Introduction

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+++Relative to its vast territorial expanse and the complexity of the prehistoric cultures represented there, West Mexico is an area of North America that has received little attention from archaeologists. As a result, portions of the different prehistoric ceramic sequences for the region remain incomplete (see Beekman 1996; Mountjoy 2000; Pollard 2000; Weigand 2000).

Much of the basic fieldwork that has been reported occurred more than twenty-five years ago, when ceramic type distributions were summarized and tabulated by hand. It occurred to us that study of pottery collections using computers and statistics might render some site excavation data more amenable to chronological control and, hence, interpretation. With this question in mind, we approached the Fowler Museum and the Cotsen Institute of Archaeology at UCLA. These institutions gave us permission to study a sample of potsherds from the vicinity of Etzatlán, Jalisco, that had been excavated during the 1960s by UCLA archaeologists and curated since that time at the university.

Over the course of this project, in constructing a ceramic sequence for Etzatlán, we employed correspondence analysis (henceforth, CA), a statistic little used in North American archaeology, including the Mesoamerican region (see Nance and Leeuw 2005; Nance et al. 2003). In chapter 2, we discuss the history of CA, both in statistics and

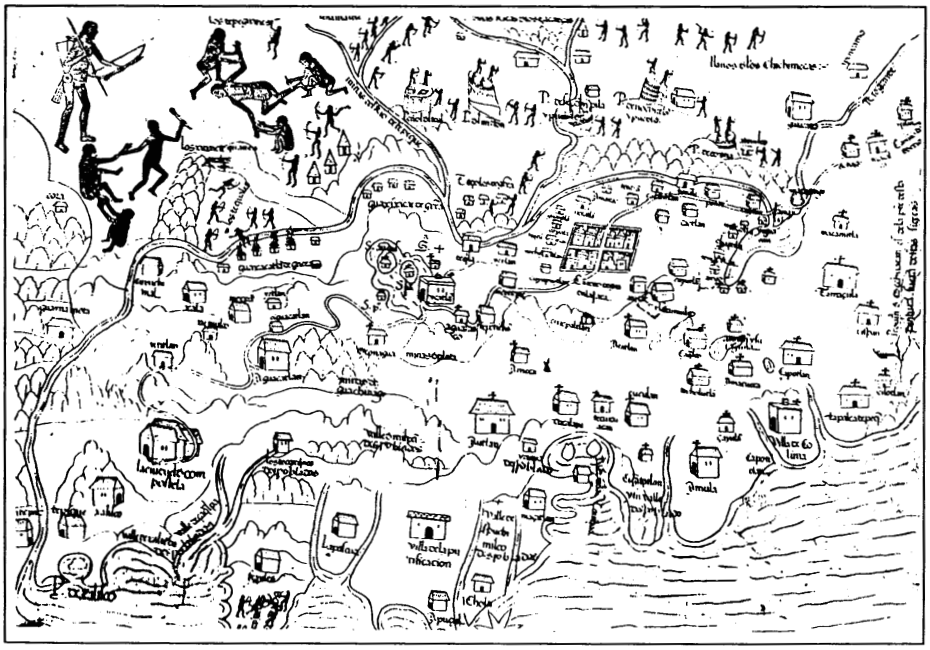

Figure I-1. A map of the Laguna de Magdalena basin, Jalisco. Map by Stanley Long (1966:45); redrawn by Sandra Wong, 2009.

archaeology. We then give the basic equations defining CA as either a multivariate exploratory technique or as a statistical model–fitting technique. Similar applications in psychometrics and ecology are discussed as well. As an illustration, we apply CA to one small and one more realistic example. But, of course, the main applications of the technique are given in other chapters of the book, where we analyze typed ceramics from Etzatlán.

The ceramics we selected derived from sites near the town of Etzatlán and in proximity to the dry lake bed of the Laguna de Magdalena in the lake district of northern Jalisco (fig. I-1). In 1963 Stanley Long and his assistant, Michael Glassow, investigated seven sites there through the excavation of randomly spaced pits, usually 1.5 by 1.5 m in dimension and almost always by 20 cm deep arbitrary levels. Apparently, these excavations were to form the basis of Long's dissertation research, but instead he studied elaborate burials from the area (Long 1966), and pottery from the pits in question remained mostly unstudied.

Except for an article by Glassow (1967) on one of these sites, Huistla, no one had systematically studied this UCLA collection. This is not to say, however, that archaeological research has been nonexistent in the Laguna de Magdalena basin. On the contrary, Phil Weigand began his own archaeological and ethnohistorical research program there and at nearby localities in north-central Jalisco soon after the Long-Glassow fieldwork. He was active in publishing archaeological fieldwork on the region and conducting pertinent library/archival research from that point up to the completion of this book. In chapter 1, Weigand provides a picture of late prehistoric cultures at Etzatlán and a narrative of key events surrounding the conquest and its socioeconomic and demographic consequences. He also describes archaeological resources in the Etzatlán basin, both as they existed thirty years ago as well as their present, more degraded condition. Chapter 1 also summarizes historical evidence for indigenous languages in this portion of Mexico.

The Collections

The collections and especially the records pertaining to these collections deteriorated to some extent during the thirty-seven years between excavation and the time we began our research. Table I-1 lists extant records for the four sites investigated in this study. Documentation for Tiana is especially meager: a site survey form and field notes are missing, and we have no map on file showing the site's location. Generally, very few photographs of the fieldwork survive, but contour maps showing pit locations are on file for three of the four sites investigated (figs. I-2–I-4). Some materials were never transported from Jalisco to UCLA, and special "Discard" catalogs enumerate the many hundreds of potsherds discarded in Jalisco by site, level, and square. These sherds are designated as either "red" or "other." We made no use of this sherd discard data in our research. Finally, some excavated potsherds, reportedly brought to UCLA, could not be located at the time of our laboratory research. For instance, Long (1966:88–89) mentions potsherds from deep levels of Las Cuevas: squares 2 and 4, 120 to 180 cm below the surface. He believed these were contemporary with shaft tomb burials at the site (chapter 7). Small samples of potsherds from these levels are listed in the Las Cuevas catalog, but in our laboratory work, we encountered no samples of potsherds from these pits from levels deeper than 60 to 80 cm.

Figure I-2. A contour map of the excavated portion of Anona. Compiled by Michael Glassow, 1963; redrawn by Sandra Wong, 2009.

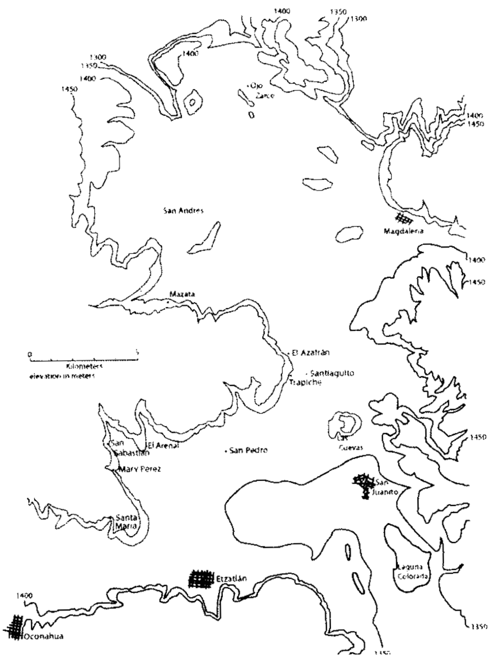

Figure I-3. A contour map of the excavated portion of Tiana. Compiled by Michael Glassow, 1963; redrawn by Sandra Wong, 2009.

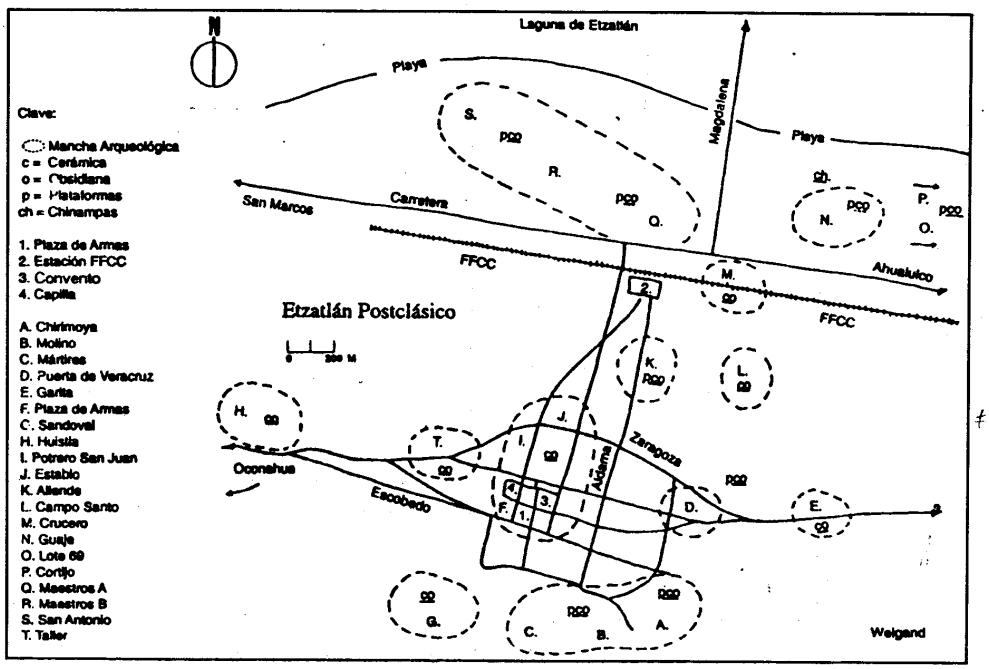

Figure I-4. A contour map of the excavated portion of Las Cuevas. Compiled by Michael Glassow, 1963; redrawn by Sandra Wong, 2009.

The collection did have positive aspects, however, that led us to undertake this research. We found potsherds excavated by Long and Glassow to be generally in very good condition. For the site collections we studied, the sherds had been marked with catalog numbers designating site, level, and square. A redundant lot number also had been written on all sherds, which cut down greatly on sherds lost to unreadable catalog numbers. Also, we found these potsherds, for the most part, sealed in their original labeled level bags, as they probably had been packed in the field lab.

While this study deals only with ceramic artifacts, Long and Glassow shipped other excavated materials back to UCLA. In addition to the pottery, these collections include the remains of human burials, animal bones and bone artifacts, hundreds of pounds of obsidian debitage and artifacts, as well as copper artifacts.

Sites Investigated

Las Cuevas

We began our work with the collection from Las Cuevas, a major site on what was once an island in the Laguna de Magdalena, located about 7 km north of the modern-day community of Etzatlán. The lake was drained through various projects between 1900 and 1960 and the lacustrine deposits turned into farmland (Weigand and Ron Siordia 1987:47–48). Las Cuevas was an important obsidian workshop where raw material from the nearby quarry of La Joya was processed into blades (Weigand and Spence 1982; see also Spence et al. 2002). Long (1966:59–60) describes a tomb and its contents, which he excavated in 1963, and Weigand (1993:figs. 2.3 and 2.8) illustrates several other tombs, one a deep shaft tomb from the same site. (See chapter 1 for more details on Las Cuevas, which is discussed in terms of both that site name and the earlier toponym, *Atitlán*, recorded during a 1525 Spanish *visita* to the then extant community.)

Tiana

While the site of Tiana is located in the vicinity of Etzatlán and probably near the old lakeshore (see Glassow 1967:64), the surviving copy of Long's field map showing site locations is obscure, and the exact location, unknown. Recently, Glassow (personal communication 2009) located a personal journal from his field season in the Etzatlán area and found mention of Tiana as "west of Huistla by somewhat less than a kilometer." Huistla is within a kilometer of the southwest edge of Etzatlán (Glassow 1967:64). As noted previously, no field notes or other documentation survive, except for the artifact catalog, a contour map, a discarded sherd list, and information written on the artifact level bags.

Anona

According to the Site Survey Record and 1963 field notes, the site of Anona is across a stream from the southeastern edge of the town of Etzatlán, situated on a stream terrace and the sloping hillside behind. Long and Glassow describe the site as covering approximately 1 km^2. Glassow wrote a brief description of this site the day excavations began there, October 2, 1963:

Began the site of Anona today. This site is located on the southeastern edge of Etzatlán, just on the other side of the first bridge east of the town hall. The site consists of a terrace above a creek and the hillside behind this terrace which flattens out somewhat at a height of ca. 15 meters. On this hillside there is the foundation of a building which is said by the town's inhabitants to be an old church. At this location there is now erected a monument about 3 meters high of a cross. The hillside has at least 2 main built up embankments with long terraces behind, running along the contours of the slope. These may be in part fallen down stone fencerows, but they may also be retaining walls for buildings that may have once stood [there]. This is a lot of rock, mostly basaltic, strewn on the surface of the hillside, some of it definitely forming patterns of building foundations. Possibly Etzatlán once extended over this hillside in earlier times, possibly even during the early Spanish period. At any rate, houses of an earlier date did exist on the site area,

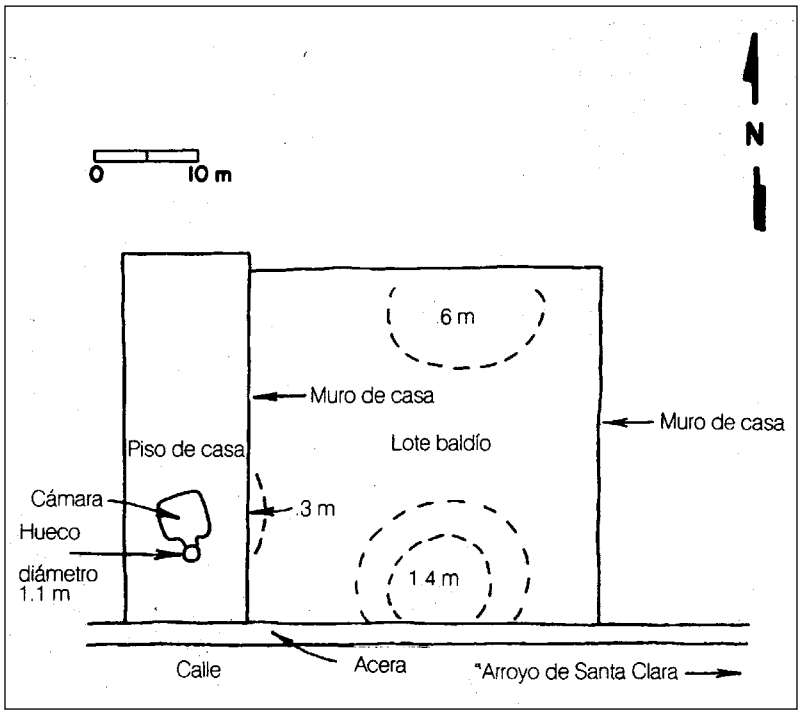

Figure I-5. A field sketch map of Anona. Map by Michael Glassow, 1963; redrawn by Sandra Wong, 2009.

as evidenced by the presence of glazed sherds and fired bricks. It would seem logical that a church would have a settlement around it. The water supply for the site must have been the stream which runs along the western margin of the site. Stan [Stanley Long] mentioned reports of an old Spanish graveyard in the vicinity, possibly near the foundations of the problematical church.

Glassow's sketch map of the site, redrawn, is included here as figure I-5.

Weigand amplifies but partially disagrees with this description: Anona is the section of the Etzatlán ruin called Santa Clara (chapter 1). The arroyo/creek Glassow refers to is Santa Clara Arroyo, which was called a *río* in prior times. Today it barely affords a dribble of water even after the heaviest rains. It used to have ponds, many fish and crawfish, reeds, and so forth, as well as clear, clean water. No more. The Santa Clara sector of the Etzatlán ruin is Late Postclassic, and it is from this part of the ruin that we have the AD 1480 ^{14}C date. It borders on the Chirimoya sector of the ruin, just to the east. Both sectors are characterized by terraces, house walls, pits, platforms (plus a ramp at Chirimoya), burials of both humans and dogs, many Huistla potsherds, obsidian, and copper artifacts (including pits with slag from malachite ores). We have *no* evidence for a chapel, church, or Spanish graveyard here or anywhere nearby, either in the archaeology, the archives, or from the looters who have pocked this area quite thoroughly. As mentioned by Glassow, the area is indeed large (taken with Chirimoya), but it does not cover a square kilometer. Twenty hectares would be more like it. (Also see chapter 1 for sites surrounding Etzatlán.)

Santiaguito

Weigand describes the site as follows: Santiaguito was on an island within the central-west sector of the now-drained Laguna de Magdalena. Its location is noted on the 1579 *Ortelius* map. The location was strategic in that it was near the narrow constriction that divides the northern Magdalena section of the lake from the Etzatlán sector to the south. The island was small, approximately 1 ha in extent, and was separated from the mainland by a shallow section of the lake less than 200 m wide. An ancient causeway may have been constructed over this narrow space to the mainland. Opposite the island, to the west, was a much larger settlement, also now a contemporary village. The two sites were

obviously integrated, as Santiaguito had no farmland, beyond space for small gardens. Very little of either of the pre-Hispanic settlements is currently visible around and beneath contemporary structures. A large platform on the mainland has been completely destroyed by road-building. The summit of the island, marked by a cross, also had a small platform. The terraces utilized by modern Santiaguito houses are most likely pre-Hispanic in origin. The streets are littered with Late Postclassic sherds and obsidian fragments. Looting has produced earlier material, some of which is Late Formative in date. Possible terrace-platform remains are visible within some house lots, and many houses are apparently built on both the pre-Hispanic terraces and platform bases. The morphology of the ancient settlement, however, is now largely unintelligible. The contemporary village of Santiaguito had, before migrations almost emptied it, approximately 150–200 people. The pre-Hispanic island settlement was probably about the same size, though the mainland sector of the site was larger. Before the Magdalena Lake was drained during the 1950s, economic activities included reed-gathering and fishing, accompanied by farming on the mainland. This economic pattern was probably the pre-Hispanic one as well.

An early colonial church or chapel may also have been situated on the island. Such a structure is indicated on one of the two early maps discussed in chapter 1: the *Pintura del nuevo reino de Galicia*. Weigand found no evidence of this structure in the field, but he found the site so altered that he believed a small chapel easily could have disappeared without much of a trace.

In all probability, Santiaguito was on a second island north of Las Cuevas in the Laguna de Magdalena; the town there was recorded as Tenyca by Gonzalo Cerezo and Diego de Coría (1937:559; see chapter 1) during their 1525 visit. They observed that Tenyca had sixty houses and an adult male population of 120.

Ethnohistory

For the Etzatlán region, Weigand and García de Weigand (1996:55) see strong continuity in settlement patterns from the Late Postclassic to colonial periods and persisting into contemporary times. The authors find evidence for this continuity not only in their own field reconnaissance, but also in early maps and documents, as described in chapter 1.

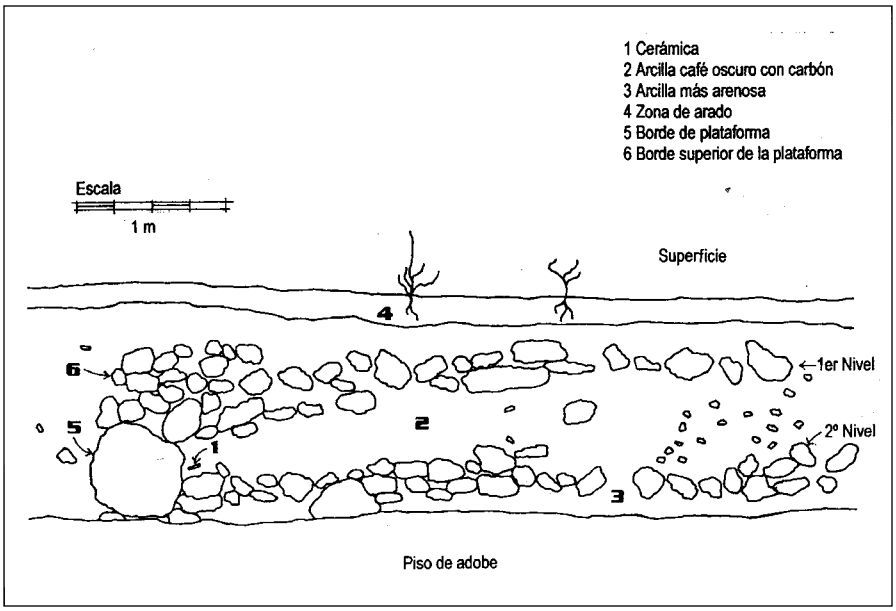

Figure I-6. Key localities in West Mexico. Drawn by Sandra Wong.

Previous Research

Within the archaeological literature on Jalisco and adjacent areas of West Mexico, relatively few publications contribute to the construction of ceramic sequences. Those we found most useful, which are cited in this publication, include two reports of excavations on the south shore of Lake Chapala, one in far eastern Jalisco (Meighan and Foote 1968), and the other nearby in far western Michoacán (Lister 1949). To the west, the important site of Amapa, as studied by Grosscup (1964, 1976) and Meighan (1976), provided the most detailed comparative data for our purposes. Amapa is located on the coastal plain of Nayarit. Kelly (1945) conducted ceramic research at localities across West Mexico and, most significantly for this study, in the Autlán-Tuxcacuesco area of southwest Jalisco. Other studies providing information on ceramic chronology include Beekman 1996; Beekman and Weigand 2000; Galván Villegas 1991; Gifford 1950; and Mountjoy 1970. Key sites/localities are depicted in figure I-6.

Organization of the Ceramic Research

The ceramic study begins in chapter 3 with typological descriptions, the basis for the ceramic classification. Throughout the book, these types are referred to using simple descriptive titles and/or the numerical codes that identify them in the data sets. Chapter 4 presents the analysis, as it developed in two stages. As mentioned, we began our lab work with the largest collection, that from Las Cuevas. We classified over seventy-eight hundred potsherds from this site and entered the data (type and provenience) into the computer with the aim of discovering the site's ceramic sequence. We employed the correspondence analysis (CA) statistic to generate a progression of types, potentially in chronological sequence. Then, in order to find corroborating evidence for this seriation as well as to explore its efficacy as a ceramic chronology, we turned to three more site collections and repeated the process for each: Tiana (approximately eighteen hundred sherds), Anona (approximately twenty-five hundred sherds), and Santiaguito (approximately three thousand sherds).

Through this series of CAs, we found a high degree of consistency between the hypothetical sequence at Las Cuevas and those of the other sites. Tiana appeared to fit in the early portion of the Las Cuevas sequence and Anona to represent the full chronological range. Pottery from Santiaguito was more eroded than that from other sites, but the full sequence did appear there as well, although slightly altered. These results led us to consider seventy-four samples from the three less-impacted sites—fifty-two from Las Cuevas, eleven from Tiana, and eleven from Anona—and to generate a CA for the combined samples. This CA will be referred to in the chapters following as the original three-site CA.

Thus far in the analysis, we had worked only with selected types or groups of related types combined to increase sample sizes. All of these types and type groups had shown some tendency to covary either positively or negatively with one another (sample by sample), which suggested either common or disparate histories in a ceramic sequence. Also, this idea was supported through the CAs mentioned previously. However, most of the types described in chapter 3 had not been included, and the next step was to find a way to expand the tentative sequence. In CA, results are displayed on a two-dimensional grid, and in our case, the types align roughly along the x-axis, or horizontal axis, hypothetically

in chronological sequence. Concurrently, though, the CA also projects sample loci onto the same grid. Type loci are arranged so that those showing similar distributions among samples are situated close together. Similarly, sample loci are projected so that samples with similar type proportions are also close together. And if type loci are aligned across a grid in chronological sequence, then sample loci will be as well.

This fact leads to several consequences favorable to archaeological research. First, one can study to some extent the distribution of types individually through a sequence, not just as a type locus relative to other type loci represented on a CA grid. In this study and by type, we assigned the sample x-axis value to each sherd, according to its sample membership. The distribution of x-axis values by type, then, provides an indication of a type's distribution through time: whether, for example, a type had a relatively long or short history at a site or a normal or skewed distribution. Secondly, the archaeologist can determine the chronological positions of some types not included in the original CA by summarizing x-axis values for each type with a sufficient sample size. Type loci or positions in the sequence, when not produced directly by the CA, are approximated by the median values for these type distributions. Our strategy, then, was to employ in the CA proper high-frequency types with relatively clear typological definitions and/or preliminary evidence of chronological sensitivity. Then, further chronological assessments could be extended to these and other types in the manner described. This approach can also be extended to nonceramic debris, such as stone tool types, debitage classes, or animal bones of a species or category. We summarize ceramic type distributions using this approach with the original three-site CA in chapter 5.

A remaining question had to do with the initial selection of types employed in the CAs. Several decisions were part of the selection process, and it seemed possible that somehow this grouping might have biased the outcome. In other words, selection of another group of types might have led to a different ordering of all types. The issue is explored in chapter 6, where we describe different CAs for which types were selected using different and simpler criteria. Another (related) statistical model was generated using the EDM (exponential distance model) statistic (chapter 2). In all cases, we found generally the same type ordering as in the original three-site CA.

In the concluding chapter of the book, we examine data from other studies, especially pottery type distributions from stratified sites, in order to confirm or reject the sequence suggested by our statistical study. We have found good support for the proposed Etzatlán sequence in the form of comparable types in parallel sequences, especially from the highly stratified site of Amapa near the coast of Nayarit. Finally, our ceramic research indicates that the indigenous ceramic tradition continued after historic contact and that after the introduction of Spanish Majolica pottery, older prehistoric ceramic forms were modified in this new sociocultural environment. Herein, we explore the implications of these data for our understanding of the prehistoric–early historic interface at Etzatlán.

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Roger Nance's interest in West Mexican pottery began over fifty years ago. While a UCLA undergraduate student in anthropology, he was escorted, probably as a class exercise, into a room filled with sherds from an ongoing project. The indelible impression of that ten minutes has remained until the present and probably led, as much as anything, to the writing of this book.

However, other ideas also motivated the Etzatlán research, including our interest in exploring the application of statistics to a collection of Mesoamerican pottery. For de Leeuw and Nance in particular, the emphases were threefold. First, our approach to the search for a ceramic sequence was explorative rather than hypothesis oriented, a mind-set compatible with the use of CA. Second, we put a premium on a large data set as we well understood the difficulties of working with small data samples in archaeology. Third, in the collaboration of a statistician and an archaeologist, we saw potential for the synergism that can follow from cross-disciplinary research.

Another motivation for this research had to do with our interest in the preservation of information through archaeological salvage. Weigand saw an increasing rate of site destruction in Etzatlán over his many years of working there. Etzatlán is no longer the traditional town described in Glassow's foreword. For one thing, the modern city of Guadalajara, 103 km and two hours' driving time from Etzatlán, has

grown greatly since the 1960s and now has a population of about 4.3 million. This growth has had its impact. Also, the population of Etzatlán itself has increased by about 50 percent to 18,633, according to the 2010 Mexican census. Phil Weigand's death in 2011 will only compound the difficulty of trying to study and preserve sites in and around Etzatlán. And what Weigand saw in the field, Nance, to some extent, witnessed in the archaeology lab. The collection has deteriorated at a much slower rate, but the effects have become both noticeable and telling, as we have discussed.

Finally, we did encounter several problems that came close to derailing the project, and their mention might prove beneficial to future students of long-stored collections. The first had to do with lab time. Archaeologists do not often take on such long-term, time-consuming projects, and lab directors might not appreciate that such projects can persist over many years. In these efforts one might face the prospect of moving, with artifacts, to a new locality. In our case, with the cooperation of the Cotsen Institute and Fowler Museum and the generous assistance of the Westside Pavilion Shopping Mall, we were able to move, rent free, to a vacant store in a nearby mall, where we worked for over a year.

Another problem is simply that long-stored collections can outlive the tenure of archaeologists responsible for their excavation. For this project, Nance knew of no locally available expert on West Mexican ceramics to consult during the course of the research, the essential issue being how to relate accurately one's typology of potsherds to published descriptions of types in the literature. As a result of fortuitous events, Christopher Beekman, who works at the University of Colorado–Denver, visited with Nance at the UCLA Fowler Museum laboratory. He examined some typed sherds and was able to clear up a misconception, thus enabling us to move forward.