

## PLUMBATE ORIGINS AND DEVELOPMENT

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*The question of spatial and temporal origins for Plumbate ware is addressed with archaeological evidence from the eastern Soconusco region of the Pacific slope, and evidence from a recent stylistic and compositional study (the latter by neutron-activation analysis). This evidence confirms the Pacific coastal-origins hypothesis proposed by Shepard (1948), suggesting specifically that the first Plumbate, designated "Guayabal Plumbate," was produced in or near the littoral zone of southwest Guatemala. The development of Early Postclassic Tohil Plumbate out of Late Classic San Juan Plumbate is found not to involve a hypothesized intermediate stage (designated "Robles" in previous literature). The fancy abstract-incised and effigy style associated with Tohil Plumbate is argued to represent a stylistic departure of a small group of ceramic artisans who previously had worked in a long-lived "background" tradition.*

Scholarly interest in mesoamerican Plumbate ware dates to 1840, when Stevens and Catherwood extracted a complete Tohil Plumbate lamp chimney from a tomb at Zaculeu, in the western highlands of Guatemala (Dutton 1943). Initially, interest in the ware centered on its unique technological qualities, especially the very hard, apparently glazed surface. During the early twentieth century, questions about temporal and spatial origins occupied the minds of scholars familiar with the extremely wide distribution of Plumbate finds (e.g., Dutton 1943; Saville 1916; Spinden 1915; Vaillant 1927). A seminal monograph by Shepard (1948) answered many questions related both to technology and culture history, but Shepard was careful to point out that numerous questions remained unanswerable until further excavations and technical and stylistic studies had been completed. The purpose of the present article is to disseminate information about Plumbate which has come to light since the publication of Shepard's work.

Considering the importance attached to Plumbate as a chronological diagnostic and as an indicator of specialization and commercialization during the Late Classic and Early Postclassic periods (e.g., Lee 1978; Webb 1973), the new information should contribute to a better understanding of the development of mesoamerican society. In this paper, we will not deal explicitly with the implications of our data for issues relating to societal development. Instead, we will address two rather specific culture-historical questions which may have an important bearing on ensuing discussions of the broader issues.

The two culture-historical questions we will address are: (1) where and when did Plumbate originate? and (2) given that the widely traded Tohil variety stylistically is distinct from earlier San Juan Plumbate, what length of time and what circumstances might have attended the transition between the two varieties? Both these questions have been discussed in previous literature.

The new data on Plumbate origins and development derive from archaeological investigations carried out on the Pacific slope of Mesoamerica since the 1940s and from a recent stylistic and chemical-compositional study undertaken by the authors. A detailed account of this research is presented in Neff (1984), but also see Neff (1987a, 1987b).

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## PLUMBATE ORIGINS

Shepard's (1948) inferences regarding Plumbate origins provide a logical point of departure for a discussion of more recent findings. To Shepard, the unusual paste composition (a distinctive, andesitic, volcanic-ash temper) combined with inferred special pyrotechnology constituted persuasive circumstantial evidence that Plumbate originated from a single source. In particular, she was convinced (Shepard 1948:115–132, 145) by survey and excavation data that the Plumbate production center or centers were on the Pacific slope of southern Mesoamerica, near the present Mexico–Guatemala border (Figure 1). Shepard's work did not deal explicitly with chronological origins, but she summarized excavation data from Kaminaljuyu (Kidder et al. 1946), El Baul (Thompson 1948), and Tajumulco (Dutton and Hobbs 1943) which indicated a Late Classic period placement for San Juan and an Early Postclassic period placement for Tohil Plumbate. Thus, Plumbate was thought by Shepard and her contemporaries to have originated on the Pacific slope of southern Mexico or southwestern Guatemala sometime during or prior to the Late Classic period.

By and large, Shepard's inferences about Plumbate origins have been confirmed by excavations and surveys undertaken on the Pacific coastal plain of Chiapas and Guatemala since the 1940s (Coe 1961; Coe and Flannery 1967; Drucker 1948; Dutton 1958; Kidder and Shook 1959; Lee 1973, 1978; Lowe et al. 1982; Lowe and Mason 1965; Neff 1984; Parsons 1967; Rands and Smith 1965; Shook 1947, 1965). The abundance of Plumbate at Late Classic sites near the Chiapas–Guatemala border, especially at Santa Romelia (Figure 2), led Shook (1965:190) to suggest that Plumbate production centers probably were located within a 20-km radius of Santa Romelia. Shook (personal communication 1981) also observed a subterranean feature during road grading at the site of La Blanca (Figure 2) which he interpreted as a primitive kiln. As at most sites on this part of the coastal plain, abundant Plumbate sherds were found associated with the feature, leading to speculation that the road grading may have unearthed a Plumbate production locus. Unfortunately, the grading also removed the feature and associated artifacts before Shook was able to make a careful study of them.

The only scholar to have questioned seriously the hypothesis of a southwest Guatemalan or southern Chiapan origin for Plumbate ware is Bruhns (1980). Bruhns (1980:845) states, "evidence has appeared that casts some doubt on the single area of manufacture hypothesis and suggests that there were other types of Plumbate that were not of Guatemalan manufacture." The discrepancy between this view and the more commonly held view about the source of Plumbate is due to the fact that Bruhns apparently defines Plumbate to include Late Classic–Early Postclassic slipped gray wares from several mesoamerican regions. Plumbate, as most investigators understand the pottery class, encompasses the fancy Tohil vessel categories described by Shepard along with a number of plain vessel forms usually referred to as San Juan Plumbate, which are common in sherd collections from southwestern Guatemala and southern Chiapas. Bruhns's inclusion of any shiny gray ware of the Late Classic and Early Postclassic periods under the rubric "Plumbate" would seem to confuse rather than clarify.

Research initiated in 1979 (Neff 1984) produced further evidence strongly supporting the origins hypothesis of Shepard, Shook, and others. The project was designed to take advantage of a data base of excavated Plumbate which had expanded rapidly since the 1940s, and to take advantage of new analytical techniques which had been introduced to ceramic studies. Fieldwork focused on a littoral region of the Pacific slope (Figure 2) which some evidence suggested was within or near the zone where Plumbate was produced. Laboratory research consisted of formal and compositional analysis of collections resulting from the fieldwork and from field survey and excavations of others. The compositional analysis involved neutron activation analysis of 432 specimens of Plumbate and other Pacific coastal ceramics.

*Results of Recent Fieldwork*

The field investigations alluded to above were carried out in the littoral zone near the mouth of the Naranjo and Tilapa rivers (Figure 2). Coe and Flannery (1967) surveyed this region in the early 1960s, locating the site of SM54 (Figure 3). They describe SM54 as follows: "Surface pottery was incredibly abundant, all of it Marcos [phase]. Of 93 'diagnostic' sherds, 84 were of San Juan

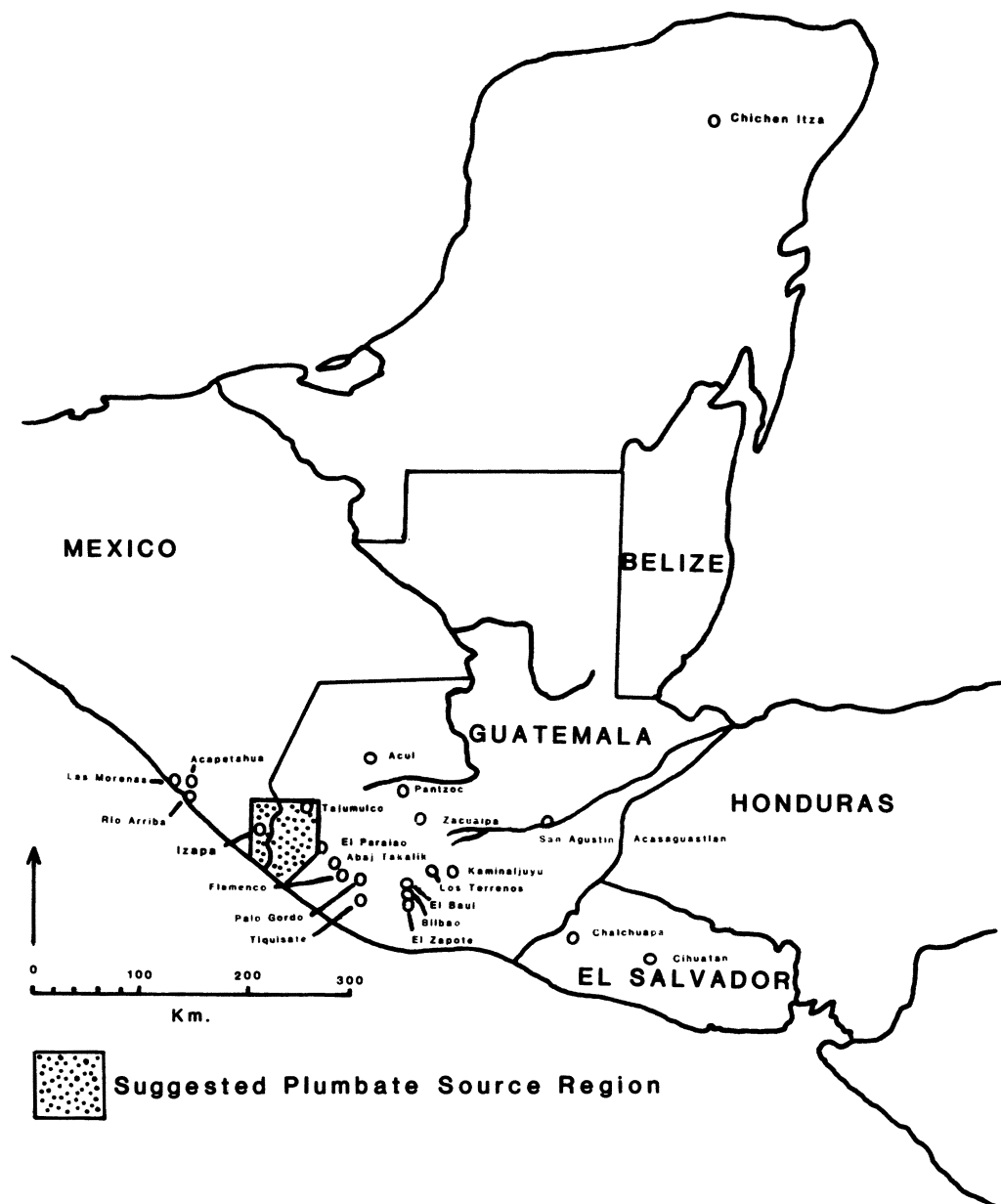


Figure 1. Map of southern Mesoamerica showing suggested Plumbate source region and some sites which contributed specimens to the Plumbate compositional data base.

Plumbate" (Coe and Flannery 1967:96). Brief reconnaissance of the area southeast of SM54 undertaken in 1981 and reported elsewhere (Neff 1981) revealed that there is an almost continuous sherd scatter extending along the inland edge of the beach sand/scrub forest zone, from SM54 at least to the vicinity of Guayabal-1 and Guayabal-2. The sites of SM54, Guayabal-1, and Guayabal-2 were investigated systematically.

The fieldwork at the above-named sites included mapping, surface collection, and, at SM54, subsurface testing with a posthole digger. The overwhelming preponderance of pottery recovered

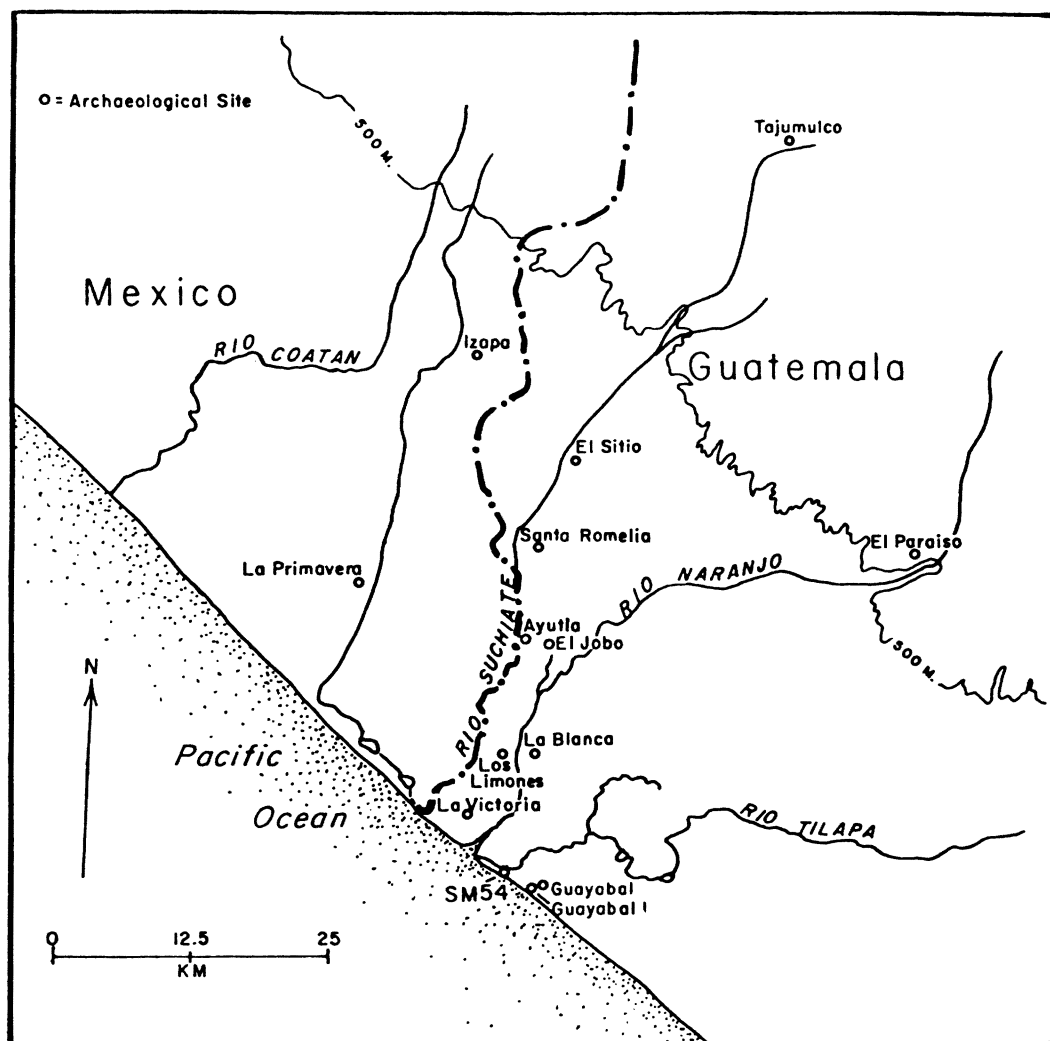


Figure 2. Map of the eastern Soconusco region showing some Late Classic and Early Postclassic period sites discussed in the text.

at all sites was Plumbate, with simple forms, usually subclassified as "San Juan Plumbate," dominating the collection. A representative sample of pottery was collected at SM54 by means of total surface collection within randomly chosen  $5 \times 5$ -m grid units. Two posthole-digger tests also were placed within each sampled unit. The overall proportion, by weight, of Plumbate to other pottery classes at SM54 is 9:1. Many sampled units yielded only Plumbate sherds. The massive bulk of Plumbate sherds at these sites (aside from the dominance relative to other pottery classes) also suggests proximity to production centers: one unit at SM54 (unit 12) yielded 12.54 kg of Plumbate sherds from the surface collection alone.

Among the material collected at SM54 were several small, amorphous lumps of poorly fired clay. These objects were tentatively interpreted as by-products of pottery making, being macroscopically similar in color and texture to the associated Plumbate sherds. Many sherds from the site showed spalling and malformation indicating they may have been wasters. Although no evidence of firing

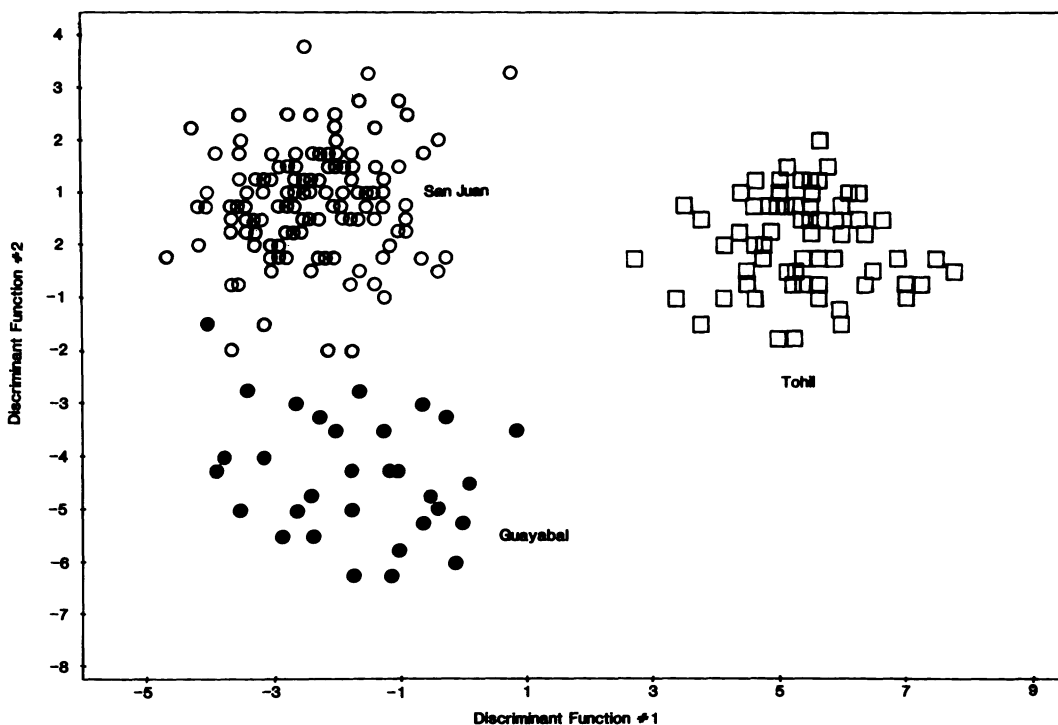


Figure 3. Scatterplot of specimens in three Plumbate compositional core groups relative to two canonical discriminant-function axes.

was encountered at SM54, the volume of ceramic material along with the presence of pottery-making by-products and wasters suggest that the site was either a production locus or a dump where the refuse from Plumbate production was discarded.

#### *Results of Compositional Analysis*

Neutron activation analysis of Plumbate and other ceramic materials from sites in extreme southwestern Guatemala and southern Chiapas (the eastern Soconusco region) yielded further evidence tending to confirm that the production center or centers were located there. Specific resemblances between Plumbate and pottery-making by-products found at SM54 constitute part of the evidence; other evidence comes from comparison of Plumbate and nonlocal pottery to a generalized ceramic-compositional profile derived for the region.

Three homogeneous compositional groups were recognized among the 360+ Plumbate specimens analyzed by neutron activation. Separation between these three chemical groups is illustrated in Figure 3, a plot of the core-group members relative to two discriminant functions derived from the three predefined groups. Outliers (i.e., specimens falling outside the 95 percent probability boundaries of all three core groups) were assigned to one of the core groups by classification functions derived from discriminant analysis. Two of the three chemical groups (San Juan and Tohil) correspond to previously established taxonomic units. The third group (Guayabal) is a new Plumbate subclass which, based on compositional, stylistic, and contextual evidence, taxonomically should be considered equivalent to San Juan and Tohil (Neff 1984). Two of the three groups, San Juan and Guayabal, were present among the analyzed specimens from the littoral-zone sites of SM54, Guayabal-1, and Guayabal-2.

It is important to point out that the noncore group members are definitely Plumbate and not

some other pottery class. Their outlier status relative to the core groups may be due to inconsistent tempering practices, analytical vagaries, or to the fact that they belong to other Plumbate compositional groups which were represented by only a few members in the analyzed sample and therefore were not recognized as distinct groups.

The amorphous clay lumps from SM54 (P744, P784, P785, P822, P827, and PCL) were analyzed by neutron activation to determine if they possibly could be derived from the same clays used to make Plumbate. In addition to six clay lumps from SM54, two similar objects collected by Shook near the putative kiln at the site of La Blanca also were analyzed.

Mean Euclidean distance (MED) was used to compare each clay lump to the analyzed Plumbate specimens. MED is a measure of pairwise similarity calculated by finding the sum of squared differences between all elemental concentrations in two specimens, dividing by the number of elements, then taking the square root (Harbottle 1976). It can be used to find all specimens closer than some cutoff distance to a pivotal specimen or as the input for hierarchical cluster analysis.

A MED of .08 was chosen as a cutoff distance for comparing the clay lumps to Plumbate specimens because .08 is above the range of instrumental error (.03–.06) but below the upper limit of MEDs observed within the Plumbate core groups. At this distance, two of the clay lumps stand out because of the number of matching Plumbate specimens. Clay lump P744 from SM54 matches 22 specimens, all members of the San Juan Plumbate core group. Clay lump P785 from SM54 matches five specimens, including three members of the Guayabal core group, one member of the San Juan core group, and one non-Plumbate sherd from SM54.

Although clay lump P744 clustered with the San Juan core group in an average-linkage cluster analysis using MEDs, it was excluded at the 5 percent level from membership in the core group when the dispersion of data values around the group centroid was taken into account in the calculation of group membership probabilities. ("Centroid" is a multivariate generalization of the mean value; dispersion is expressed by the group variance–covariance matrix [Davis 1986].) If the clay lump is made of the same clay used in the manufacture of San Juan Plumbate, its exclusion from the core group based on multivariate probability could be due to contamination with a material not normally added in the preparation of Plumbate paste (the clay lump is, after all, a by-product, presumably tossed aside during clay preparation or pot forming) or to an anomalously large or anomalously small amount of temper. It should be borne in mind that most San Juan Plumbate outliers assigned to the group using classification functions derived from discriminant analysis showed even lower probabilities of membership in the core group than did clay lump P744.

P785, the clay lump which resembled several Guayabal core group members, showed a 15 percent probability of belonging to the Guayabal core group. In Euclidean terms, this sample is not as close to the Guayabal centroid as P744 is to the San Juan centroid. It shows a higher probability of group membership because the Guayabal core group is smaller than the San Juan core group, and the parameters of group dispersion consequently are not as tightly defined.

Given Harbottle's (1976:47) generalization that ceramic compositional MEDs of .05 to .20 are expected within a single clay bed when about 15 elements are utilized, the matches for clay lumps P744 and P785 at distances of .08 suggest that the clay lumps and the clay used in the ceramics came from a single clay bed. Assuming that no one would have bothered to move an amorphous clay lump far from its source, this evidence also suggest that the clay bed from which San Juan and Guayabal Plumbate clays were derived lies within a fairly small radius around SM54. The absence of other evidence for manufacture (e.g., firing) makes the hypothesis that Plumbate was made at SM54 unlikely. Instead, manufacture of Guayabal and San Juan Plumbate probably took place at as yet undiscovered localities close to SM54.

Although the close similarity of Plumbate sherds from two of the core groups to pottery-making by-products discovered in the eastern Soconusco region supports the Shepard–Shook Plumbate origins hypothesis, the fact that no clay source within the eastern Soconusco region has ever been characterized attenuates the strength of this evidence. As long as the origins question is confined to a regional level rather than a source-specific level, the problem of source characterization may be circumvented by establishing a "generalized" compositional profile for the region as a whole. Such a generalized profile can be derived from analysis of materials not likely to have been moved far

from their point of origin. Examples of such materials are clay lumps, such as those found at La Blanca and SM54, and sherds from utilitarian wares, especially large vessels. If sampling coverage of the region is sufficiently extensive and the total number of samples is kept small, the group will be "general" in the sense that most or all of the ceramics from the region will be included in the group (say, with a probability of at least 5 percent), even if the exact source clay used in a particular kind of pottery is not represented in the generalized sample. The generality of the group must, of course, not be so great that ceramics made in other regions also show high probabilities of belonging to the generalized regional group.

A generalized eastern Soconusco group was formed using 32 specimens representing 12 sites, at least four different time periods, and both coarse- and fine-paste wares (Neff 1984). The eight clay lumps previously discussed were included. With such a broadly conceived group, Plumbate was expected to show consistently high probabilities of membership if in fact Plumbate was made within the eastern Soconusco region. If, at the same time, known nonlocal ceramics did not show high probabilities of belonging to the group, then the results would support the hypothesis of Plumbate manufacture within the eastern Soconusco region. Failure to verify either prediction would constitute evidence against the hypothesis.

The results of projecting eight comparison groups against the generalized eastern Soconusco group are shown in Figure 4. Members of the five groups thought to have been made in the eastern Soconusco region, including members of three Plumbate core groups, fall most abundantly above the 95 percent probability level. In contrast, the three comparison groups which are known to have originated elsewhere on the Pacific coastal plain fall most abundantly below the 95 percent probability level. Thus, the results of projecting Plumbate and known nonlocal specimens against the generalized eastern Soconusco group profile support the hypothesis that Plumbate was made within the eastern Soconusco region.

#### *Results of Chronological Analysis*

The age-area assumption holds that, in general, any artifact class will make its first appearance in its source region. For example, Plumbate precursors and early Plumbate pottery should appear first in the archaeological record of the Plumbate source region. Based on excavations at Izapa, Lee (1973, 1978) and Lowe et al. (1982) trace the Plumbate tradition back to Middle Classic (Metapa phase) roots in the eastern Soconusco region, thus implying an eastern Soconusco origin under the age-area assumption. Chronological analyses undertaken as part of the present study confirm Lee's interpretation, indicating that the earliest Plumbate appeared in the eastern Soconusco littoral zone approximately 45 km south of Izapa.

Frequency seriation was carried out on provenience-unit assemblages studied during the course of the Plumbate project. Because the information of interest was when, relative to other localities, people at a particular locality were making and/or using Plumbate, the seriations exclusively were based on the frequencies of various subclasses of Plumbate. The seriations cannot, therefore, be considered seriations of the various provenience units; instead, they are estimates of the midpoints of the spans of time when people living at the seriated localities were making and/or using Plumbate.

Two complementary numerical methods were used, both based on the Brainerd–Robinson coefficient (distances rather than similarities were used). One method, hereafter referred to as Gelfand's Method II (Gelfand 1971), utilizes distance or similarity data to find the order of the provenience units that most closely resembles a "battleship curve." As a check on the order obtained by Gelfand's Method II, the Brainerd–Robinson distance data were scaled by nonmetric multidimensional scaling, and the resulting two-dimensional curvilinear configuration interpreted as a seriation (e.g., Drennan 1976; Kendall 1971). Rank-order correlation coefficients for the two types of seriation usually were between .83 and .97, indicating that the two methods produced closely similar results.

For any given set of assemblages there are, of course, as many different seriations as there are distinct classificatory schemes for the artifacts in those assemblages. Most of the seriations undertaken as part of the present study were based on some permutation of a form/composition classificatory scheme derived from the combined results of stylistic and compositional analysis (Neff

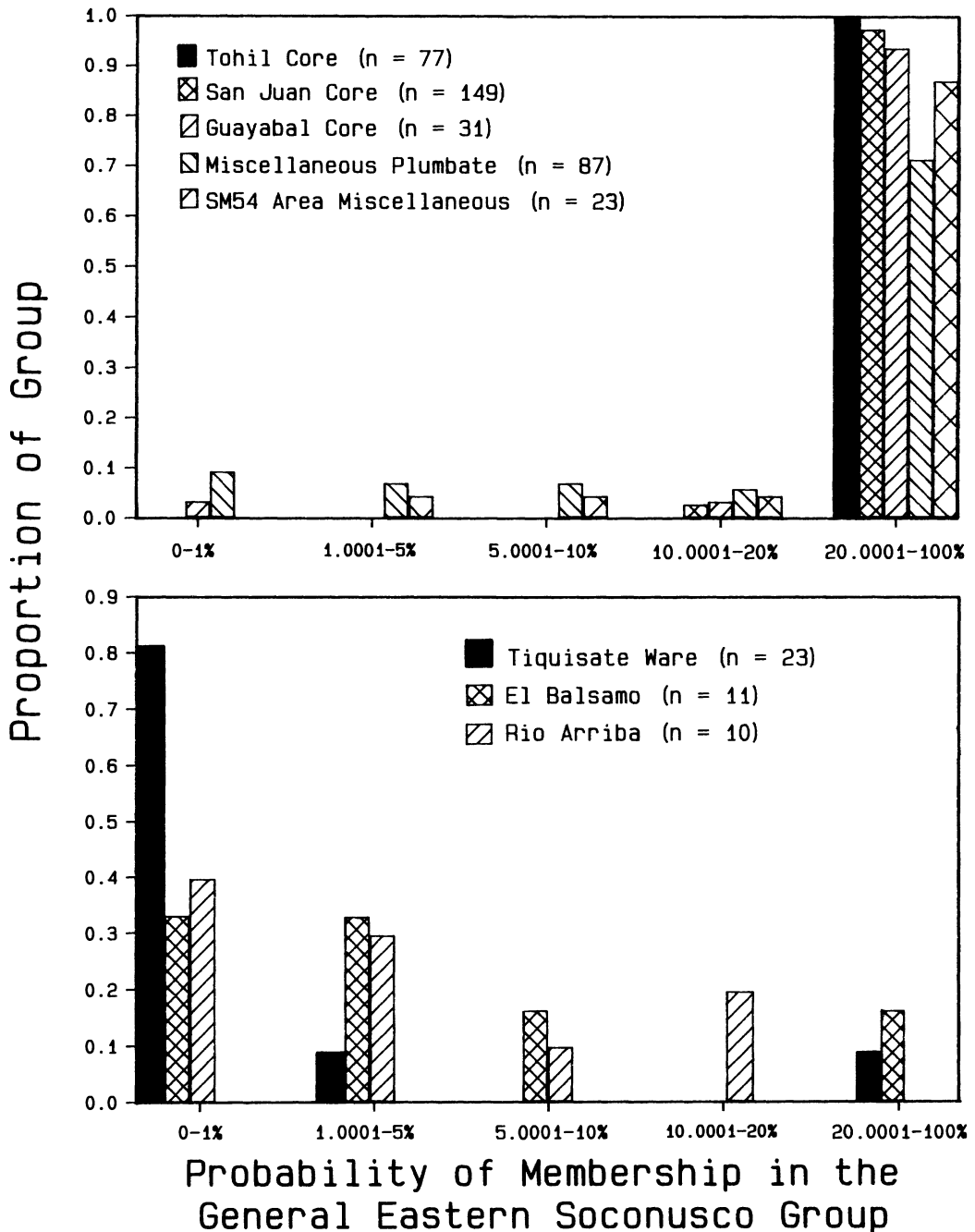


Figure 4. Results of projecting five subgroups of Plumbate (top) and three groups of known noneastern Soconusco specimens (bottom) against the compositional profile of the general eastern Soconusco group. Probabilities of group membership based on Hotelling's  $T^2$  (derived from Mahalanobis distance from specimen to group centroid).



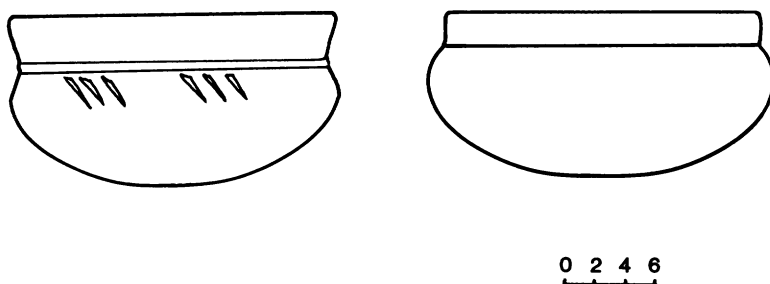


Figure 5. Plumbate background-tradition composite-silhouette vessels. Left-hand reconstruction based on San Juan core-group specimens P11 (Bilbao) and P612 (SM54) and Tohil core-group specimen P267 (Acapetahua). Right-hand reconstruction incorporates stylistic elements inferred to be early, and is based on Guayabal core-group specimen P656 (Guayabal-2) and San Juan core-group specimen P700 (Guayabal-1).

1984). Because there are several arguments that might be advanced against the assumption that form/composition classes may be historical classes (see Neff [1984] for a more extended discussion of this problem), a check on the seriation that utilized classes based on nonfunctional attributes was carried out. One vessel form, the composite-silhouette vessel, occurred abundantly enough in collections from a great enough number of proveniences to permit a seriation of a subset of 17 provenience units based exclusively on neck modification and decoration on this form class. Figure 5 depicts two composite-silhouette vessels which exemplify some of the decorative variation on this form class. If the form/composition-class seriation and the composite-silhouette vessel seriation are not too different, they may be assumed to reflect an underlying linear order related at least partially to time.

The seriations do reveal a similar underlying linear arrangement of the proveniences. Rank-order correlations between the form/composition-class seriation (Table 1) and the composite-silhouette vessel seriation (results not shown) range from .55 to .69. We consider this level of correlation between seriations derived from entirely different classificatory schemes sufficient to validate the overall outline of the seriation, though its specific details remain to be worked out.

In the seriation of all inspected collections based on form/composition class frequencies (Table 1), presumed Early Postclassic sites such as Tajumulco and Chichen Itza fall at one end of the series while the sites of Guayabal-1, Guayabal-2, and SM54 Unit 30 fall at the other end. Assuming, as seems likely, that the Early Postclassic sites are at the late end, it may be inferred that the littoral-zone sites are at the early end. The littoral-zone collections contrast with collections from the Early Postclassic sites due to the relative abundance of Guayabal form/composition classes in the former and the abundance of Tohil form/composition classes in the latter. The two ends of the series are linked by common occurrence of a few San Juan Plumbate classes. San Juan composition sherds from the early proveniences conform closely to Guayabal stylistic norms. For example, short, thick necks, absence of rim modification, and absence of a horizontal relief band at the base of the neck (e.g., Figure 5, right-hand drawing) characterize composite-silhouette vessels of both Guayabal and San Juan composition from Guayabal-1, Guayabal-2, and SM54 Unit 30. And, of course, the uniformity of composite-silhouette vessel style accounts for the clustering of the littoral-zone sites at the early end of the seriations based on composite-silhouette vessel rim/decorative classes.

The main point to emphasize about the seriations just discussed is the position of SM54 Unit 30, Guayabal-1, and Guayabal-2 at one end, inferred to be the early end, of the time span when Plumbate was made and used. This consistent pattern implies that these are the earliest-known Plumbate sites, and, making the age-area assumption, also implying that Plumbate production originated in or near the littoral zone where these sites are located. By extrapolation from the Izapa chronology (Lowe et al. 1982), the inception of Guayabal Plumbate production can be placed in the Middle Classic Metapa phase (A.D. 600–A.D. 700).

Table 1. Seriations of 37 Proveniences Represented in the Plumbate Sample.

A. Non-Metric MDS	B. Gelfand's Method II
SM54, Unit 30	SM54, Unit 30
Guayabal-2	Guayabal-1
Guayabal-1	Guayabal-2
SM54, Unit 4	General Ocos area
SM54, Unit 2	Kaminaljuyu
SM54B	Flamenco
SM54, Unit 12	Los Terrenos
SM54, Unit 1P	Bilbao
SM54, Unit 13	Las Morenas 1
General Ocos area	SM54, Unit 1P
Santa Romelia	Sm54, Unit 2
Ayutla	SM54, Unit 12
Las Morenas 1	SM54B
Bilbao	El Baul
Flamenco	SM54, Unit 13
El Baul	La Victoria
Kaminaljuyu	SM54, Unit 4
Rio Arriba	Ayutla
Los Limones	Santa Romelia
El Paraiso	Los Limones
La Victoria	Rio Arriba
Los Terrenos	El Paraiso
La Primavera	Acapetahua
Palo Gordo	La Primavera
Izapa	Izapa
Tiquisate	Tiquisate
Las Morenas 2	Las Morenas 2
Chalchuapa	Palo Gordo
Acapetahua	Tajumulco
Tajumulco	El Zapote
El Zapote	Chalchuapa
Pantzoc	Zacualpa
Zacualpa	Abaj Takalik
Abaj Takalik	Chicken Itza
Cihuatán	Pantzoc
Acul	Cihuatán
Chichen Itza	Acul

Note: Order A based on 20 form/composition classes, obtained using non-metric multidimensional scaling. Order B based on 8 more inclusive form/composition classes. (Classes were combined for the Gelfand II seriation in order to reduce the number of ties in the distance matrix.)

Rank-order correlation coefficient = .87;  $p < .01$ .

### *Interpretation of the Evidence on Plumbate Origins*

This section has brought together multiple lines of evidence supporting the Shepard-Shook Plumbate origins hypothesis. Survey and excavation data, compositional data, and chronological data all support the hypothesis that Plumbate was made in the eastern Soconusco region. The origins issue now can be considered resolved, at least on the regional level.

The exact location of Plumbate manufacturing centers within the eastern Soconusco region remains a matter of some speculation. Evidence cited above suggests that early Guayabal Plumbate and at least some San Juan form/composition classes probably were made within the littoral zone near SM54. Lee (1973, 1978), in contrast, argues that Plumbate precursors were made near Izapa, as were later San Juan and Tohil varieties of Plumbate.

The interpretation advanced here and elsewhere (Neff 1984, 1987a) is that San Juan Plumbate

developed out of a widespread Middle to Late Classic period fine-paste tradition of the Pacific slope which was manifested by, for example, Tiquisate ware at Bilbao, El Baul, and Tiquisate, by Middle Classic fine-paste ware (Lee's Tiquisate ware) at Izapa, and by Guayabal Plumbate in the eastern Soconusco littoral zone. These wares share fine paste, slipped orange surfaces, and numerous common vessel forms (Neff 1984). While sharing certain broad guidelines for making pottery, the people making these pottery classes faced distinct ceramic environments, and consequently the subtraditions gradually diverged from common Middle to Late Classic roots. Around the littoral zone of the eastern Soconusco region, this gradual divergence eventually gave rise to San Juan Plumbate.

#### THE SAN JUAN-TOHIL TRANSITION

Shepard's (1948) study indicated that the paste of typical Tohil vessels known from museum collections differed consistently from the paste of plain San Juan varieties of Plumbate from excavations at El Baul and Kaminaljuyu. San Juan paste was distinguished from Tohil paste by the presence of minute vitric-ash particles and by the absence of glassy rock fragments characteristic of Tohil paste. What appeared to be a strong association between paste type and stylistic attributes led Shepard (1948:146) to hypothesize that some kind of cultural discontinuity, such as an invasion, might have attended the development of Tohil Plumbate out of San Juan Plumbate.

The discontinuity hypothesis has remained viable in light of archaeological data accumulated since 1948. The frequency of "typical" Tohil Plumbate (meaning sherds from vessels like the fancy traded pieces common in museums) was found to be very low at most sites within the eastern Soconusco region (Coe 1961; Coe and Flannery 1967; Lowe and Mason 1965; Shook 1965). A collection made by Drucker (1948) at Izapa and La Primavera in the eastern Soconusco and later inspected by Shepard (1952) was described by her in the following terms: "Judging from the collections I have examined, I do not find anything in your sample that could not belong to the early style and there are a number of specimens that are typical [of the early style]" (Shepard 1952:1). In sum, fancy Tohil Plumbate rarely has been found to succeed San Juan Plumbate in the archaeological record of the eastern Soconusco, where Plumbate presumably was produced. This archaeological evidence is consistent with the discontinuity hypothesis originally proposed by Shepard.

The New World Archaeological Foundation excavations at Izapa (Lee 1973, 1978; Lowe et al. 1982) have produced data that suggest a variant of the discontinuity hypothesis. Refuse dumps from Group F and caches from Mound 125a, Group F at Izapa demonstrate a temporal sequence beginning with pre-Plumbate fine-paste ware (designated Tiquisate ware by Lee), progressing to San Juan types and varieties, then to Tohil types and varieties. Lee (1978:291) identifies late San Juan types which he believes are transitional to Tohil, and notes that several Plumbate vessel forms continue from the Late Classic (Metapa phase) into the Early Postclassic (Remanso phase). However, he suggests that development of the definitive Tohil attributes (the lamp-chimney shape, various anthropomorphic and zoomorphic effigies, etc.) came about when Toltec invaders imposed new stylistic norms on local Plumbate potters (Lee 1978:292-293). This suggestion constitutes an elaboration of the discontinuity hypothesis, not an alternative to it.

Shepard had proposed at least one alternative to the discontinuity hypothesis. Shortly before her monograph was published in 1948, an unusual collection of Plumbate from Finca El Paraiso, at the upper edge of the piedmont zone of southwestern Guatemala, was brought to her attention. The collection seemed unusual to her because of the presence of previously unidentified stylistic attributes, including non-Tohil effigies and anomalous forms (Shepard 1948:125). Later, in the early 1950s, she had occasion to examine a collection of thin sections made from sherds excavated by Kidder and Shook (1959) at "La Gruta," a feature at El Paraiso interpreted as a sweatbath. In unpublished correspondence to Shook (Shepard 1951:2) she stated: "This small selection of Paraiso chips which I have just examined suggests transition [from San Juan to Tohil] because of the occurrence of the two types of paste and mixtures of the distinctive constituents of each which I have not found before." Thus, in the El Paraiso collection, Shepard noted greater variety than she had seen before, both in Plumbate style and in Plumbate temper. This led her to speculate that a coincident transition of style and paste might be reflected in the collection from the site. Gradual

development of fancy Tohil out of earlier San Juan was Shepard's alternative to the discontinuity hypothesis she had proposed originally.

The published and unpublished statements of Shepard led several investigators to accept the hypothesized intermediate Plumbate stage, referring to it as "Robles," after the owner of Finca El Paraiso. Rands and Smith (1965), Dutton (1958), Smith et al. (1960), Smith (1957, 1971), and Brown (1978) all have incorporated "Robles Plumbate" into their typological schemes. The definitive attributes of the intermediate class never have been spelled out in print. However, Rands and Smith (1965) illustrate several examples of "Robles Plumbate," including a distinctive jar variety which is common in the assemblage from El Paraiso. The fact that Shepard originally suggested the existence of an intermediate variety after examining the El Paraiso material suggests that "Robles Plumbate," if it exists as a distinct taxonomic unit, should be exemplified in the collection from the site.

The existence or nonexistence of the intermediate class clearly is central to the choice between competing hypotheses on the San Juan-Tohil transition. Thus, Lee (1978:288), who supports a variant of the discontinuity hypothesis, also disputes the status of "Robles" as an intermediate class, contending that, "While the importance of Robles Plumbate is still not completely understood it now appears to have been a rather local development more closely related to Tohil Plumbate but still to one side of the general Plumbate evolution." The new data discussed below shed further light on the debate.

#### *The Status of Robles Plumbate*

The neutron activation analysis of Plumbate pottery defined three compositional groups, as discussed above. None of the three groups can be called "Robles Plumbate." The analyzed specimens from El Paraiso (the type site for Robles) all fall into either the San Juan or the Tohil compositional group.

The Tohil composition specimens from El Paraiso include typical specimens, such as Tohil jars similar to many in museum collections, along with atypical Tohil specimens such as plain, open, and globular bowls. The latter categories are indistinguishable from many San Juan specimens from such San Juan type sites as El Baul and Kaminaljuyu. The apparent overlap between San Juan and Tohil will be taken up in greater detail in a later section.

The San Juan composition specimens from El Paraiso include typical San Juan forms such as composite-silhouette vessels; plain, globular, and open bowls; cylinders; and one distinctive jar form (Figure 6). Jars such as the one depicted in Figure 6 have been used to exemplify "Robles" Plumbate (Lowe and Mason 1965; Rands and Smith 1965). The "La Gruta" excavation at El Paraiso (Kidder and Shook 1959) produced by far the largest collection of such jars ever encountered, many of them nearly complete, though broken. The association of this jar type, both in the literature and in fact, with the Robles farm at El Paraiso warrants the designation "Robles jar."

A total of 36 examples of Robles jars from nine sites were analyzed by neutron-activation analysis. Twenty-nine were included as members of the San Juan core group, and the remaining seven were assigned to the San Juan group using the classification functions derived from discriminant analysis. The Robles jar is the only form class exclusively found to fall in the San Juan compositional group.

Robles jars are noteworthy not only because of their homogeneity of composition, but because of their stylistic distinctiveness from typical San Juan on the one hand and from typical Tohil on the other hand. Robles jar-forming and decorative techniques found rarely or never on other Plumbate forms include turning to form the neck (indicated by horizontal striations on all specimens studied); generally elaborate use of plastic alteration of the vessel wall in decoration, including horizontal gadrooning to frame-decorated bands; and stamp decorations. Unique decorations include two representational motifs (a stamped monkey and an incised serpent), and continuous (rather than intermittent) simple, incised, decorative bands around the superior surface of the vessel wall. Conversely, decorative techniques used on both typical Tohil and typical San Juan vessels, such as carved, horizontal-relief bands and appliqué coffee beans, do not occur on Robles jars at all.

The stylistic contrast between Robles jars and typical Tohil Plumbate is consistent with the compositional contrast; the contrast with typical San Juan style stands in partial contradiction both to the compositional evidence and to the archaeological evidence of consistent association. Although

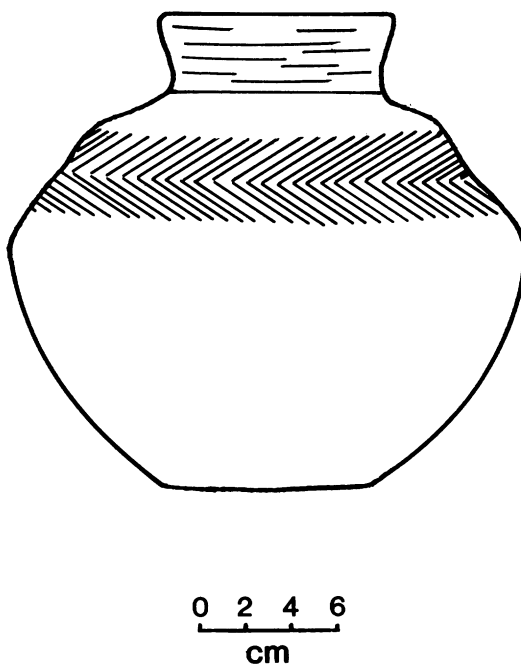


Figure 6. Robles jar reconstruction based on San Juan core-group specimens P8 (El Baul), P10 (El Baul), P156 (El Paraiso), and P220 (El Paraiso). Specimen P8 also illustrated in Thompson (1948).

some of the stylistic differences between Robles jars and other San Juan Plumbate may relate to differing constraints imposed on decoration by different shapes, the contrasts are sufficiently comprehensive to suggest that they have some cultural significance. Given the compositional evidence pointing to use of a single clay source, Robles jars may have been made in a single community which shared a clay source with surrounding communities, but where most potters emphasized the Robles jar over other shapes. Community specialization by shape class has numerous parallels in the ethnographic record (Neff 1984).

In summary, as Shepard pointed out, the Plumbate from El Paraiso indeed is distinctive in comparison both to typical Tohil assemblages (e.g., Tajumulco) and to typical San Juan assemblages (e.g., El Baul and Kaminaljuyu). Its distinctiveness does not, however, seem to reflect the presence of a class transitional between San Juan and Tohil. Rather, its distinctiveness is due (1) to the occurrence of plain Plumbate varieties indistinguishable from San Juan in style but made out of Tohil paste, and (2) to the high frequency of Robles jars, which appear to reflect the specialization of a subgroup of San Juan potters. Although "Robles Plumbate" is not an entirely imaginary category, it does not constitute a taxonomic unit equivalent to San Juan or Tohil, nor does it reflect a transitional stage between San Juan and Tohil. Rather, its importance lies in the light it sheds on the production variation of San Juan Plumbate.

#### *Interpretation of the San Juan–Tohil Transition*

Before the present study, Tohil Plumbate was equated with fancy effigy and elaborately incised vessels which were traded widely in antiquity and are common in museum collections today. The identification of plain forms of Tohil Plumbate was one of the surprising results of the recent compositional study. Plain Tohil Plumbate was identified not only in the El Paraiso collection just discussed; it also occurs in collections from El Baul, Acapetahua, Palo Gordo, Tiquisate, Santa Romelia, Los Limones, La Primavera, and Izapa (Figures 1 and 2). These sites all are on the Pacific slope, either within or near the inferred Plumbate-production region. The greatest proportions of plain Tohil vessels came from Drucker's Izapa and La Primavera collections which Shepard thought,

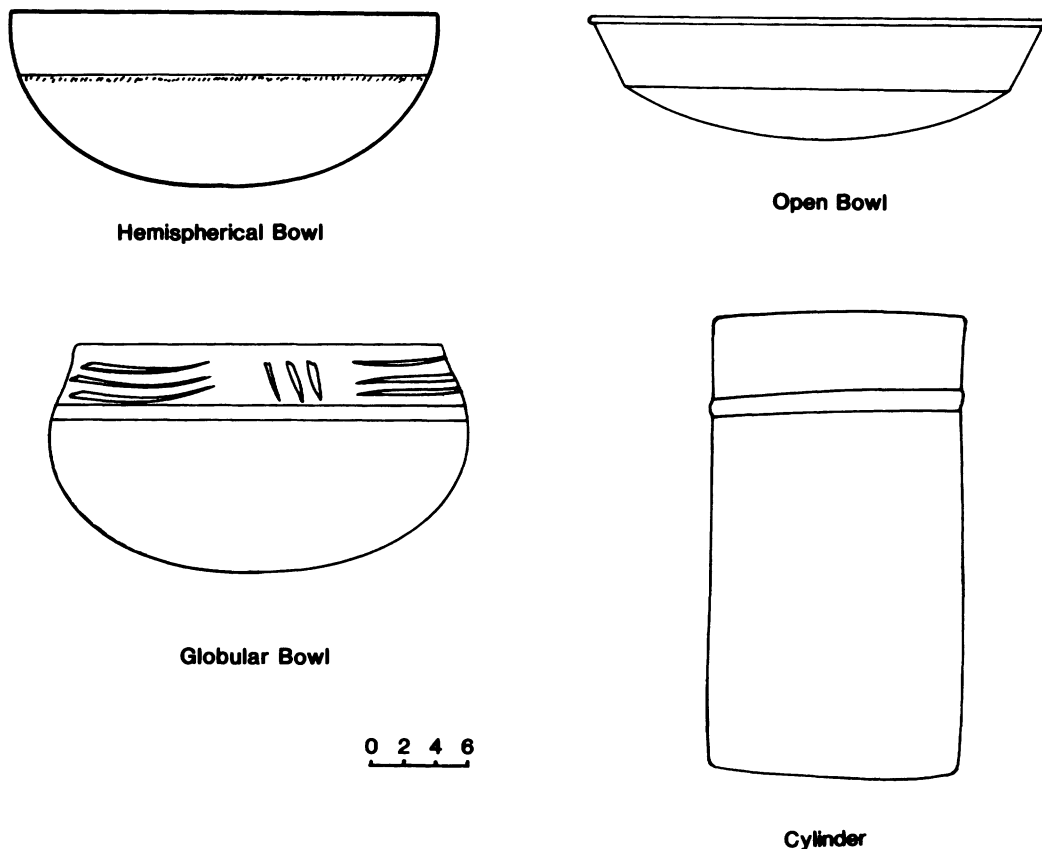


Figure 7. Plumbate background-tradition forms. Hemispherical bowl reconstruction based on San Juan core-group specimen P678 (SM54) and P789 (SM54) and Tohil core-group specimen P177 (La Primavera). Open-bowl reconstruction based on Tohil core-group specimen P170 (Izapa), San Juan core-group specimen P633 (SM54), and Guayabal core-group specimen P664 (Guayabal-2). Globular-bowl reconstruction based on San Juan core-group specimen P212 (El Paraiso). Cylinder reconstruction based on San Juan core-group specimens P97 (Kaminaljuyu) and P325 (El Baul) and Guayabal core-group specimen P657 (Guayabal-2).

based on a preliminary examination, were dominated by San Juan Plumbate (Shepard 1951; see above). Three Tohil-composition large vessels (which presumably were not moved far from where they were made) were identified in the La Primavera collection. No examples of plain Tohil were identified outside of the Pacific slope.

The plain Tohil specimens include composite-silhouette vessels (Figure 5); open, globular, and hemispherical bowls (Figure 7); possibly cylindrical vessels (Figure 7); and large hemispherical and globular vessels. These plain San Juan and Tohil forms also are paralleled in Guayabal Plumbate. They constitute evidence of a "background tradition," that is, a body of pottery-making conventions shared by potters using at least three different clay sources over period of perhaps 400–600 years (Neff 1984).

The evidence related to Plumbate origins (see above) suggests that production of background-tradition vessels began in or near the littoral zone sites of SM54 sometime during the Middle Classic period (Izapa Metapa phase). The dominance of background-tradition Plumbate at Late Classic-period sites (contemporary with the Izapa Peistal phase) implies that Plumbate potters enjoyed considerable success, that is, favorable markets for their pottery, during this 200-year period. Part of their success may have been due to expanding population within the region, perhaps related to

the spread of commercial cacao production. Under such favorable marketing conditions, the number of pottery-making households and villages probably increased through population growth and group fissioning among the original pottery-making groups and perhaps through adoption of pottery making by nonpotter households.

Proliferation of pottery-making groups eventually led to establishment of some workshops outside the original production zone. To reduce costs associated with raw-material procurement, Plumbate potters probably experimented from time to time with new sources of clay and temper. In the vicinity of Izapa and La Primavera, potters eventually discovered the source of Tohil clay, and began exploiting it for production of background tradition vessels. On one level, the San Juan–Tohil transition can be considered the outcome of prolonged growth of Plumbate production as a result of expanding opportunities for pottery producers in the eastern Soconusco region during the Late Classic period. There is no discontinuity in the scenario up to this point.

The foregoing reconstruction, of course, begs the question of why potters exploiting the Tohil source eventually began producing the fancy vessels which were traded widely during the Early Postclassic period. On the one hand, continuity with the background tradition is evident, not only in a continued reliance on the Tohil clay source, but in numerous techniques of workmanship (Neff 1984). On the other hand, there is no question that fancy Tohil represents a radical stylistic departure, with many new vessel forms appearing along with a unique abstract incised decorative style, miniatures, and a series of human and animal effigies. Why would potters working within a well-established tradition with a history of perhaps 400 years suddenly begin making vessels totally unlike those made by previous generations?

The explanation for the stylistic discontinuity must take into account the fact that fancy Tohil vessels, unlike background tradition vessels, apparently were intended primarily for export. One possibility is that, as Lee (1978:293) suggests, Toltec invaders imposed stylistic norms through taxation of the region around Izapa. Such direct involvement by Toltec interests, whether bureaucratic, military, or commercial, may be difficult to demonstrate. An alternative formulation (Neff 1984, 1987b) draws parallels with ethnographic examples of traditional potters who are faced with growing external markets for their goods (e.g., from tourists or urban dwellers). Stylistic elaboration, including new forms, miniatures, effigies, and decorative innovations invariably occur in such situations.

At any rate, the innovations associated with fancy Tohil Plumbate took place rather abruptly among one or a few workshops with access to the Tohil clay source. Background-tradition production almost certainly continued, but local markets for pottery apparently were declining. By around A.D. 1250, all Plumbate production had ceased.

The foregoing reconstruction of Plumbate development also provides an epilogue to the history of Plumbate studies up to Shepard's time. Shepard's first petrographic analyses of Plumbate incorporated thin sections from fancy Tohil vessels, which were at that time considered "typical Plumbate," but which now are inferred to represent the specialization of a rather small group of ceramic artisans responding to external demand for Plumbate ware. Shepard found a striking homogeneity of nonplastic tempering material in these specimens, a finding consistent with the new interpretation of fancy Tohil production. Examination of a more representative sample of Tohil composition specimens (Neff 1984) reveals greater variation in nonplastic constituents, with vitric particles (supposedly a definitive characteristic of San Juan temper) occurring in many. Conversely, glassy rock fragments (the definitive attribute of Tohil according to Shepard's earlier work) were present in some of the San Juan composition specimens from the source area.

The variation in nonplastics within each Plumbate compositional group is what would be expected if potters exploiting each clay source were utilizing temper sources close to their individual workshops. This resource exploitation pattern is consistent with the inferences on Plumbate development presented above and has ethnographic parallels, for example in the northern Valley of Guatemala (Arnold 1978a, 1978b). A larger comparative data base compiled by Arnold (1985) similarly suggests that traditional potters tend to travel farther to procure clay than to procure temper.

Up to the time Shepard's monograph was published, she had examined the products of a very limited number of Plumbate workshops, principally workshops making fancy Tohil for export and

San Juan workshops which, at an earlier time, had been exporting their products to the El Baul-Kaminaljuyu area. Not surprisingly, she found a clear and consistent petrographic distinction between San Juan and fancy Tohil. Thus, when she later examined thin sections from the El Paraiso collection the extent of petrographic variation and overlap struck her as unusual (Shepard 1952; see previous quotation). Ironically, the variability in the El Paraiso collection was unusual only in comparison to Shepard's earlier experience with Plumbate, not in comparison to the norm for collections from the source region.

### CONCLUSION

We have attempted to summarize information on Plumbate pottery which has been accumulating since the publication of *Plumbate: A Mesoamerican Tradeware* (Shepard 1948). The task has seemed worthwhile to us not only because of Plumbate's importance to understanding the development of mesoamerican society, but because the history of research on Plumbate provides an example of how increasingly specific culture-historical information accumulates gradually as a result of the long-term interplay of hypotheses and data.

In her monograph, Shepard (1948:144-147) stressed the need for more survey and excavations, along with careful study of excavated San Juan assemblages, as a means of testing hypotheses on the origin and development of Plumbate. The necessary data have accumulated as a result of archaeological investigations in and around the eastern Soconusco region of the Pacific slope. Surveys and excavations have yielded large collections of Plumbate from a region that now appears without a doubt to have been the Plumbate source region. Alternative origins hypotheses, such as the multiple source-region hypothesis recently championed by Bruhns (1980), now may be rejected.

Compositional and stylistic analysis of collections from the source region and elsewhere have supported a variant of the developmental discontinuity hypothesis originally proposed by Shepard to account for the transition between San Juan and Tohil. Hypothetical transitional stages, proposed by Shepard in light of discoveries made after publication of her monograph, do not hold up under detailed scrutiny of collections from the source region. Lee (1973, 1978) recognized this, and proposed a new version of the discontinuity hypothesis which allowed for continuity of a background tradition accompanied by a dramatic stylistic departure by some potters. This version of the discontinuity hypothesis remains essentially intact in light of a consideration of all data available up to the present time.

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### REFERENCES CITED

- Arnold, D. E.  
1978a Ethnography of Pottery-Making in the Valley of Guatemala. In *The Ceramics of Kaminaljuyu, Guatemala*, edited by R. K. Wetherington, pp. 327-400. The Pennsylvania State University Monograph Series on Kaminaljuyu, University Park.  
1978b Ceramic Variability, Environment, and Culture History Among the Pokom in the Valley of Guatemala. In *Spatial Organization of Culture*, edited by I. Hodder, pp. 39-60. University of Pittsburgh.  
1985 *Ceramic Theory and Cultural Process*. Cambridge University Press, New York.
- Brown, K.  
1978 The Ceramics of the Southern Half of the Valley of Guatemala. In *The Ceramics of Kaminaljuyu, Guatemala*, edited by R. K. Wetherington, pp. 151-172. The Pennsylvania State University Monograph Series on Kaminaljuyu, University Park.
- Bruhns, K. O.  
1980 Plumbate Origins Revisited. *American Antiquity* 45:845-848.



- Coe, M. D.  
1961 *La Victoria: An Early Site on the Pacific Coast of Guatemala*. Papers of the Peabody Museum of Archaeology and Ethnology, vol. 53. Harvard University, Cambridge.
- Coe, M. D., and K. V. Flannery  
1967 *Early Cultures and Human Ecology in South Coastal Guatemala*. Smithsonian Contributions to Anthropology Vol. 3. Washington, D.C.
- Davis, J. C.  
1986 *Statistics and Data Analysis in Geology*. 2nd ed. John Wiley and Sons, New York.
- Drennan, R. D.  
1976 A Refinement of Chronological Seriation Using Non-Metric Multidimensional Scaling. *American Antiquity* 41:290–302.
- Drucker, P.  
1948 *Preliminary Notes on an Archaeological Survey of the Chiapas Coast*. Middle American Records Vol. 1(11). Tulane University, New Orleans.
- Dutton, B. P.  
1943 *A History of Plumbate Ware*. Papers of the School of American Research No. 31. Santa Fe.  
1958 Studies in Ancient Soconusco. *Archaeology* 11:48–54.
- Dutton, B. P., and H. R. Hobbs  
1943 *Excavations at Tajumulco, Guatemala*. Monographs of the School of American Research No. 9. Santa Fe.
- Gelfand, A. E.  
1971 Seriation Methods for Archaeological Materials. *American Antiquity* 36:263–274.
- Harbottle, G.  
1976 Activation Analysis in Archaeology. In *Radiochemistry: A Specialist Periodical Report*, edited by G. W. A. Newton, pp. 33–72. The Chemical Society, Burlington House, London.
- Kendall, D. J.  
1971 Seriation from Abundance Matrices. In *Mathematics in the Archaeological and Historical Sciences*, edited by F. R. Hodson, D. J. Kendall, and P. Tautu, pp. 215–252. University Press, Edinburgh, Scotland.
- Kidder, A. V., J. D. Jennings, and E. M. Shook  
1946 *Excavations at Kaminaljuyu, Guatemala*. Publication No. 561. Carnegie Institution of Washington, Washington, D.C.
- Kidder, A. V., and E. M. Shook  
1959 A Unique Ancient Maya Sweathouse, Guatemala. *Amerikanistischhe Miscellen* XXV:70–74.
- Lee, T. A.  
1973 Secuencia de Fases Postformativas en Izapa, Chiapas, Mexico. *Estudios de Cultura Maya* IX:75–84.  
1978 The Origin and Development of Plumbate Pottery. *Revista Mexicana de Estudios Antropológicos* XXV(3):287–300.
- Lowe, G. W., and J. A. Mason  
1965 Archaeological Survey of the Chiapas Coast, Highlands, and Upper Grijalva Basin. In *Archaeology of Southern Mesoamerica*, edited by G. R. Willey, pp. 195–236. Handbook of Middle American Indians, vol. 2, R. Wauchope, general editor. University of Texas Press, Austin.
- Lowe, G. W., T. A. Lee, and E. Martinez Espinosa  
1982 *Izapa: An Introduction to the Ruins and Monuments*. Papers of the New World Archaeological Foundation No. 31. Provo, Utah.
- Neff, H.  
1981 El Período Clásico Tardío de la Zona Litoral del Suroccidente de Guatemala. *Antropología e Historia de Guatemala* 3(2):259–285.  
1984 *Developmental History of the Plumbate Pottery Industry in the Eastern Soconusco Region, A.D. 600 Through A.D. 1250*. Ph.D. dissertation, University of California, Santa Barbara. University Microfilms, Ann Arbor.  
1987a Origins of Plumbate Pottery Production. In *Prehistoric Economy of the Soconusco*, edited by B. Voorhies. University of Utah Press, Salt Lake City, in press.  
1987b The Impact of Long-Distance Trade on Plumbate Production. In *Prehistoric Economy of the Soconusco*, edited by B. Voorhies. University of Utah Press, Salt Lake City, in press.
- Parsons, L. A.  
1967 *Bilbao, Guatemala*, vol. 1. Publications in Anthropology No. 11. Milwaukee Public Museum.
- Rands, R. L., and R. E. Smith  
1965 Pottery of the Guatemalan Highlands. In *Archaeology of Southern Mesoamerica*, edited by G. R. Willey, pp. 95–145. Handbook of Middle American Indians, vol. 2, R. Wauchope, general editor. University of Texas Press, Austin.
- Saville, M. H.  
1916 The Glazed Ware of Central America, with Special Reference to a Whistling Jar from Honduras. In *Holmes Anniversary Volume*, pp. 421–426. Washington, D.C.

- Shepard, A. O.  
1948 *Plumbate: A Mesoamerican Tradeware*. Publication No. 528. Carnegie Institution of Washington, Washington, D.C.  
1951 Shepard to Edwin Shook, November 17, 1951, University of Colorado Museum, Boulder.  
1952 Shepard to Phillip Drucker, October 13, 1952, University of Colorado Museum, Boulder.
- Shook, E. M.  
1947 *Guatemala Highlands*. Carnegie Institution of Washington Yearbook No. 46, 1946–1947, pp. 179–184. Washington, D.C.  
1965 Archaeological Survey of the Pacific Coast of Guatemala. In *Archaeology of Southern Mesoamerica*, edited by G. R. Willey, pp. 180–194. Handbook of Middle American Indians, vol. 2, R. Wauchope, general editor. University of Texas Press, Austin.
- Smith, R. E.  
1957 *Tohil Plumbate and Classic Maya Polychrome Vessels in the Marquez Collection*. Notes on Middle American Archaeology and Ethnology No. 129. Carnegie Institution of Washington, Washington, D.C.  
1971 *The Pottery of Mayapan*. Papers of the Peabody Museum of Archaeology and Ethnology Vol. 66. Harvard University, Cambridge.
- Smith, R. E., G. R. Willey, and J. C. Gifford  
1960 The Type-Variety Concept as a Basis for the Analysis of Maya Pottery. *American Antiquity* 25:330–340.
- Spinden, H. J.  
1915 Notes on the Archaeology of Salvador. *American Anthropologist* 17:446–484.
- Thompson, J. E. S.  
1948 *An Archaeological Reconnaissance in the Cotzumalhuapa Region, Escuintla, Guatemala*. Publication No. 574. Carnegie Institution of Washington Contributions to American Anthropology and History No. 44. Washington, D.C.
- Vaillant, G. C.  
1927 *The Chronological Sign of Maya Ceramics*. Unpublished Ph.D. dissertation, Peabody Museum of American Archaeology and Ethnology, Harvard University, Cambridge.
- Webb, M. C.  
1973 The Peten Maya Decline Viewed in the Perspective of State Formation. In *The Maya Collapse*, edited by T. P. Culbert, pp. 367–404. University of New Mexico Press, Albuquerque.