceramic counts pertain to Late Postclassic levels as presented in Galván's (1974–1975) tables.

<sup>c</sup>These data are from Lister's surface collections. Figures for location 12, Teloloapan area, represent mean values for the eight Late Postclassic sites. The Oztuma data (one of those sites) are also listed separately because of the ethnohistorical importance of this settlement as an Aztec frontier fortress.

<sup>d</sup>These data are from Smith's (unpublished) analysis of ceramics from Late Postclassic levels in Jorge Angulo's excavations in the Palacio de Cortes site.

<sup>e</sup>These data are the mean percentages per house in a random sample of houses at the sites of Capilco and Cuexcomate, Morelos. For the Early Cuauhnahuac phase there are 8 houses in the random sample, 5 at Capilco, and 3 at Cuexcomate. For Late Cuauhnahuac the respective figures are 8 and 18 houses. Only ceramics from well-dated domestic refuse deposits are included here.

<sup>f</sup>Data are from levels 13–15 only of Gorenstein's test pit; lower levels appear to be Middle Postclassic in date, while upper levels may be Colonial.

<sup>g</sup>These data represent the means of the percentages for excavated Late Postclassic deposits at eight sites (MacNeish, Peterson, and Flannery 1970:227). These authors incorrectly identify Aztec III Black-on-Orange (Figure 137) as "Tenayuca Black-on-Orange" (p. 226ff), another name for Aztec II Black-on-Orange.

<sup>h</sup>These data are from Sisson's surface collections. Quantified data from his excavations have yet to be published.

southeastern Mesoamerica. This agrees with recent interpretations of the functions of obsidian by the Classic Maya, who apparently used the tools in rituals such as autosacrifice (Freidel and Sheets 1990; Rice 1984; Schele 1984).

Obsidian use in northern Mesoamerica tended to stress utilitarian tasks over ritual uses (e.g. Drennan 1984b), and the high frequencies of Pachuca obsidian at sites west of the isthmus are probably best explained by economic factors. At many sites, the material is very common in spite of the existence of closer sources of obsidian. The purported superior quality of Pachuca obsidian for prismatic blade production (Spence and Parsons 1972) may account for its high frequencies at these sites. The presence of low frequencies of Pachuca obsidian in the Tarascan area (sites 6 and 7) is an interesting phenomenon which is discussed below.

## TRADE GOODS FROM OTHER AREAS

### Foreign Goods Found in the Basin of Mexico

The only significant quantities of foreign goods encountered in Late Aztec phase archaeological contexts in the Basin of Mexico are from excavations in the ceremonial zone of Tenochtitlan. The recent Templo Mayor project recovered large quantities of foreign objects, but most of these have yet to be published in detail. Preliminary reports include the following

categories: (1) *Ceramics* from the Huasteca, central Veracruz, Oaxaca, and Cholula (Ahuja 1982:246f). No information is given on quantities, forms, context, or condition (sherds or vessels). The remaining objects were all recovered in caches and offerings associated with the Templo Mayor. (2) *Mixtec sculptures* (Umberger 1987b). (3) Large quantities of *Mezcala-style sculptures* presumably from the Balsas/Mezcala region of Guerrero (González G. 1987). The conflict between the Late Postclassic provenience of these objects in Tenochtitlan and their prior Formative/Classic dating has yet to be resolved (González G. 1987); their manufacture may in fact date to the Postclassic, or else their use may represent another example of the Mexica interest in antiques (see Umberger 1987a). (4) Many objects of *jade/jadeite, copper, and gold* (Wagner 1982). (5) Large quantities of *vertebrate and invertebrate faunal remains* from marine species originating in both the Atlantic and Pacific (Matos Motezuma 1982:143–184). In addition to the Templo Mayor excavations, foreign objects were uncovered in a number of the poorly reported early excavations in Mexico City (Mateos H. 1979). For example, the so-called "volador offerings" of ceramic vessels include a number of polychrome vessels from the Gulf Coast and Cholula and/or the Mixteca (Mateos H. 1979:231ff). The lack of full reporting for any of the above finds prevents confident analysis, but it is clear that these objects were luxuries obtained for ceremonial uses in Tenochtitlan. In addition, a few sherds of Tlahuica Polychrome bowls from Morelos were recovered in recent excavations by the In-

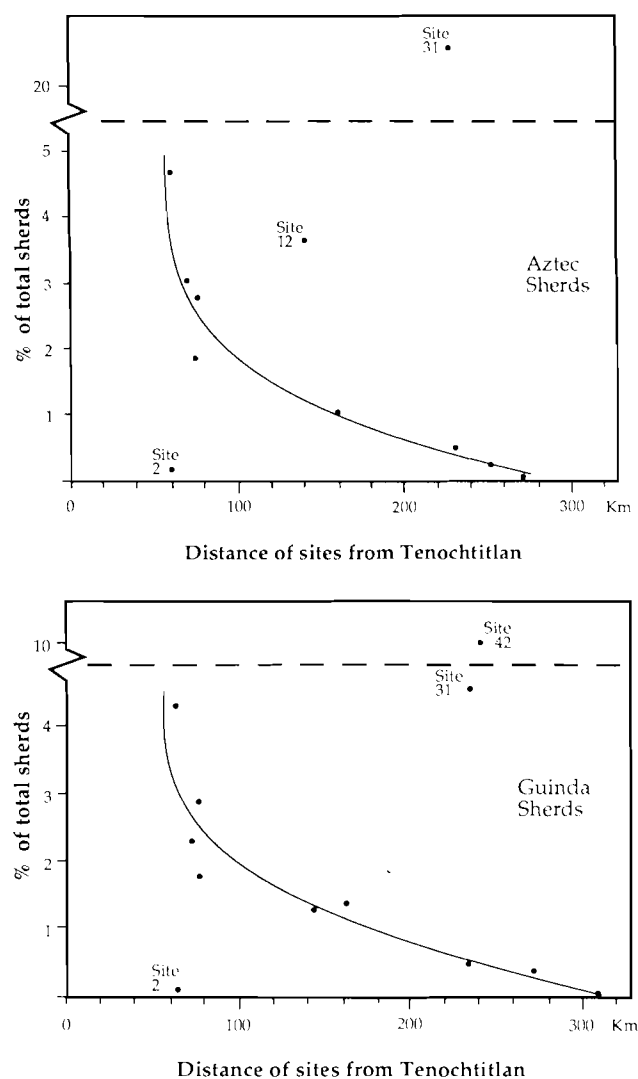


Figure 3. Graphs of ceramic percentages by distance from Tenochtitlan.

stituto Nacional de Antropología e Historia in the Mexico City zocalo (personal observations of the author).

The paucity of excavations in Late Aztec nonceremonial contexts in the Basin of Mexico makes it difficult to assess the distribution and significance of imported goods outside of Tenochtitlan. No clear imports are present from test-pit excavations in the southern Basin of Mexico (O'Neill 1962; Parsons et al. 1982; Séjourné 1983), although one possible Tlahuica Polychrome sherd (from Morelos) is illustrated by Séjourné (1970:Figure 7). Charlton and Nichols (1987) and Susan Evans (personal communication) report small frequencies of ceramics from the Huasteca and possibly the central Gulf Coast in Late Aztec contexts in the Teotihuacan Valley, and Brumfiel notes the presence of Huastec ceramics in her surface collections from Huexotla (1976:240) and Xaltocan (personal communication).

Late Aztec chipped-stone inventories in the Basin of Mexico are dominated by Pachuca obsidian (the data are reviewed in Smith, Sorensen, and Hopke 1984), and most of the gray ob-

sidian probably comes from the Otumba source area in the Teotihuacan Valley (this needs to be tested with characterization studies). Even if obsidian from sources outside of the Basin of Mexico is found to be present (as it is in earlier periods; Healan 1986), it probably accounts for a small proportion of the total amount used.

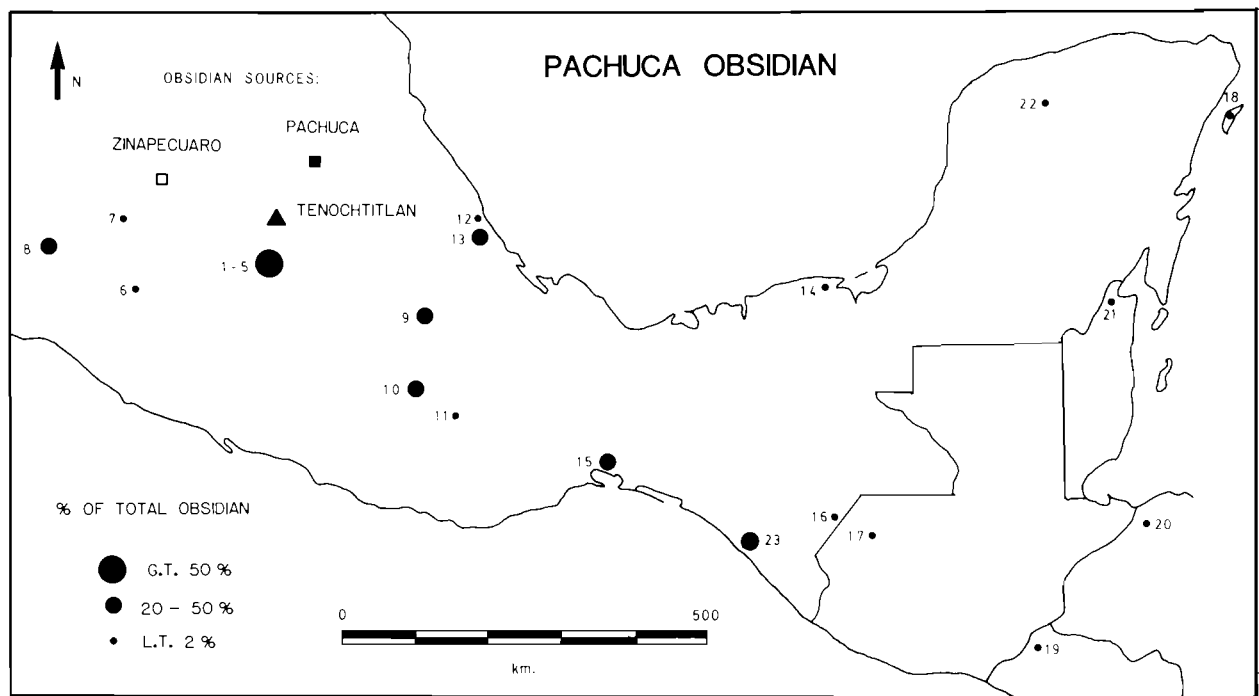
In sum, importation of archaeologically visible goods from outside of the Basin of Mexico was apparently carried out at a very limited scale in the Late Aztec phase. Residential contexts have few or no imported artifacts, and most of the documented imports are from ceremonial deposits at Tenochtitlan. One perishable exotic item whose import can be inferred is cotton.

#### Late Postclassic Trade Not Involving the Basin of Mexico

Archaeological evidence for Late Postclassic long-distance trade in central and northern Mesoamerica that did *not* involve the Basin of Mexico is not abundant. Quiahuiztlan and Cempoala on the Gulf Coast utilized the nearby Zaragoza and Orizaba obsidian sources in addition to Pachuca (Jack, Hester, and Heizer 1972), and at least one unknown source is reported for Late Postclassic contexts in Morelos (source samples were included from nearly all of the known central Mexican obsidian source areas; Smith, Sorensen, and Hopke 1984). If it were possible to visually source gray obsidian with accuracy, we would undoubtedly learn much more about the distribution networks focused on such important sources as Zaragoza and Orizaba.

The only widespread non-Aztec trade ceramics in Late Postclassic central and northern Mesoamerica are the elaborate Cholula Polychromes. These are reported from a number of sites in Veracruz (Medellín Zenil 1960:160; Barbara Stark, personal communication) and the Tehuacan Valley (MacNeish, Peterson, and Flannery 1970:227) and are present in Late Postclassic Morelos (M. Smith, unpublished notes). A problem in tracing the distribution of Cholula Polychromes in the central highlands is their great similarity to the contemporaneous Chalco Polychrome of the southern Basin of Mexico (see Séjourné 1983); indeed, many archaeologists working in the Basin of Mexico prefer to speak of "Chalco/Cholula Polychrome" until these wares can be more easily distinguished (e.g., Brumfiel 1976; Parsons et al. 1982). It is likely that not all of the elaborate polychromes in the Basin of Mexico are local and that vessels were imported from Cholula (in line with ethnohistoric data).

Beyond the Cholula case, ceramic evidence for other inter-regional contacts in central Mexico *not* involving the Basin of Mexico suggest the operation of at least three exchange spheres. First, interaction was common along the Gulf Coast, with apparent widespread exchange of local decorated ceramics (Medellín Zenil 1952:81, 1960; Stark 1990). Some of these wares reached the Basin of Mexico, and they comprise 5% of the imported sherds in Late Venta Salada excavations in the Tehuacan Valley (MacNeish, Peterson, and Flannery 1970:227). Second, parts of central Guerrero southeast of the Tarascan empire were apparently linked to that polity through exchange. Tarascan ceramics have been recovered in the Teloloapan area (Lister 1947) and in the central Balsas (Muller 1979:23). Third, Morelos, the Toluca Valley, and northeastern Guerrero may have formed another exchange sphere; Toluca and Guerrero wares were imported in small numbers into western Morelos



**Figure 4.** Distribution of Pachuca obsidian in Late Postclassic contexts outside of the Basin of Mexico (see Table 3 for site names and citations).

**Table 3.** Late Postclassic sites with Pachuca obsidian

Code	Site	Percent	Citation
1	Cuernavaca <sup>a</sup>	100	Smith, Sorensen, and Hopke 1984
2	Xochicalco	71	Ibid.
3	Cuexcomate and Capilco	97	J. Sorensen, unpublished data
4	Coatlan Viejo	98	Mason 1980:91
5	CDR-27	—	Lewarch 1980
6	Villa Morelos <sup>b</sup>	1	Hester, Jack, and Benfer 1973
7	Tzintzuntzan <sup>c</sup>	—	Pollard 1982:259
8	Apatzingan <sup>a,b</sup>	41	Hester, Jack, and Benfer 1973
9	Coxcatlan Viejo	45	Sisson 1984
10	Tamazulapan Valley	50	Byland 1980
11	Valley of Oaxaca <sup>b</sup>	—	Spence 1985:15
12	Quiahuiztlan <sup>a</sup>	2	Jack, Hester, and Heizer 1972
13	Cempoala <sup>a</sup>	22	Ibid.
14	Atasta <sup>c</sup>	—	Berlin 1956:140ff
15	Laguna Zope	45	Zeitlin 1982:270ff
16	Canajasté	1	Blake 1985:470f
17	Zaculeu <sup>c</sup>	—	Woodbury and Trik 1953,2:228ff
18	Cozumel <sup>a</sup>	5	Nelson 1985:644
19	Chalchuapa <sup>b</sup>	0.2	Sheets 1978:13
20	Naco, Honduras <sup>b</sup>	—	Wonderly 1986:327
21	Sta. Rita Corozal <sup>c</sup>	—	Chase 1985:109
22	Mayapan	0.2	Proskouriakoff 1962:369ff
23	Soconusco <sup>d</sup>	10-57	Clark, Lee, and Salcedo 1989:271
24	La Mixtequilla <sup>c</sup>	43	Stark 1990

<sup>a</sup>Frequencies are based on a very limited sample of obsidian.

<sup>b</sup>A Late Postclassic dating for these contexts is likely, but not certain.

<sup>c</sup>Percentages cannot be calculated from the data as presented, but it is stated or implied that Pachuca obsidian is found in very small amounts.

<sup>d</sup>This source presents data on obsidian sources from several sites. The sites and percentages for Pachuca obsidian are as follows: La Palma (32.3%), Acapetahua (18.2%), Las Morenas (10.4%), Ocelocaleo (57.1%), and El Aguacate (38.7%).

<sup>e</sup>This area is not shown in Figure 4 because I received the data after final production of the figures.



(Smith, unpublished notes), as were polychromes from Malinalco (Galván V. 1984 incorrectly refers to clearly local polychromes at Malinalco as "Tlahuica" Polychrome from Morelos). Two or three sherds of Morelos Polychrome are illustrated from Malinalco (Galván 1984:Lámina 108). Ceramics from the Cuernavaca area, Yautepec, and eastern Morelos were recovered in my recent excavations in western Morelos, indicating trade on a regional level.

### Other Goods

A number of the durable valuables encountered in ceremonial deposits in Tenochtitlan are also reported from other Late Postclassic sites in central and northern Mesoamerica. The most common of these are copper and jade. Their scarcity, degree of labor investment, aesthetic quality, and presence in caches in Tenochtitlan all point to high economic and symbolic value (see Smith 1987c on archaeological concepts of value), and the mechanisms and patterns of their distributions are important to an understanding of trade in the Late Postclassic period. However, archaeological data on these items is quite scarce and at this point very little can be learned from archaeological sources alone. First, we have only a very incomplete understanding of the places of origin for these items, and second, their archaeological occurrences are rare and often poorly reported, preventing meaningful quantification.

Copper objects are particularly tantalizing. While non-Maya occurrences of the metal are clearly Postclassic in date (Pendergast 1962), most examples cannot be phased firmly, although Hosler's (1988) recent technological chronology of west Mexican metallurgy represents a major advance. More than 45 copper artifacts were recovered in Late Postclassic contexts by the Postclassic Morelos Archaeological Project; most of these are tools (needles and chisels), with some luxury items (bells) as well. However, we do not yet know where these objects may have been manufactured, nor whence they arrived in Morelos. If the copper is from west Mexico (a likely source), was it traded directly to Morelos or did it come by way of Tenochtitlan? (Sahagún [1950–1982, book 9:18] mentions copper jewelry among the goods traded by the *pochteca*.) Current chemical analyses of these artifacts by Dorothy Hosler may help resolve this question. In spite of the obvious importance of copper, jade, and other valuables, I must reluctantly exclude them from further consideration in this article. Some discussion of archaeological occurrences of copper, jade, and turquoise may be found in Pendergast (1962), Bray (1977), Thouvenot (1982), Weigand, Harbottle, and Sayre (1977), and Hosler (1988).

Archaeological analyses of trade must also take into consideration perishable goods for which we have evidence of manufacture, although the goods themselves have not survived. For Late Postclassic Mesoamerica, the most important of these is cotton textiles (see Berdan 1987c; Drennan 1984a). Cotton spinning is recognizable from spindle whorls and spinning bowls (Smith and Hirth 1988), and the former are common in the Basin of Mexico in spite of the lack of cotton cultivation (Parsons 1972); this indicates a trade in raw cotton with producing areas like Morelos and the Gulf Coast. Cotton spinning was an intensive and widespread activity in Late Postclassic Morelos (Smith and Hirth 1988), and many of the finished textiles must have been destined for export. Further discussion of archaeological

evidence for Postclassic cotton production and trade is found in Smith and Hirth (1988). The archaeologically documented importance of cotton textiles fits well with the abundant ethnohistoric data for the production, distribution, and use of these items in Aztec Mexico (e.g., Berdan 1987c).

Another perishable good for which we have evidence of high levels of production suggesting export is paper. Basalt "bark-beaters" are common in Late Postclassic Morelos (e.g., Mason 1980), and the recovery of large numbers by the Postclassic Morelos Archaeological Project strongly suggests production of paper for export (Szymsorski 1987); again, this corresponds to the ethnohistorically documented importance of paper production in this area (Codex Mendoza 1980:23v).

### DISCUSSION OF ARTIFACT DISTRIBUTIONS

Several conclusions should be drawn from this distribution data before comparisons are made with the relevant ethnohistoric documentation for Aztec trade. First, these data indicate that ceramic exchange was widespread in Late Postclassic northern Mesoamerica, and imported vessels comprised a significant component of local ceramic inventories in many areas. The ceramic percentages listed in Table 2 are based upon total counts of sherds, and thus systematically underrepresent the numerical importance of imported wares. In most Postclassic ceramic assemblages, the vast majority of the sherds are from ollas (jars) because these are large common vessels that tend to break into many fragments. When vessel estimates based upon rims are used in place of raw sherd counts, the percentages of bowls increase dramatically, and most imports are bowls. For example, in a sample of excavated levels from Cuexcomate and Capilco in Morelos, the mean frequency of Basin of Mexico ceramic imports for the Early Cuauhnahuac phase is 2.8% for sherd counts and 8.3% for vessel counts (using a minimum number of vessels estimate based upon rims). Similar transformations would probably apply to the ceramics of all sites listed in Table 2, suggesting that Aztec vessels made up a far higher percentage of local inventories than the 0.1% to 3% generally reported. The significance of imported ceramics goes beyond this, however, since most sites also have vessels imported from areas besides the Basin of Mexico. In Early Cuauhnahuac Morelos, for example, frequencies of all imported ceramics (calculated from vessels, not sherds) are often above 10%.

This finding goes against Drennan's assertion that:

Despite the long archaeological tradition of stylistic identification of "trade sherds" and the more recent accuracy of chemical identification of source materials, the Aztec case does not provide any encouragement for the idea that pottery was a major item in long-distance movement of goods. (Drennan 1984a:110)

This assertion is not based on any archaeological data for Aztec ceramic trade, but rather on ethnohistoric records.<sup>2</sup> Dren-

<sup>2</sup>Drennan's statement on Aztec pottery exchange is based upon quantities of bowls in tribute documents like the Codex Mendoza (1980). However, these items are almost certainly gourds (many are glossed "xicaras") rather than ceramic bowls (Frances Berdan, personal communication).

nan's disparagement of the economic significance of pottery exchange in Prehispanic Mesoamerica (see also Drennan 1984b) is echoed by Sanders and Santley (1983). These authors argue that high production and transport costs would have limited exchange of ceramics (and most other subsistence and utilitarian goods, but not obsidian) to relatively small local regions. While this may be true in many cases, the volume of ceramic transport is an empirical issue and not all exchange systems will conform to cost constraints in the same way. The high volume of Aztec ceramic trade will be discussed later.

The falloff curves for Aztec and Guinda ceramics (Figure 3) conform closely to exponential curves, indicating that transport distance is a major factor in explaining the distribution data (see Renfrew 1977). This suggests that the ceramic exchange systems were relatively open (involving merchants and markets) and not under strong political control. These curves correspond more closely to Renfrew's "down-the-line exchange" model than to his "prestige-chain exchange" model (1977). The obsidian distributions are far more complex and require a combination of economic, political, and ideological factors for their explanation. The contrasting quantitative distributions and the far greater spatial range of Aztec obsidian relative to ceramics suggest that separate exchange networks or activities may have been involved.

The widespread distribution of Aztec ceramics and obsidian implies a similarly extensive system of exchange of perishable goods. It is clearly dangerous to speculate on what might have been traded if only we had greater evidence. However, some archaeologists have suggested that the extent of ceramic trade may serve as an index to the extent of exchange of perishable items (e.g., Hopkins 1978:46), and thus while ceramics by themselves may have had limited economic significance, they do provide evidence of exchange routes and activities which probably involved many other commodities that have left no material traces. Texcoco Fabric-Marked provides a good example; we know that these ceramics were used to transport salt from the Basin of Mexico, and their occurrence in foreign areas is strong evidence for salt trade.

The overall spatial configuration of trade goods shows that Late Postclassic exchange systems were strongly nucleated with a focus on the Basin of Mexico. This mirrors the situation in the Classic period, when Teotihuacan was at the hub of a widespread exchange system involving both the transport of goods and the spread of styles (Sanders and Santley 1983; Santley 1983). These centralized configurations present a strong contrast with the Early Postclassic (Toltec) period, when Mesoamerican exchange networks were highly decentralized. Smith and Heath-Smith (1980) show that while Early Postclassic trade was extensive, most exchange routes bypassed the Basin of Mexico. Tula was not nearly the economic central place (on a macroregional scale) that Teotihuacan or Tenochtitlan was. As Renfrew (1975) points out, spatial centralization does not necessarily imply political centralization or control (Renfrew frames his discussion in terms of the spatial equivalence of central place market exchange and central place redistribution). The falloff data suggest that the predominance of Tenochtitlan in Late Postclassic exchange networks was more economic than political in nature, but this cannot be firmly established from distribution data alone. Further information on archaeological contexts and nonceramic data is needed, and of course the ethnohistorical record is of great relevance here.

## COMPARISONS WITH ETHNOHISTORY

### Exchange Mechanisms

There is very little ethnohistorical information on long-distance exchange of ceramics in Aztec Mexico. I have found three references: (1) Díaz del Castillo (1983:167) states that Moctezuma was served meals in Cholula Polychrome vessels at Tenochtitlan (see also Torquemada 1975–1983, 1:387); (2) one of Sahagún's lists (1950–1982, book 9:18) of goods traded by the *pochteca* merchants<sup>3</sup> includes "golden bowls for spindles" (*teucuitlatzaocalxiti*) which may refer to Aztec III Black-on-Orange spinning bowls (see Smith and Hirth 1988); and (3) Sahagún's (1950–1982, book 10:84) discussion of salt merchants (*iztanamacac*) mentions that they traveled from market to market selling salt and "salt ollas" (*iztacomitl*), which probably correspond to the Texcoco Fabric-Marked salt vessels.

Beyond these, the only related data on ceramic trade are some statements that ceramics were sold in markets (e.g., Anderson, Berdan, and Lockhart 1976:138ff; Sahagún 1950–1982, book 10:83). While Sahagún's list (1950–1982, book 10:83) does include "merchants' bowls" (*puchtecaicocaxiti*), most of the ceramics in any market were almost certainly locally produced. This suggests that merchants distinct from the *pochteca* were involved in the ceramic trade (or else the *pochteca* distributed Aztec and Guinda pottery and the surviving lists of *pochteca* merchandise are incomplete).

Documentary references to obsidian exchange are slightly more abundant; much of these data are reviewed by Isaac (1986). Pachuca obsidian was moved to Texcoco and Tenochtitlan through both tribute and market channels (Isaac 1986; Spence 1985), and *pochteca* traveling south carried obsidian as far as Xicalanco (Sahagún 1950–1982, book 9:18). Berlin (1956:142) suggests that this Xicalanco obsidian trade was responsible for the origin of the green blades found at Atasta, a site located in the vicinity of the Xicalanco port of trade. It is possible that some of the differences in the quantitative distributions of obsidian and ceramics are due to different merchants involved in the two types of exchange—*pochteca* for the obsidian and non-*pochteca* merchants for the ceramics.

The foreign luxury objects excavated from ceremonial contexts in Tenochtitlan probably originated in tribute payments, given the symbolic importance of the Templo Mayor as the center of the Aztec empire (see Matos M. 1982; Pasztory 1987). The lack of objects like sculptures, crocodiles, or exotic ceramics in the imperial tribute rolls (e.g., Codex Mendoza 1980) should not be taken to indicate that these items were not obtained through tribute channels. Berdan (1987b) emphasizes that the Mexica tribute system included both the regularly scheduled payments from tributary provinces recorded in the tribute rolls and irregular payments of "gifts" from foreign nobles and rulers (many of whom ruled in strategic provinces rather than tributary provinces; see Berdan 1987a; Smith 1987b). On the other hand, Berdan (1987b) makes the point that ethnohistoric descriptions of tribute in luxury items show

<sup>3</sup>The *pochteca* were state-sponsored professional merchants organized in a guildlike fashion. There is abundant ethnohistoric data on the *pochteca*, much of which is discussed by Berdan (1982, 1987b) and Isaac (1986). A basic question in the ethnohistory of Aztec trade is whether or not there were long-distance merchants *not* part of the formal *pochteca* organization.

relatively modest quantities relative to the probable high demand, and that consequently many such goods must have been obtained by means of trade. Finally, goods like Huastec ceramics or obsidian from exterior sources found outside of Tenochtitlan were most likely obtained through trade rather than tribute.

### Elite Consumption

Several recent studies have discussed the exchange of luxury items among Late Postclassic elites, emphasizing their role in interregional communication, social stratification, and political action (Blanton and Feinman 1984; Brumfiel 1987a, 1987b; Charlton and Nichols 1987; Smith 1986). It is possible that exotic decorated ceramics, clearly relatively valuable commodities in comparison with local wares in most areas, were used by the elite as luxury consumption goods. The fact that most of the Aztec III and Guinda vessels found outside of the Basin of Mexico are serving bowls with painted decorations is in line with such a suggestion (see Smith 1987c) as is the presence of Aztec goods in enemy areas like Tlaxcala because elite interaction cut across political borders (Smith 1986).

However, ceramic distribution data indicate that Aztec and other trade wares were not limited to elite contexts and were probably traded through market systems rather than through limited or specialized channels of elite exchange. Excavations of refuse deposits from a random sample of Late Postclassic houses at Capilco and Cuexcomate in Morelos revealed a widespread distribution of ceramics (and obsidian) from the Basin of Mexico. In the Early Cuauhnahuac phase, both elite residences in the sample have Aztec ceramics, as do five of six non-elite houses. In the Late Cuauhnahuac phase, all houses (2 elite and 24 nonelite in the random sample) have Aztec ceramics. In both phases, the elite houses have higher frequencies of Aztec III Black-on-Orange plates and bowls than nonelite houses, but most houses have at least small numbers of these sherds. Other Basin of Mexico imports like Texcoco Fabric-Marked salt vessels and Aztec III spinning bowls show no elite association.

Similarly, Stark (1990) notes that Aztec imports are distributed widely (though at low frequencies) among rural households in the La Mixtequilla area of Veracruz. The widespread distribution of imports among houses in the two areas points strongly to the presence of market exchange according to Hirth's (1990) models, and the higher frequencies of some imports in elite contexts is probably due to the economic and perhaps stylistic value of the goods. The falloff curves also support the notion of independent merchants and market exchange as mechanisms for the distribution of Aztec ceramics. In short, the connection between elites and decorated ceramics, often hypothesized by archaeologists (e.g., Rice 1983; Smith and Heath-Smith 1980), may not be very strong in the Late Postclassic period due to the prevalence of market exchange (Hirth 1990). Durable luxury goods like jade, gold, or copper are more likely to have exclusive or strong associations with elites, but detailed excavation data on these goods at a large sample of sites are lacking.

### Aztec Artifact Distributions and the Aztec Empire

How do the artifact distribution data relate to the spatial organization of the Aztec empire? While the lack of chronological

refinement of Late Postclassic ceramic chronologies prevents detailed correlations with the ethnohistoric record on the empire (Smith 1987a), it is instructive to consider the data we have at our current state of knowledge. Figure 5 presents a map of the extent of the Aztec empire (as developed by the 1986 Dumbarton Oaks Summer Seminar on the empire<sup>4</sup>), superimposed on the distribution map of Aztec ceramics from Figure 1. *Tributary provinces* are the imperial units listed in the Codex Mendoza (1980); their major responsibility was to provide regular payments of tribute to the Triple Alliance. *Strategic provinces* were under Aztec control, but had a different kind of relationship with the empire. They tended to fulfill military and defensive roles, and their payments in kind to the empire were less regular and tended to be referred to as "gifts." These two types of provinces are discussed in Smith (1987b) and Berdan (1987a).

Figure 5 shows that most of the sites with Aztec ceramics (83%) were included in the provinces of the Aztec empire in 1519. Most of the provinces which have *no* published evidence for Aztec trade goods have not yet seen intensive archaeological fieldwork directed at Late Postclassic contexts. While at first glance this may appear to support the interpretation that the movement of Aztec ceramics was associated with conquest and the expansion of the empire, some caution is needed here. As discussed in Smith (1987a), the Late Postclassic period as an archaeological entity includes intervals of time both before and after the formation of the Triple Alliance empire in 1428; hence, Late Postclassic Aztec ceramics outside of the Basin of Mexico may date to either the pre- or postimperial periods. Furthermore, ethnohistoric documentation clearly indicates that the polities of the Basin of Mexico were trading with exterior areas both prior to and after conquering them, and the creation of export markets for ceramics was not an imperial strategy of the Triple Alliance (Berdan 1982; Blanton 1987; Smith 1986, 1987a, 1987b). In Morelos, two separate studies have documented Late Aztec imports both before and after the area was conquered by the Mexica (Smith 1987a, unpublished data). The data plotted in Figure 5 only permit the inference that the Aztecs were interested in many provincial areas for both their trade potential (as measured by ceramics) and their tributary potential (as known from ethnohistory). Documentary sources clearly indicate that long-distance trade was extensive within the empire, both between the provinces and Tenochtitlan and within provincial areas (see Smith 1987b; Berdan 1978, 1987a).

As stated earlier, the ceramic distribution data by themselves suggest that the goods were moved through exchange channels not strongly under political control. This interpretation is supported by the map in Figure 5. If the distribution of Aztec ceramics had been carried out by the state in relation to imperial policy and organization, one would expect far higher frequencies of Aztec ceramics at provincial capitals like Coixtlahuaca (site 44, Figure 2), coupled with low frequencies (or a lack of Aztec ceramics) at nonimperial sites in areas like the Tehuacan

<sup>4</sup>The Dumbarton Oaks project on the Aztec empire originated in a summer seminar at Dumbarton Oaks in 1986. Frances Berdan was the organizer, and other participants were Richard Blanton, Elizabeth Boone, Mary Hodge, Emily Umberger, and myself. Justifications for our revision of Barlow's (1949) classic map of the empire and discussions of our methods and sources are presented in Berdan (1987a) and Smith (1987b). The map shown in Figure 4 is provisional in character and we are still working out the details. Final results and detailed maps will be published in monograph form in the near future.

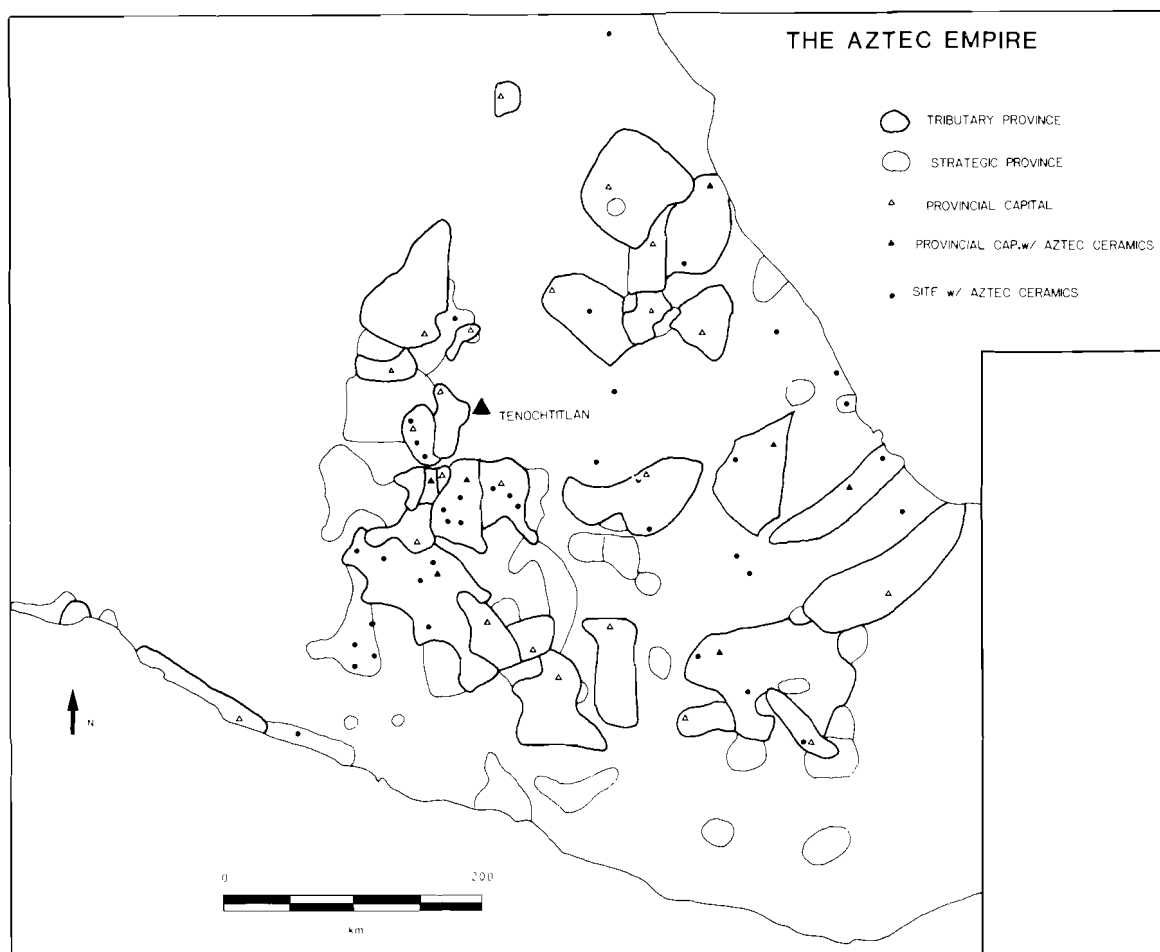


Figure 5. Map of the Aztec empire showing sites with Aztec ceramics (see footnote 4 on the origin of this map).

Valley (nos. 41 and 42). There are even Aztec ceramics in the enemy territory of Tlaxcala and Pachuca obsidian in the Tarascan realm. Cholula has limited quantities of Aztec ceramics (Table 1), and Snow's survey in the Rio Zahuapan area of northern Tlaxcala recovered Aztec III (12 sherds at 7 sites) and Guinda (541 sherds at 21 sites) ceramics (Snow's methods of data presentation prevent the calculation of percentages of types by site). Again, these data suggest the importance of exchange mechanisms independent of the control of the Triple Alliance states.

The political and military situation in central Mexico also helps explain the distribution of Pachuca obsidian in Late Post-classic sites. Zeitlin (1982) demonstrates the importance of political factors in shaping obsidian production and exchange systems throughout the Prehispanic epoch in Mesoamerica, and his insights apply to the current data. Two political/strategic factors appear to be relevant to the obsidian distribution data: the imperial status of receiver towns and the effects of the Tarascan empire on exchange in west Mexico. Along the Gulf Coast, Cempoala had considerably more Pachuca obsidian than the nearby town of Quiahuiztlan (Table 3), which may relate to Cempoala's inclusion in the Aztec empire and the independence of the Quiahuiztlan area (Figure 4; see Berdan 1987a). (An example contrary to this interpretation is the *similarity* in green obsidian levels between Tamazulapan, an imperial area, and Te-

huacan, an independent area.) The site of Quauhtochco, provides a unique example of an imperial town with considerable archaeological evidence of contact with the Basin of Mexico. Quauhtochco was an Aztec garrison and provincial capital (Codex Mendoza 1980:17v, 48r; see Berdan 1987a; van Zantwijk 1967), and it is encouraging that the archaeological remains excavated by Medellín Zenil (1952) lead to similar conclusions on their own.

The effects of the Tarascan empire on trade are relevant to the patterns of Pachuca obsidian distribution in Michoacan. Tzintzuntzan and Villa Morelos, both included in that empire, have very small amounts of green obsidian, while Azpatzingan, a far more distant site *not* part of the Tarascan domain (Chadwick 1971:686), has large quantities of green obsidian (Table 3). The Tarascan state relied upon obsidian from the Zinapecuaro source area, which is located in Tarascan territory (Figure 4). At Villa Morelos, 96% of the sourced obsidian (96 out of 100 artifacts) is from Zinapecuaro (Hester, Jack, and Benfer 1973), while Azpatzingan has only 1 of 17 artifacts from the Tarascan source.

It is interesting to note that the Aztec/Tarascan frontier was not impermeable to trade. Gorenstein (1985:104ff) comments on possible exchange activities between groups on opposite sides of the frontier, and obsidian took part in this trade. In addition to Pachuca obsidian at Tarascan sites (Table 3), Zinapecuaro

material was recovered in Late Postclassic contexts at Xochicalco and El Ciruelo in western Morelos (Smith, Sorensen, and Hopke 1984). The vast majority of the obsidian at a workshop at El Ciruelo is green, but 6 out of the 7 gray artifacts sourced from the workshop pertain to Zinapécuaro (Smith, Sorensen, and Hopke 1984). However, this is the only known example of Zinapécuaro obsidian outside of the Tarascan zone in the Late Postclassic period (D. Healan, personal communication), a situation in contrast to earlier periods when this material was quite widespread in Mesoamerica. Zinapécuaro material was even traded as far as Yucatan in the Early–Middle Postclassic (Nelson 1985). This suggests that the Morelos situation may represent an anomaly, and that Tarascan/Aztec hostilities may have drastically reduced the distribution of Zinapécuaro obsidian outside of Michoacan. It is probably significant that Aztec ceramics have not been reported from Tarascan sites (Moedano 1941, 1946).

## CONCLUSIONS

### The High Volume of Trade in the Late Postclassic Period

The transition from the Middle Postclassic period (post-Toltec, pre-Mexica; ca. A.D. 1150–1350) to the Late Postclassic witnessed a dramatic increase in exchange between the Basin of Mexico and other parts of Mesoamerica. The quite extensive distributions of Late Aztec ceramics and obsidian documented here contrast strongly with the situation in the Middle Postclassic. Early Aztec (Middle Postclassic) ceramics are rarely found outside of the Basin of Mexico (see Parsons 1966:398–447), although the common type Aztec I Black-on-Orange (Griffin and Espejo 1950) participated in a wider zone of stylistic interaction. There are ceramics identical to Aztec I in form and decoration, but with a coarser, softer, non-Aztec paste; these ceramics are found in Middle Postclassic contexts in Morelos and southern Puebla where they are termed “Morelos-Puebla Black-on-Orange” (Smith 1983:407–410; see also Plunkett 1989). In the case of obsidian, a number of authors have noted a dramatic increase in the occurrence of green obsidian in the Late Postclassic period relative to earlier times (e.g., Clark, Lee, and Salcedo 1989; Nelson 1985; Smith, Sorensen, and Hopke 1984; Stark 1990).

The data presented in this article point strongly to independent merchants and market systems as the mechanisms by which Aztec ceramics and other goods were moved to distant areas. The widespread distribution of Aztec ceramics (Figure 1), including enemy areas never conquered by the Aztecs, suggests the activity of merchants independent of state control. The use of these objects by most households, both elite and commoner, is an indication of market distribution (Hirth 1990), and the exponential falloff curves provide additional support for this interpretation. The lack of a direct association between ceramic exchange and Aztec imperialism is shown by the widespread trade both before and after the formation of the empire. In light of these patterns, we may posit a relationship between the increase in archaeological evidence for long-distance trade between Middle and Late Postclassic times and the growth of market systems and independent trade as documented by ethnohistory (Berdan 1978, 1985; Isaac 1986).

The growth of market systems and market exchange is stimulated primarily by the “bottom-up” forces of population growth and production intensification and secondarily by “top-

down” forces like political centralization and an expanding elite (Blanton 1983), and both sets of factors were prevalent in Postclassic central Mexico. Demographic increase and agricultural intensification were significant processes in the Basin of Mexico, Morelos, and other areas (Sanders, Parsons, and Santley 1979; Smith 1990), and city-states with hereditary elites were expanding all over northern Mesoamerica (Charlton and Nichols 1987; Hodge 1985; Smith 1986). These processes were operating throughout central Mexico, but one area—the Basin of Mexico—achieved a significant demographic and politico-economic advantage over other areas, leading to imperialistic expansion and the nucleated spatial pattern of long-distance trade noted earlier. These processes had reached critical levels by the start of the Late Postclassic (well before the formation of the Aztec empire), and they are therefore more relevant to the explanation of the volume of Late Postclassic trade than are the ethnohistorically documented effects of Aztec imperialism.

### The Relationship between Archaeology and Ethnohistory

The most common approach to the joint use of archaeology and ethnohistory in the study of contact-period populations in Mesoamerica is to set up models and hypotheses based upon ethnohistory and then use archaeology to evaluate and extend these models. While this method has generated much useful work (e.g., Brumfiel 1987a; Byland 1980; Gorenstein 1973; Mason 1980), it assigns ethnohistory an epistemological and procedural priority over archaeology, and as a result it can place limitations on the scope of archaeological research and explanation. An alternative approach gives archaeology and ethnohistory equivalent status in the investigation of the past. The archaeological and ethnohistorical records are first analyzed separately to yield their own conclusions before correlation is attempted (Charlton 1981; Pasztor 1987; Smith 1987a, 1990; South 1977).

In this view, the only justification for the predominant role that ethnohistory has played in Aztec studies is the abundance of data. However, now that archaeology is gaining a foothold in the analysis of conquest-period societies, we must insist upon its independence of, and epistemological equivalence to, ethnohistory. This is an empirical as well as a conceptual issue—we need more excavation of Late Postclassic sites to provide adequate contextual and quantified data so that archaeology can reach its potential in the study of Postclassic Mesoamerica. This article suggests some of the potential of Late Postclassic archaeological data in their own terms, while at the same time the analysis indicates the clear need for more archaeological data and higher quality data for studies of Late Postclassic economics.

In conclusion, there were a number of fundamental processes of socioeconomic change occurring in Postclassic central Mexico, including population increase, the spread of city-states, the development of elite networks, and a major intensification of political and economic evolution in the Basin of Mexico (Smith 1986:82, 1990). These processes produced both the political/territorial configuration known through ethnohistory as the Aztec empire, and an economic configuration known through archaeology and documented in this article. Rather than using the ethnohistoric record to explain the archaeological record (or vice versa), we need to use *both* sets of data to document and explain the socioeconomic processes that shaped the Mesoamerican past.

## SUMARIO

Este artículo discute datos arqueológicos sobre el intercambio de larga distancia en la época Postelásico Tardío en las áreas norte y central de la Mesoamérica. Artefactos Aztecos de la Cuenca de México (cerámica y obsidiana) muestran una distribución amplia, pero artefactos de otras áreas son menos comunes en la cuenca y en otras regiones. Estos datos indican un nivel alto de intercambio en el Postelásico Tardío.

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Aunque los patrones espaciales de este comercio era nucleado alrededor de la Cuenca de México, parece que la mayoría del intercambio no era bajo un control administrativo fuerte. Se comparan los resultados arqueológicos con fuentes etnohistóricas para avanzar el conocimiento de los mecanismos de comercio, los efectos del elite sobre el intercambio, y las relaciones entre el intercambio y el imperialismo.

## REFERENCES

- Acosta, Jorge R.  
1956–1957 Interpretación de algunos de los datos obtenidos en Tula relativos a la época tolteca. *Revista Mexicana de Estudios Antropológicos* 14:75–110.
- Ahuja O., Guillermo  
1982 La cerámica prehispánica en el Templo Mayor. In *El Templo Mayor: Excavaciones y estudios*, edited by Eduardo Matos Moctezuma, pp. 245–252. Instituto Nacional de Antropología e Historia, Mexico City.
- Anderson, Arthur J.O., Frances Berdan, and James Lockhart  
1976 *Beyond the Codices: The Nahuatl View of Colonial Mexico*. University of California Press, Berkeley.
- Barlow, Robert H.  
1948 Tres complejos de cerámica del norte del río Balsas. In *El occidente de México, 4th Mesa Redonda*, pp. 180–190. Sociedad Mexicana de Antropología, Mexico City.
- 1949 *The Extent of the Empire of the Culhua Mexica*. Ibero-Americana, no. 28, Berkeley.
- Berdan, Frances F.  
1978 Ports of Trade in Mesoamerica: A Reappraisal. In *Cultural Continuity in Mesoamerica*, edited by David Browman, pp. 179–198. Mouton, The Hague.
- 1982 *The Aztecs of Central Mexico: An Imperial Society*. Holt, Rinehart and Winston, New York.
- 1985 Markets in the Economy of Aztec Mexico. In *Markets and Marketing*, edited by Stuart Plattner, pp. 339–367. University Press of America, Lanham.
- 1987a *Political and Economic Geography of the Eastern Aztec Realm*. Paper presented at the 86th Annual Meeting of the American Anthropological Association, Chicago.
- 1987b The Economics of Aztec Luxury Trade and Tribute. In *The Aztec Temple Mayor*, edited by Elizabeth H. Boone, pp. 161–183. Dumbarton Oaks, Washington, DC.
- 1987c Cotton in Aztec Mexico: Production, Distribution, and Uses. *Mexican Studies/Estudios Mexicanos* 3:235–262.
- Berlin, Heinrich  
1956 *Late Pottery Horizons of Tabasco, Mexico*. Contributions to American Anthropology and History, vol. 12, no. 59. Carnegie Institution of Washington, Washington, DC.
- Bernal, Ignacio  
1948–1949 Exploraciones en Coixtlahuaca, Oaxaca. *Revista Mexicana de Estudios Antropológicos* 10:5–76.
- Blake, Michael  
1985 *Canajasté: An Evolving Postclassic Maya Site*. Unpublished doctoral dissertation, Department of Anthropology, University of Michigan, University Microfilms, Ann Arbor.
- Blanton, Richard E.  
1978 *Monte Alban: Settlement Patterns at the Ancient Zapotec Capitol*. Academic Press, New York.
- Elizabeth Boone, Mary Hodge, and Emily Umberger. David Freidel, Kenneth Hirth, Donald McVicker, Jerrel Sorensen, Barbara Stark, and Emily Umberger kindly provided unpublished data and/or papers used in this article. Cynthia Heath-Smith and two anonymous referees made helpful comments on an earlier draft of this article. Figure 3 was produced by the Loyola University Center for Instructional Design, which also aided in the production of the other figures.
- 1983 Factors Underlying the Origin and Evolution of Market Systems. In *Economic Anthropology: Topics and Theories*, edited by Sutti Ortiz, pp. 51–66. University Press of America, Lanham, MD.
- 1987 *A Comparative Political Economy of Empires*. Paper presented at the 86th Annual Meeting of the American Anthropological Association, Chicago.
- Blanton, Richard E., and Gary Feinman  
1984 The Mesoamerican World System. *American Anthropologist* 86:673–682.
- Bray, Warwick  
1977 Maya Metalwork and Its External Connections. In *Social Process in Maya Prehistory*, edited by Norman Hammond, pp. 365–404. Academic Press, New York.
- Brumfiel, Elizabeth  
1976 *Specialization and Exchange at the Late Postclassic (Aztec) Community of Huexotla, Mexico*. Unpublished doctoral dissertation. Department of Anthropology, University of Michigan, University Microfilms, Ann Arbor.
- 1987a Elite and Utilitarian Crafts in the Aztec State. In *Specialization, Exchange, and Complex Societies*, edited by Elizabeth M. Brumfiel and Timothy K. Earle, pp. 102–118. Cambridge University Press, New York.
- 1987b Consumption and Politics at Aztec Huexotla. *American Anthropologist* 89:676–686.
- Byland, Bruce E.  
1980 *Political and Economic Evolution in the Tamazulapan Valley, Mixteca Alta, Oaxaca, Mexico*. Unpublished doctoral dissertation. Department of Anthropology, Pennsylvania State University, University Park. University Microfilms, Ann Arbor.
- Cabrera Castro, Rubén  
1986 El proyecto arqueológico “Cocula.” Resultados generales. In *Arqueología y etnohistoria del estado de Guerrero*, pp. 173–200. Instituto Nacional de Antropología e Historia, Mexico City.
- Chadwick, Robert  
1971 Archaeological Synthesis of Michoacan and Adjacent Regions. In *Archaeology of Northern Mesoamerica*, part 2, edited by Gordon F. Ekholm and Ignacio Bernal, pp. 657–693. *Handbook of Middle American Indians*, vol. 11. University of Texas Press, Austin.
- Charlton, Thomas H.  
1969 Texcoco Fabric-Marked Pottery, Tlaxteles, and Salt-Making. *American Antiquity* 34:73–76.
- 1981 Archaeology, Ethnohistory, and Ethnology: Interpretive Interfaces. *Advances in Archaeological Method and Theory* 4:129–176.
- Charlton, Thomas H., and Deborah L. Nichols  
1987 *Late Postclassic and Colonial Period Elites at Otumba, Mex-*

- ico. Paper presented at the 86th Annual Meeting of the American Anthropological Association, Chicago.
- Charlton, Thomas H., and Michael W. Spence  
1982 Obsidian Exploitation and Civilization in the Basin of Mexico. In *Mining and Mining Techniques in Ancient Mesoamerica*, edited by Phil C. Weigand and Gretchen Gwynne, pp. 7–86. *Anthropology* 6(1/2).
- Chase, Diane Z.  
1985 Ganned but Not Forgotten: Late Postclassic Archaeology and Ritual at Santa Rita Corozal, Belize. In *The Lowland Maya Postclassic*, edited by Arlen F. Chase and Prudence M. Rice, pp. 104–125. University of Texas Press, Austin.
- Clark, John E., Thomas A. Lee, Jr., and Tamara Salcedo  
1989 The Distribution of Obsidian. In *Ancient Trade and Tribute: Economies of the Soconusco Region of Mesoamerica*, edited by Barbara Voorhies, pp. 268–284. University of Utah Press, Salt Lake City.
- Codex Mendoza  
1980 *Colección de Mendoza o Códice Mendocino*, edited by Francisco del Paso y Troncoso. Editorial Innovación, Mexico City. (Reprint of 1925 edition)
- Díaz del Castillo, Bernal  
1983 *Historia verdadera de la conquista de la Nueva España*. 13th ed., edited by Joaquín Ramírez Cabañas. Editorial Porrúa, Mexico City.
- Drennan, Robert D.  
1984a Long-Distance Transport Costs in Pre-Hispanic Mesoamerica. *American Anthropologist* 86:105–112.  
1984b Long-Distance Movement of Goods in the Mesoamerican Formative and Classic. *American Antiquity* 49:27–43.
- DuSolier, Wilfrido  
1949 Cerámica arqueológica de San Cristóbal Ecatepec. *Anales del Instituto Nacional de Antropología e Historia* 3:27–57.
- Earle, Timothy K., and Jonathon E. Ericson (eds.)  
1977 *Exchange Systems in Prehistory*. Academic Press, New York.
- Freidel, David A., and Payson D. Sheets  
1990 Obsidian in the Maya Lowlands: Utilitarian Luxury or Ritual Necessity. In *Pathways to Power: New Models for the Political Economy of Pre-Columbian Politics*, edited by Patricia Netherly and David A. Freidel. Unpublished manuscript.
- Galván Villegas, Luis Javier  
1974–1975 *La arqueología del Valle de Malinalco*. 2 vols. Professional thesis, Escuela Nacional de Antropología e Historia, Mexico City.  
1984 *Aspectos generales de la arqueología de Malinalco, estado de México*. Instituto Nacional de Antropología e Historia, Colección Científica, no. 137, Mexico City.
- García Payón, José  
1956–1957a Síntesis de las investigaciones estratigráficas practicadas en Tecaxic-Calixtlahuaca. *Revista Mexicana de Estudios Antropológicos* 14(2):157–159.  
1956–1957b Síntesis de las excavaciones en Malinalco. *Revista Mexicana de Estudios Antropológicos* 14(2):161–165.  
1971 Archaeology of Central Veracruz. In *Archaeology of Northern Mesoamerica*, part 2, edited by Gordon F. Ekholm and Ignacio Bernal, pp. 505–542. *Handbook of Middle American Indians*, vol. 11. University of Texas Press, Austin.
- González González, Carlos J.  
1987 Mezcala Style Anthropomorphic Artifacts in the Templo Mayor. In *The Aztec Templo Mayor*, edited by Elizabeth H. Boone, pp. 145–160. Dumbarton Oaks, Washington, DC.
- Gorenstein, Shirley  
1973 Tepexi El Viejo: A Postclassic Fortified Site in the Mixteca-Puebla Region of Mexico. *American Philosophical Society, Transactions* 63(1).
- 1985 Acámbaro: Frontier Settlement on the Tarascan-Aztec Border. *Vanderbilt University Publications in Anthropology*, no. 32.
- Greengo, Robert E.  
1971 *Late Ceramic Complexes in Northeastern Guerrero, Mexico*. Paper presented at the 36th Annual Meeting of the Society for American Archaeology.
- Griffin, James B., and Antonieta Espejo  
1950 La alfarería del último período de ocupación del valle de México, I: Culhuacan, Tenayuca, Tenochtitlan, y Tlatelolco. *Memorias de la Academia Mexicana de la Historia* 9(1):118–169.
- Healan, Dan M.  
1986 Technological and Nontechnological Aspects of an Obsidian Workshop Excavated at Tula, Hidalgo. In *Economic Aspects of Prehispanic Highland Mexico*, edited by Barry L. Isaac, pp. 133–152. Research in Economic Anthropology, supplement no. 2. JAI Press, Greenwich, CT.
- Hester, Thomas R., Robert N. Jack, and Alice Benfer  
1973 Trace Element Analysis of Obsidian from Michoacan, Mexico: Preliminary Results. *University of California Archaeological Research Facility, Contributions*, no. 18:167–176.
- Hirth, Kenneth G. (ed.)  
1984 *Trade and Exchange in Early Mesoamerica*. University of New Mexico Press, Albuquerque.  
1990 *Ancient Urbanism at Xochicalco*. Book in preparation.
- Hodge, Mary  
1985 Aztec City-States. *University of Michigan, Museum of Anthropology, Memoirs*, no. 18.
- Hopkins, Keith  
1978 Economic Growth and Towns in Classical Antiquity. In *Towns in Societies*, edited by Philip Abrams and E.A. Wrigley, pp. 35–77. Cambridge University Press, Cambridge.
- Hosler, Dorothy  
1988 Ancient West Mexican Metallurgy: A Technological Chronology. *Journal of Field Archaeology* 15:191–217.
- Isaac, Barry L.  
1986 Notes on Obsidian, the Pochteca, and the Position of Tlatelolco in the Aztec Empire. In *Economic Aspects of Prehispanic Highland Mexico*, edited by Barry L. Isaac, pp. 319–343. Research in Economic Anthropology, Supplement no. 2. JAI Press, Greenwich, CT.
- Jack, Robert N., Thomas R. Hester, and Robert F. Heizer  
1972 Geological Sources of Archaeological Obsidian from Sites in Northern and Central Veracruz, Mexico. In *University of California Archaeological Research Facility, Contributions*, no. 16:117–122.
- Lewarch, Dennis E.  
1980 A Late Postclassic Lithic Industry from Western Morelos. *Lithic Technology* 9:10–11.
- Lind, Michael  
1987 The Sociocultural Dimensions of Mixtec Ceramics. *Vanderbilt University Publications in Anthropology*, no. 33.
- Lister, Robert H.  
1947 An Archaeological Survey of the Region About Tloloapan, Guerrero. In *El occidente de México, 4th Mesa Redonda*, pp. 107–122. Sociedad Mexicana de Antropología, Mexico City.  
1949 Excavations at Cozumel, Michoacan, Mexico. *University of New Mexico Publications in Anthropology*, no. 5.  
1971 Archaeological Synthesis of Guerrero. In *Archaeology of Northern Mesoamerica*, part 2, edited by Gordon F. Ekholm and Ignacio Bernal, pp. 619–631. *Handbook of Middle American Indians*, vol. 11. University of Texas Press, Austin.
- MacNeish, Richard S., F.A. Peterson, and Kent V. Flannery  
1970 *The Prehistory of the Tehuacan Valley*, vol. 3, *Ceramics*. University of Texas Press, Austin.
- McVicker, Donald  
1987 *The Twentieth-Century Value of a Nineteenth Century Collection*. Paper presented at the 86th Annual Meeting of the American Anthropological Association, Chicago.
- Mason, Roger D.  
1980 *Economic and Social Organization of an Aztec Provincial Center: Archaeological Research at Coatlan Viejo, Morelos, Mexico*. Unpublished doctoral dissertation, Department of Anthropology, University of Texas, Austin. University Microfilms, Ann Arbor.
- Mateos Higuera, Salvador  
1979 Herencia arqueológica de México-Tenochtitlan. In *Trabajos arqueológicos en el centro de la ciudad de México*, edited by Eduardo Matos Moctezuma, pp. 205–275. Instituto Nacional de Antropología e Historia, Mexico City.
- Matos Moctezuma, Eduardo (ed.)  
1982 *El Templo Mayor: Excavaciones y estudios*. Instituto Nacional de Antropología e Historia, Mexico City.
- Medellín Zenil, Alfonso  
1952 *Exploraciones de Quauhtochco*. Gobierno del Estado de Veracruz, Jalapa.

- 1960 *Cerámicas del Totonacapan*. Universidad Veracruzana, Jalapa.
- Moedano, Hugo
- 1941 Estudio preliminar de la cerámica de Tzintzuntzan: Temporada II, 1939–1940. *Revista Mexicana de Estudios Antropológicos* 5:21–42.
- 1946 La cerámica de Zinapécuaro, Michoacan. *Anales del Museo Michoacano* 4:39–49.
- Muller, Florencia
- 1956–1957 El valle de Tulancingo. *Revista Mexicana de Estudios Antropológicos* 14(2):129–137.
- 1978 *La alfarería de Cholula*. Instituto Nacional de Antropología e Historia, Mexico City.
- 1979 *Estudio tipológico provisional de la cerámica del Balsas medio*. Instituto Nacional de Antropología e Historia, Colección Científica, no. 78, Mexico City.
- Nelson, Fred W.
- 1985 Summary of the Results of Analysis of Obsidian Artifacts from the Maya Lowlands. *Scanning Electron Microscopy* 2:631–649.
- O'Neill, George C.
- 1962 *Postclassic Ceramic Stratigraphy at Chalco in the Valley of Mexico*. Unpublished doctoral dissertation, Department of Anthropology, Columbia University, New York. University Microfilms, Ann Arbor.
- Parsons, Jeffrey R.
- 1966 *The Aztec Ceramic Sequence in the Teotihuacan Valley, Mexico*. 2 vols. Unpublished doctoral dissertation, Department of Anthropology, University of Michigan, University Microfilms, Ann Arbor.
- Parsons, J., E. Brumfiel, M. Parsons, V. Popper, and M. Taft
- 1982 *Late Prehispanic Chinampa Agriculture on Lake Chalco—Xochimilco, Mexico: Preliminary Report*. Unpublished report submitted to the National Science Foundation, Ann Arbor.
- Parsons, Mary H.
- 1972 Spindle Whorls from the Teotihuacan Valley, Mexico. In *Miscellaneous Studies in Mexican Prehistory* by M.W. Spence, J.R. Parsons and M.H. Parsons, pp. 45–80. *University of Michigan, Museum of Anthropology, Anthropological Papers*, no. 45, Ann Arbor.
- Pasztor, Esther
- 1987 Texts, Archaeology, Art, and History in the Templo Mayor: Reflections. In *The Aztec Templo Mayor*, edited by Elizabeth H. Boone, pp. 451–462. *Dumbarton Oaks*, Washington, DC.
- Pendergast, David M.
- 1962 Metal Artifacts in Prehispanic Mesoamerica. *American Antiquity* 27:520–545.
- Plog, Fred
- 1977 Modeling Economic Exchange. In *Exchange Systems in Prehistory*, edited by Timothy K. Earle and Jonathon E. Ericson, pp. 127–140. Academic Press, New York.
- Plunket, Patricia
- 1989 *La población del valle de Atlizco: Fronteras cerámicas del Postclásico*. Paper presented at the 21st Annual Mesa Redonda, Sociedad Mexicana de Antropología, Mérida, Yucatan.
- Proskouriakoff, Tatiana
- 1962 The Artifacts of Mayapan. In *Mayapan, Yucatan, Mexico*, edited by H.E.D. Pollock et al., pp. 321–442. Carnegie Institution of Washington, pub. 619.
- Renfrew, Colin
- 1975 Trade as Action at a Distance: Questions of Integration and Communication. In *Ancient Civilization and Trade*, edited by Jeremy A. Sabloff and C.C. Lamberg-Karlovsky, pp. 3–59. University of New Mexico Press, Albuquerque.
- 1977 Alternative Models for Exchange and Spatial Distribution. In *Exchange Systems in Prehistory*, edited by Timothy K. Earle and Jonathon E. Ericson, pp. 71–90. Academic Press, New York.
- Rice, Prudence M.
- 1983 Serpents and Styles in Peten Postclassic Pottery. *American Anthropologist* 85:866–880.
- 1984 Obsidian Procurement in the Central Peten Lakes Region, Guatemala. *Journal of Field Archaeology* 11:181–194.
- Rodríguez Betancourt, Felipe
- 1986 Desarrollo cultural en la región de Mezcala-Tetela del Río. In *Arqueología y etnohistoria del estado de Guerrero*, pp. 155–170. Instituto Nacional de Antropología e Historia, Mexico City.
- Sahagún, Fray Bernardino de
- 1950–1982 *Florentine Codex, General History of the Things of New Spain*. 12 Books. Edited and translated by A.J.O. Anderson and C.E. Dibble. School of American Research, Santa Fe and University of Utah, Salt Lake City. (First published in 1569.)
- Sanders, William T., Jeffrey R. Parsons, and Robert S. Santley
- 1979 *The Basin of Mexico: Ecological Processes in the Evolution of a Civilization*. Academic Press, New York.
- Sanders, William T., and Robert S. Santley
- 1983 A Tale of Three Cities: Energetics and Urbanization in Pre-Hispanic Central Mexico. In *Prehistoric Settlement Patterns: Essays in Honor of G.R. Willey*, edited by Evon Z. Vogt and Richard Leventhal, pp. 243–291. University of New Mexico Press, Albuquerque.
- Santley, Robert S.
- 1983 Obsidian Trade and Teotihuacán Influence in Mesoamerica. In *Highland-Lowland Interaction in Mesoamerica: Interdisciplinary Approaches*, edited by Arthur G. Miller, pp. 69–124. *Dumbarton Oaks*, Washington, DC.
- Schele, Linda
- 1984 Human Sacrifice among the Classic Maya. In *Ritual Human Sacrifice in Mesoamerica*, edited by Elizabeth H. Boone, pp. 7–48. *Dumbarton Oaks*, Washington DC.
- Schmidt, Paul
- 1986 Secuencia arqueológica de Xochipala. In *Arqueología y etnohistoria del estado de Guerrero*, pp. 107–117. Instituto Nacional de Antropología e Historia, Mexico City.
- Séjourné, Laurette
- 1970 *Arqueología del valle de México, I: Culhuacan*. Instituto Nacional de Antropología e Historia, Mexico City.
- 1983 *Arqueología e historia del valle de México: De Xochimilco a Amecameca*. Siglo Veintiuno, Mexico City.
- Sheets, Payson D.
- 1978 Artifacts. In *The Prehistory of Chalchuapa, El Salvador*, vol. 2, *Artifacts and Figurines*, edited by Robert Sharer, pp. 2–107. University of Pennsylvania Press, Philadelphia.
- Sisson, Edward B.
- 1973 *First Annual Report of the Coxcatlan Project*. Robert S. Peabody Foundation for Archaeology, Andover, MA.
- 1974 *Second Annual Report of the Coxcatlan Project*. Robert S. Peabody Foundation for Archaeology, Andover, MA.
- 1984 *Archaeological Evidence for Aztec Expansion in Southern Puebla and Northern Oaxaca*. Paper presented at the 1984 Annual Meeting, American Society for Ethnohistory, New Orleans.
- Smith, Michael E.
- 1983 *Postclassic Culture Change in Western Morelos, Mexico: The Development and Correlation of Archaeological and Ethnohistorical Chronologies*. Unpublished doctoral dissertation, Department of Anthropology, University of Illinois, Urbana. University Microfilms, Ann Arbor.
- 1986 The Role of Social Stratification in the Aztec Empire: A View from the Provinces. *American Anthropologist* 88:70–91.
- 1987a The Expansion of the Aztec Empire: A Case Study in the Correlation of Diachronic Archaeological and Ethnohistorical Data. *American Antiquity* 52:37–54.
- 1987b *Imperial Strategies in the Western Portion of the Aztec Empire*. Paper presented at the 86th Annual Meeting of the American Anthropological Association, Chicago.
- 1987c Household Possessions and Wealth in Agrarian States: Implications for Archaeology. *Journal of Anthropological Archaeology* 6:297–335.
- 1987d Archaeology and the Aztec Economy: The Social Scientific Use of Archaeological Data. *Social Science History* 11:237–259.
- 1990 Rhythms of Change in Postclassic Central Mexico: Archaeology, Ethnohistory, and the Braudellian Model. To appear in *Anales, Archaeology, and Ethnohistory*, edited by A. Bernard Knapp. Cambridge University Press, New York.
- Smith, Michael E., and Cynthia Heath-Smith
- 1980 Waves of Influence in Postclassic Mesoamerica? A Critique of the Mixteca-Puebla Concept. *Anthropology* 4(2):15–50.
- Smith, Michael E., and Kenneth G. Hirth
- 1988 The Development of Cotton Spinning Technology in Postclassic Morelos, Mexico. *Journal of Field Archaeology* 15:349–358.
- Smith, Michael E., Jerrel H. Sorensen, and Philip K. Honke.



- 1984 *Obsidian Exchange in Postclassic Central Mexico: New Data from Morelos*. Paper presented at the 1984 International Symposium on Archaeometry, Washington, DC.
- Smith, Michael E., et al.  
1989 Architectural Patterns at Three Aztec Period Sites in Morelos, Mexico. *Journal of Field Archaeology* 16:185-203.
- Snow, Dean R.  
1966 *Seriation of Archaeological Collections from the Rio Zahuapan Drainage*. Unpublished doctoral dissertation, Department of Anthropology, University of Oregon, Eugene. University Microfilms, Ann Arbor.
- South, Stanley  
1977 *Method and Theory in Historical Archaeology*. Academic Press, New York.
- Spence, Michael W.  
1985 Specialized Production in Rural Aztec Society: Obsidian Workshops of the Teotihuacan Valley. In *Contributions to the Archaeology and Ethnohistory of Greater Mesoamerica*, edited by William J. Folan, pp. 76-125. Southern Illinois Press, Carbondale.
- Spence, Michael W., and Jeffrey R. Parsons  
1972 Prehispanic Obsidian Exploitation in Central Mexico: A Preliminary Synthesis. In *Miscellaneous Studies in Mexican Prehistory*, by M.W. Spence, J.R. Parsons, and M.H. Parsons, pp. 1-43. *University of Michigan Museum of Anthropology, Anthropological Papers*, no. 45, Ann Arbor.
- Stark, Barbara L.  
1990 The Central Highlands of Mexico and the Gulf Coast: Alternative Material Culture Models for Interaction. *Research in Economic Anthropology*, edited by Barry L. Isaac. JAI Press, Greenwich, CT. (in preparation)
- Stocker, Terence L., and Robert H. Cobean  
1984 Preliminary Report on the Obsidian Mines at Pico de Orizaba, Veracruz. In *Prehistoric Quarries and Lithic Production*, edited by Jonathan E. Ericson and Barbara A. Purdy, pp. 83-95. Cambridge University Press, New York.
- Szymborski, Deborah J.  
1987 *Ground Stone Analysis*. Unpublished senior thesis, Department of Sociology and Anthropology, Loyola University of Chicago.
- Thouvenot, Marc  
1982 *Chalchihuitl: Le jade chez les Aztèques*. Institut d'Ethnologie, Paris.
- Tolstoy, Paul  
1958 Surface Survey of the Northern Valley of Mexico: The Classic and Post-Classic Periods. *American Philosophical Society, Transactions*, vol. 48, no. 5.
- Torquemada, Fray Juan de  
1975-1983 *Monarquía indiana*. 7 vols. Edited by Miguel León-Portilla. Universidad Nacional Autónoma de México, Mexico City.
- Umberger, Emily  
1987a Antiques, Revivals, and References to the Past in Aztec Art. *Res* 13:62-105.  
1987b *Style in the Aztec Empire*. Paper presented at the 86th Annual Meeting of the American Anthropological Association, Chicago.
- van Zantwijk, Rudolf A.M.  
1967 La organización de once guarniciones aztecas: Una nueva interpretación de los folios 17v y 18r del Códice Mendocino. *Journal de la Société des Americanistes de Paris* 56:149-160.
- Vargas Pacheco, Ernesto  
1975 La cerámica. In *Teotenango: El antiguo lugar de la muralla*, vol. 1, edited by Román Piña Chán, pp. 189-264. Gobierno del Estado de México, Mexico City.
- Wagner, Diana  
1982 Reporte de las ofrendas excavadas, 1978. In *El Templo Mayor: Excavaciones y estudios*, edited by Eduardo Matos Moctezuma, pp. 119-142. Instituto Nacional de Antropología e Historia, Mexico City.
- Weigand, Phil C., Garman Harbottle, and Edward V. Sayre  
1977 Turquoise Sources and Source Analysis: Mesoamerica and the Southwestern USA. In *Exchange Systems in Prehistory*, edited by Timothy K. Earle and Jonathon E. Ericson, pp. 15-34. Academic Press, New York.
- Weitlaner, Robert J.  
1948 Exploración arqueológica en Guerrero. In *El occidente de México, 4th Mesa Redonda*, pp. 77-84. Sociedad Mexicana de Antropología, Mexico City.
- Wonderly, Anthony  
1986 Naco, Honduras: Some Aspects of a Late Precolumbian Community on the Eastern Maya Frontier. In *The Southeast Maya Periphery*, edited by Patricia Urban and Edward Schortman, pp. 313-332. University of Texas Press, Austin.
- Woodbury, Richard B., and Aubrey S. Trik  
1953 *The Ruins of Zaculeu, Guatemala*. 2 vols. United Fruit Company, New York.
- Zeitlin, Robert N.  
1982 Toward a More Comprehensive Model of Interregional Commodity Distribution: Political Variables and Prehistoric Obsidian Procurement in Mesoamerica. *American Antiquity* 47:260-275.