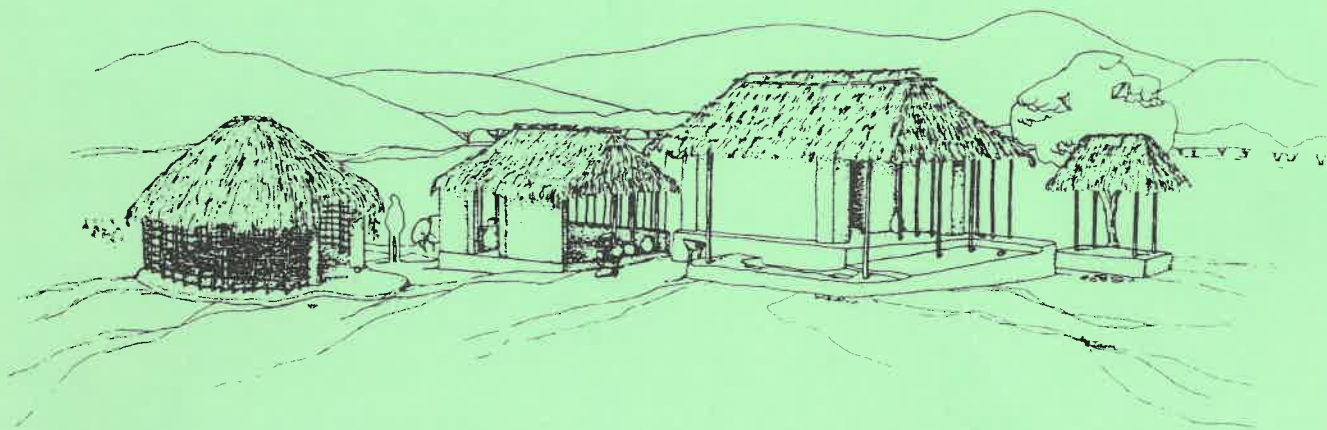


**1990 Investigations
at the Cerén Site, El Salvador:
A Preliminary Report**



**Department of Anthropology
University of Colorado, Boulder**

**1990 Investigations
at the Cerén Site, El Salvador:
A Preliminary Report**

*edited by Payson D. Sheets
and Brian R. McKee*

1990

DEPARTMENT OF ANTHROPOLOGY
UNIVERSITY OF COLORADO, BOULDER

PATIMONIO CULTURAL

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JARDIN BOTANICO

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Cover Reconstruction Drawing of
Household 1 by David B. Tucker

Cerén Project Preliminary Report 1990

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Chapter 1. INTRODUCTION TO THE 1990 RESEARCH OF THE CEREN PROJECT, EL SALVADOR

Payson Sheets, University of Colorado

"... the science of digging housemounds or home sites ... holds none of the glitter, the thrill, or the hopes for valuable rewards of rich burials and palaces of the ancient plutocrats. However, it is essential to proper exploration.... Such digging is painfully realistic and humdrum, but must be done [to shed] light on the vast majority, the ancient peasantry". (Dimik 1969:12-13)

BRIEF OVERVIEW

Ceren was a thriving village 1400 years ago, in what is now the Zapotitan Valley of El Salvador (Figure 1). Each household constructed specialized buildings on fired adobe platforms, including a communal structure for sleeping and daytime activities, a storehouse for food and cutting and grinding implements, and others. Architecture featured adobe walls, doorways with wood-adobe lintels, cornices, benches, and niches, and substantial thatch roofs. Activities included agriculture, pottery making, food storage, food processing, cooking, and implement storage. Sharp-edged obsidian blades were tucked in thatch roofs, generally near doorways, for safekeeping, and probably to protect children from being cut. Many artifacts, including mortars, pots, and scrapers, were placed on walltops and rafters. Grains were stored in large capped ceramic vessels, but a fieldmouse and two species of ants got inside. All thatch roofs had at least one mouse, and bodegas often had a half dozen. The sudden explosive eruption of Laguna Caldera Volcano enveloped the site in steaming clouds of volcanic ash, preserving buildings, features, organic materials, and artifacts in pristine condition.

Four structures of Household 1 have been excavated. Two structures of Household 2 have been excavated, but only one building of Household 4 has been excavated. Structure 3, probably a communal building, has been fully excavated. Structures at Ceren have been renumbered; structures are now numbered in order of their discovery and excavation (Fig. 2). Complete excavations of all three households are necessary to reconstruct the similarities and differences among them, and investigate interrelationships. Geophysical research south of Households 1-3 detected a long anomaly at depths of a few meters, but two test pits indicated that it may have been from natural causes. The powerful turbulence of the pyroclastic surge during Unit 5 scoured out a part of the hillside, removing Unit 4 and some of Unit 3, and that may have caused the anomaly.

RESULTS OF THE PREVIOUS 1989 RESEARCH PROGRAM

Fieldwork, from May to August of 1989, resulted in significant new geophysical, volcanological, biological, and archaeological data. Geophysical anomalies were detected at the 5-7 meter depth, and one was confirmed as a prehistoric structure (Str. 3) by core drilling. Microstratigraphic volcanological research resulted in detailed unit-by-unit knowledge of the components of the complex Laguna Caldera eruption. Biologists identified flora and fauna preserved in and near the structures excavated. The archaeological research excavated parts of three households, finding exceptionally well-preserved structures, roofs, vessels with their contents, activity areas, and other features.

One of the geophysical anomalies which was detected by resistivity during 1989 was confirmed as a prehistoric structure (Str. 3) by core drilling, and was excavated. It is the largest single structure excavated at Ceren to date, measuring about 5 by 8 meters, with solid adobe walls extending vertically more than 3 1/2 meters above its environs (Fig. 3). (Note: the term "adobe" is used in this report in its more general sense of earthen architecture, not in its more specific reference to adobe bricks.) In spite of the roof's large size, it was relatively independent of the structure, being supported largely by poles and adobe column bases outside the building. Two adobe column bases were built on top of the front and back walls of the structure. Confidence in the strength of their construction is indicated by the placement of an adobe column base for roof support on top of the adobe-and-wood lintel above the main doorway of the house. The large roof covered about 40 m² inside the walls of Structure 3, and approximately the same area outside the walls. As a likely communal building, it was kept relatively free of artifacts, with only a large storage vessel on one of the two large benches, a polychrome vessel on a wall-top, and a donut stone inside on the floor (Fig. 4). Curiously, a number of rocks were stored on rafters or even on top of the thatch. A significant aspect, probably indicating social or economic

Figure 1. The Zapotitan Valley, El Salvador, with the Cerén Site Pointed Out.

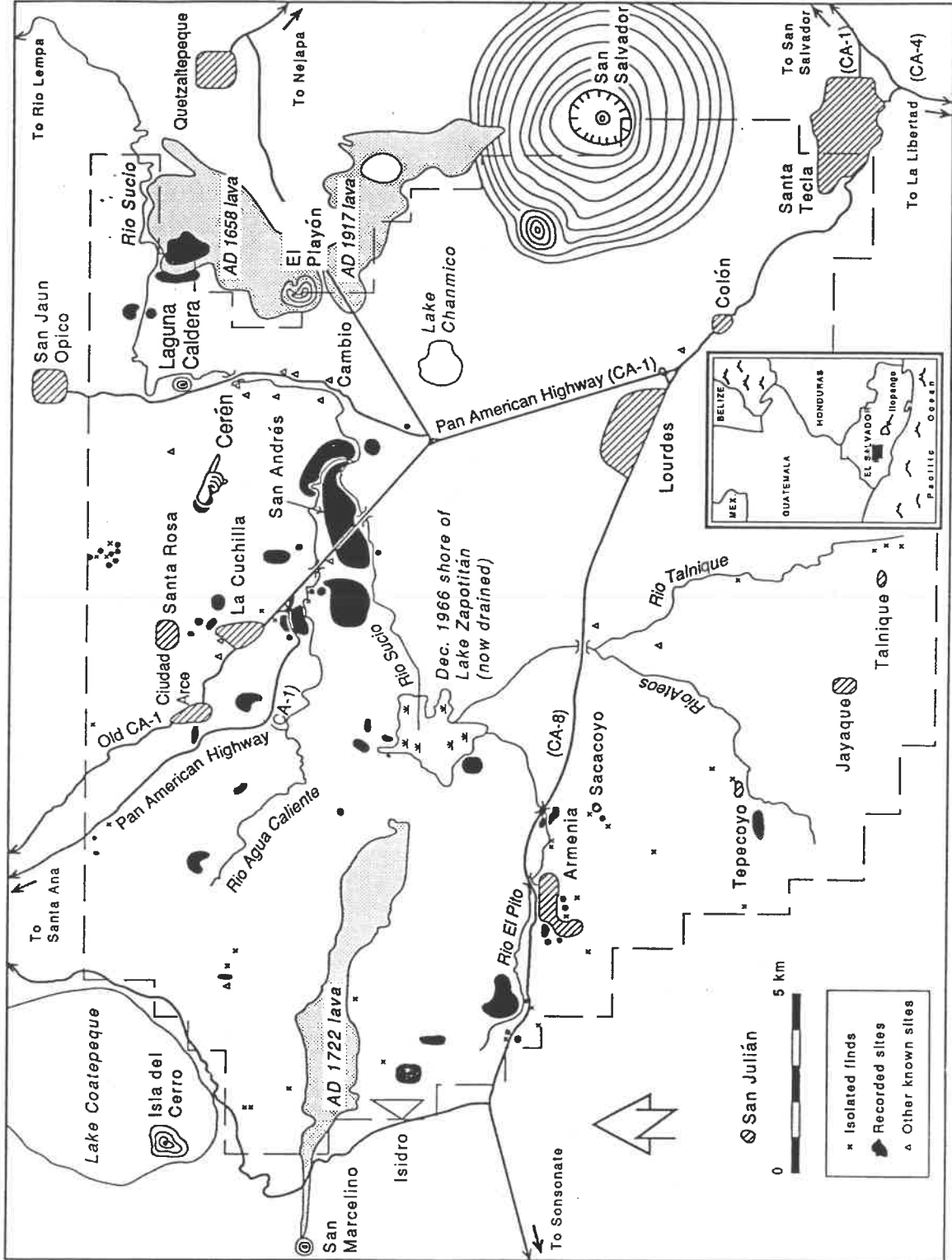


Figure 2. Map of the Cerén Site.

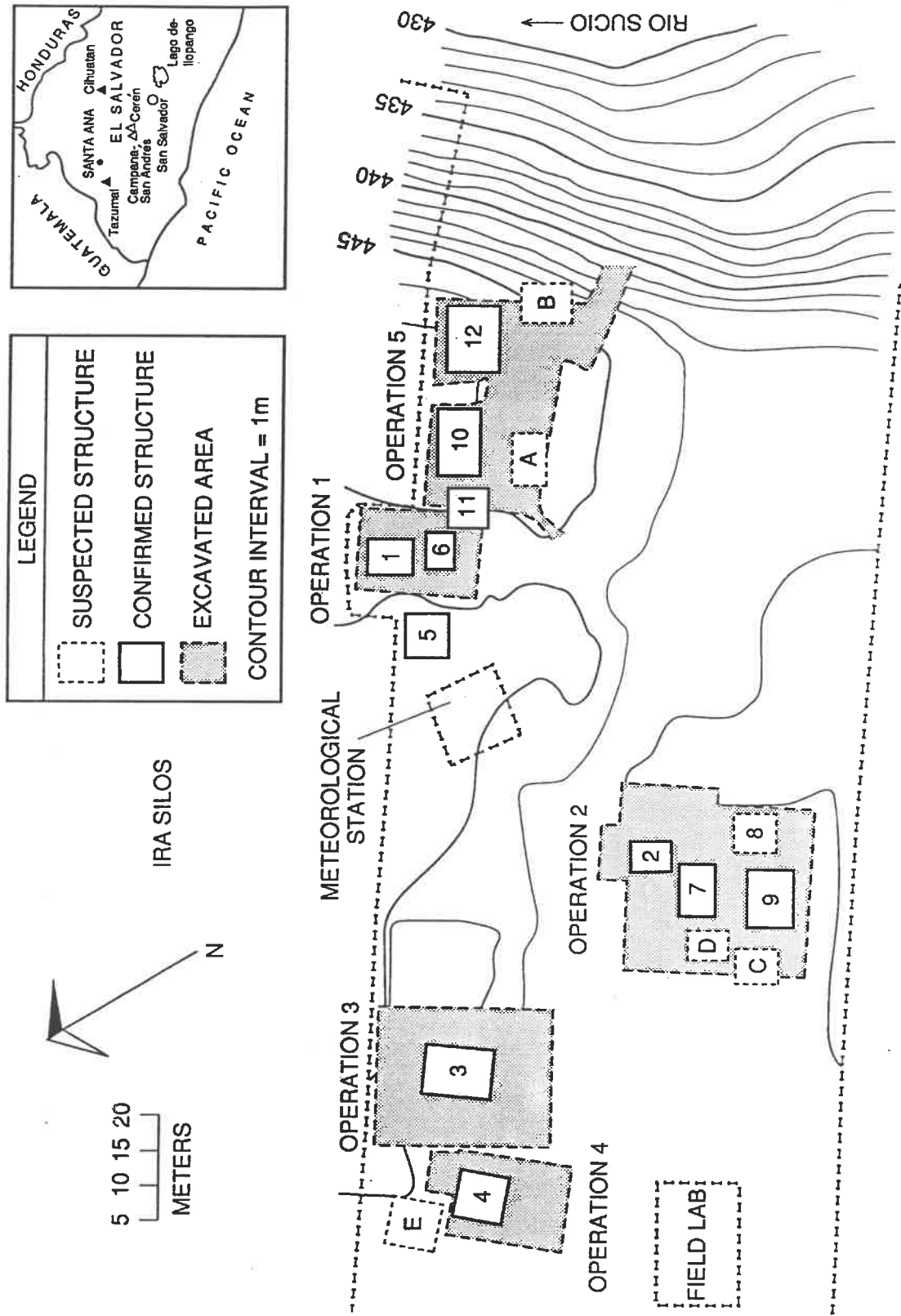


Figure 3. Artist's Reconstruction of Structure 3.
Drawing by Karen Kievit

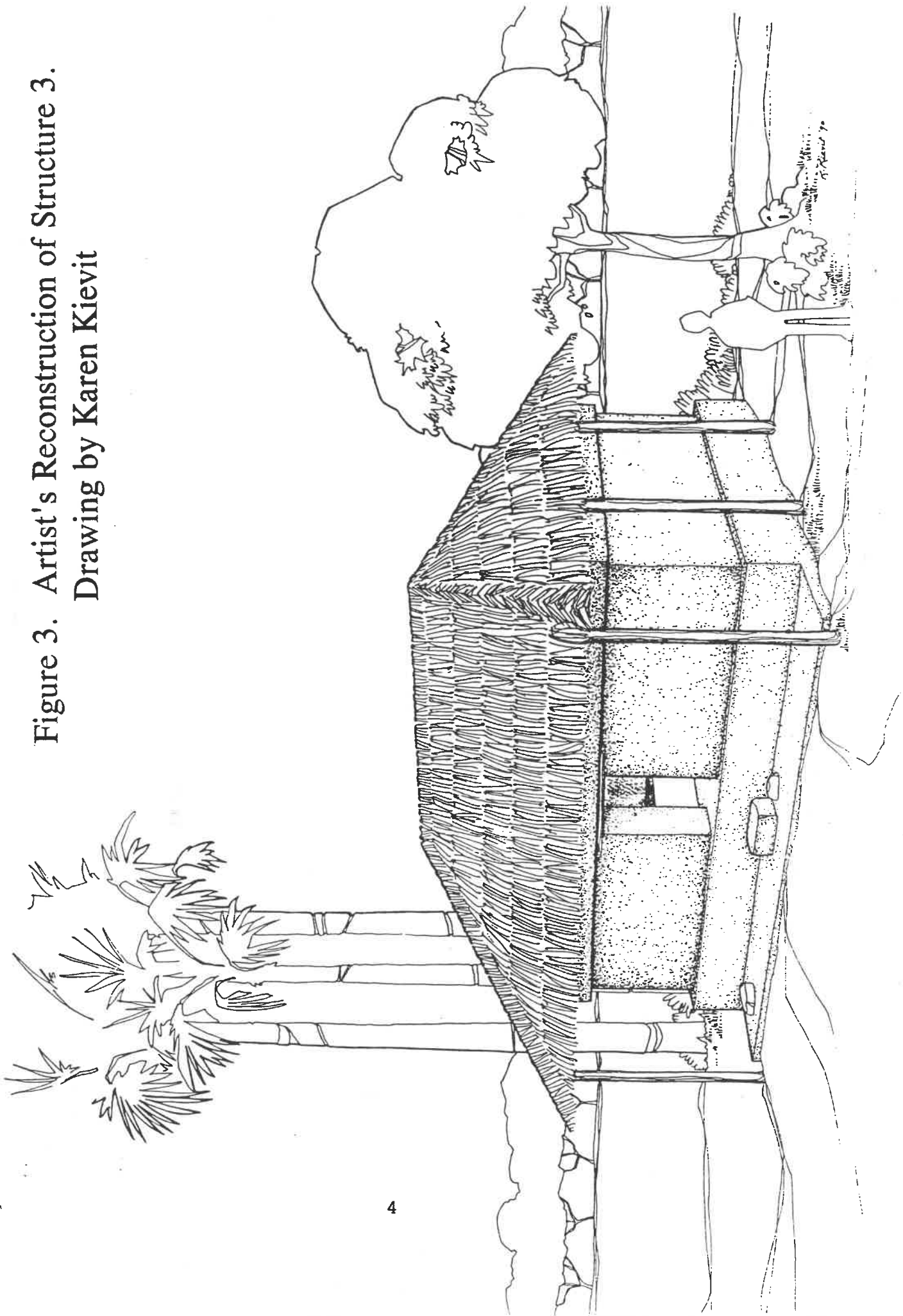
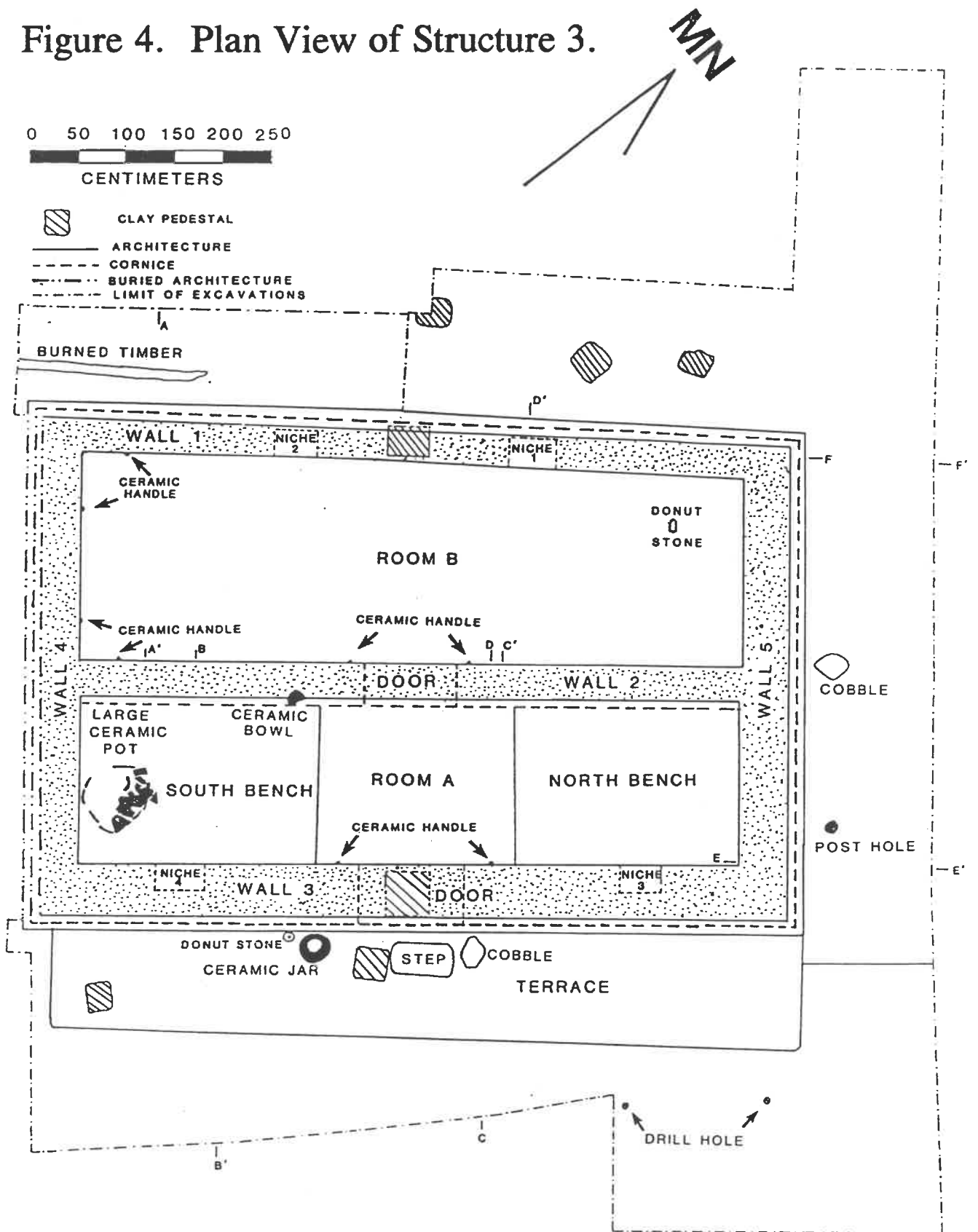


Figure 4. Plan View of Structure 3.



differences among households, is that there was no obsidian in the structure, in contrast to the communal structures of Households 2 and 3.

Household 2 was first detected as a geophysical anomaly using resistivity and ground-penetrating radar, and confirmed as a prehistoric structure by core drilling (Loker 1983). Str. 2 was excavated in 1989 (McKee 1989), and it appears to be the communal activity building, the domicile, of the household (Fig. 5). Two other associated structures have been excavated, and others have been detected nearby but have yet to be excavated. One may be a sweathouse.

Structure 2 is divided into two rooms on a 15 m² platform. Four solid adobe columns anchor the corners of bajareque (wattle-and-daub) walls, and solid adobe wing walls extend past the columns to the north. The columns have nearly identical dimensions, and probably were prefabricated elsewhere before being erected at Str. 2. As with many of the buildings at Ceren, the area within the structure covered by the thatch roof is about equal to the area outside the structure. Under the eaves were a number of storage and activity areas. The tops of the bajareque walls supported an elevated wooden platform inside of the doorway, which extended outside the walls where it was capped with adobe. The southern room had two levels, a lower floor and an elevated bench which contained a niche. The niche contained three ceramic vessels, a bivalve seashell, and a multilayered polychrome-painted artifact.

Work is now ongoing to try to determine if this artifact was a codex or a set of polychrome painted gourds that decomposed and flattened. The artifact, presently under study at the Smithsonian's Conservation Analytic Lab by Harriet Beaubien, was made of kaolinite covering both sides of the thin organic material, and painted with cinnabar (HgS), limonite (yellow ocher, i.e. hydrous iron oxide), and other pigments. If it is confirmed that cinnabar was used to paint food serving gourds, the health implications of mercury in the diet need to be explored. One of the pottery vessels in the niche still retained the finger swipes from its last use as a food serving vessel, as it had not been washed prior to the eruption. The handles of broken vessels were embedded into solid adobe and bajareque walls, probably to suspend or tie objects. Sets of embedded vessel handles are found consistently inside of doorways in all households, probably to provide privacy by securing a mat or other kind of doorway covering. They could also be used to secure front doors. The front doors of Structures 4 and 7 were found in 1990; they were made of wooden poles.

Household 1 (Fig. 6) was domestic, agrarian, and craft-oriented. Residents, likely females, made, decorated, and fired ceramics in the household. Males evidently used the ramada (Str. 5) for daytime craft activities, including obsidian working. Females probably made and used cotton thread, as evidenced by the small spindle whorls. Household residents grew agave, manioc (?), and maize nearby, and stored large amounts of corn, beans, chiles, and other foods in the house and *bodega* (storehouse). Food was ground on metates still preserved on forked posts ("horquetas") that elevated them to waist level. The adobe bench was almost as big as Str. 2's bench, with a cornice added after original construction, but without a niche.

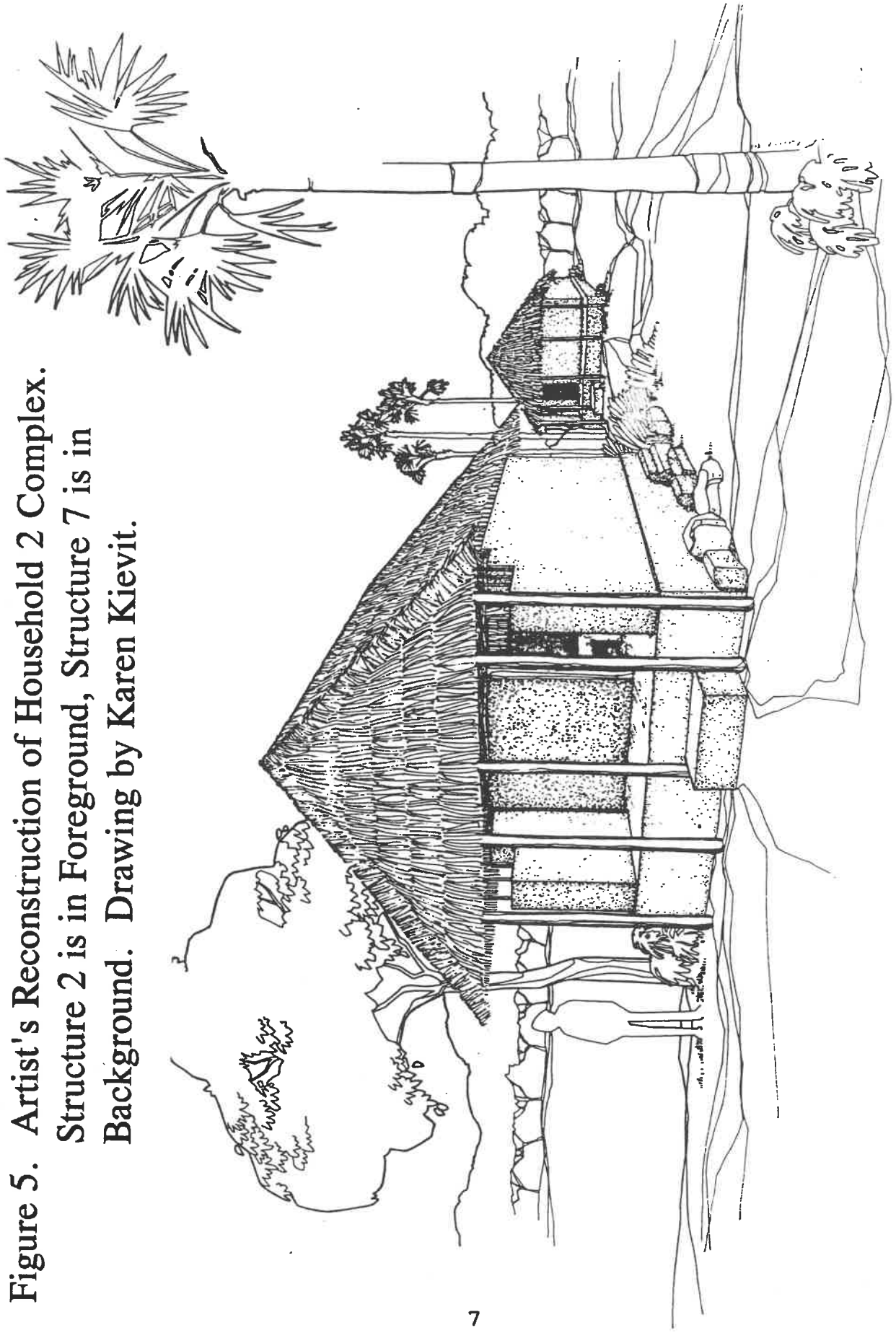
Household 1's circular kitchen was excavated in 1990, almost 5 meters in diameter (some 20 square meters of interior floor space), with a thin thatch roof and thin thatch walls. The roof was supported by a series of vertical poles. The thinness of the thatch roof probably was to allow smoke to escape. The structure contained numerous organic artifacts such as baskets and painted gourds.

Many structures excavated to date had an enigmatic item suspended from the roof, in the middle of the building, and above the floor, or perhaps blown into the structure during the early stages of the eruption. It was made of a mixture of fine Ilopango volcanic ash (from an earlier eruption), grass, and water, perhaps suspended in some kind of organic container about 1/2 meter in diameter. It was mixed vigorously enough to get air bubbles in it. It is possible that it was used as a scrubbing cleanser, but there is no direct evidence of such a use.

Households stored their fine obsidian prismatic blades, generally in the roofing thatch, but occasionally tucked into a crack in a wall. That probably was done to protect the edges as well as to protect children from being cut. Valued items, such as polychrome pots, or "donut" stone mortars, were often placed on top of adobe walls or with roofing members for safekeeping.

Ceren residents constructed multiple buildings for specific functions per household, in contrast to Lower Central America and northern Mesoamerica. In Lower Central America a household is encompassed by a single structure (cf. Lange and Stone 1984). Oaxacan families constructed large rectangular buildings for multiple household activities (e.g. Whalen 1981). The same is true for

Figure 5. Artist's Reconstruction of Household 2 Complex. Structure 2 is in Foreground, Structure 7 is in Background. Drawing by Karen Kievit.



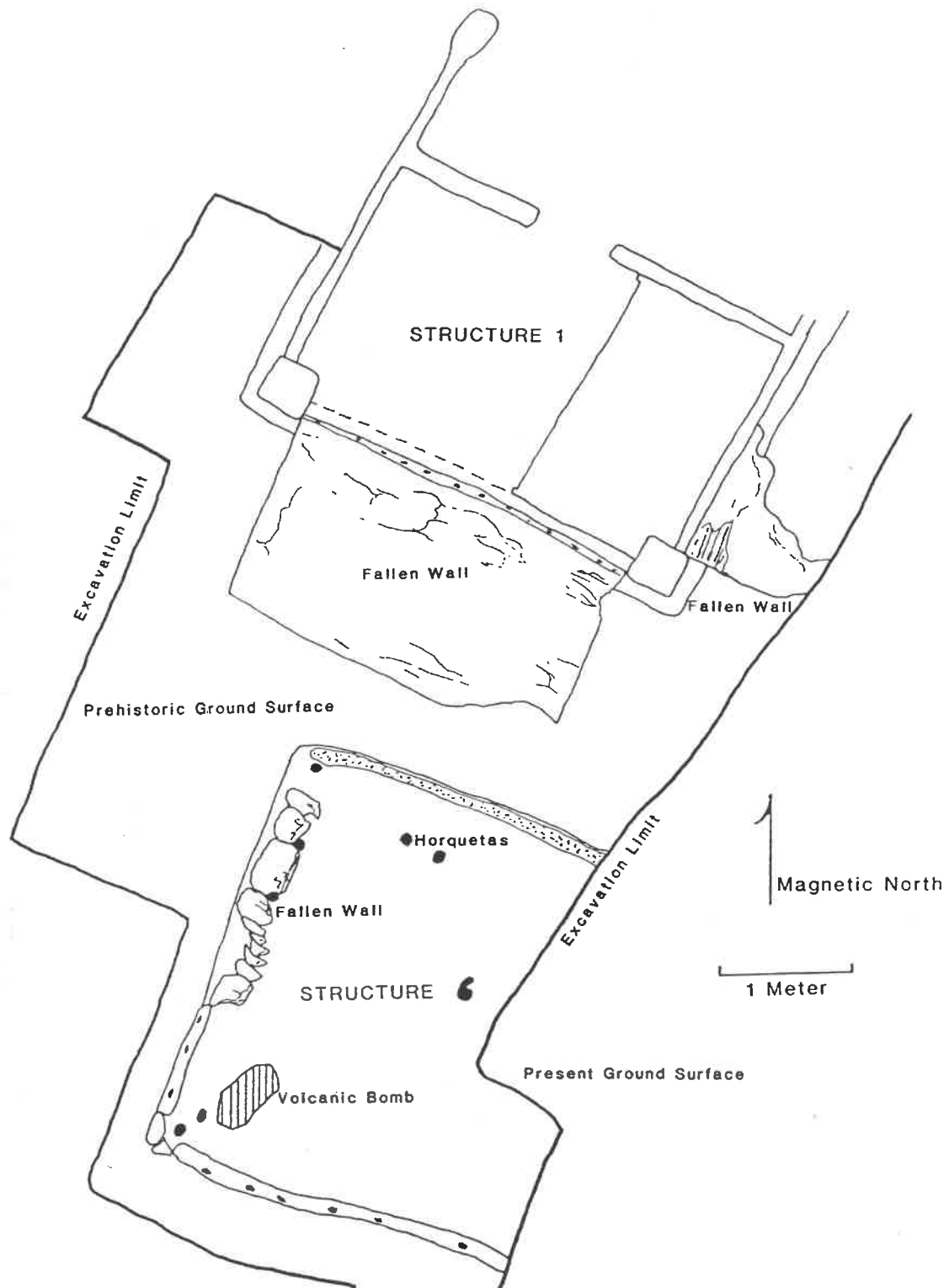


Figure 6. Plan of 1989 Operation 1 Excavations showing in situ Architecture.

Teotihuacan (Millon 1973) and later societies in the Basin of Mexico. Stone (1948) describes the Lenca living in single structures per family, and most have only one room. The Chorti Maya (Wisdom 1940) presently construct a number of functionally-specific buildings per household. The Classic Maya of Copan constructed multiple structures per household (Webster and Gonlin 1988). The Kekchi Maya space families at least 30 meters from each other, and each family generally lives in a multiple-structure complex internally facing a patio (Wilk 1988). Gerstle finds many architectural and space-use similarities with the Maya at Copan. The issue of cultural affiliation of Ceren residents is not clearly resolved, but architectural data would favor the Maya over the Lenca. However, in a frontier situation, with flux of goods and people, it may be an oversimplification to expect Ceren residents to be clearly one or the other.

1990 PROJECT DESCRIPTION: OBJECTIVES AND FRAMEWORK

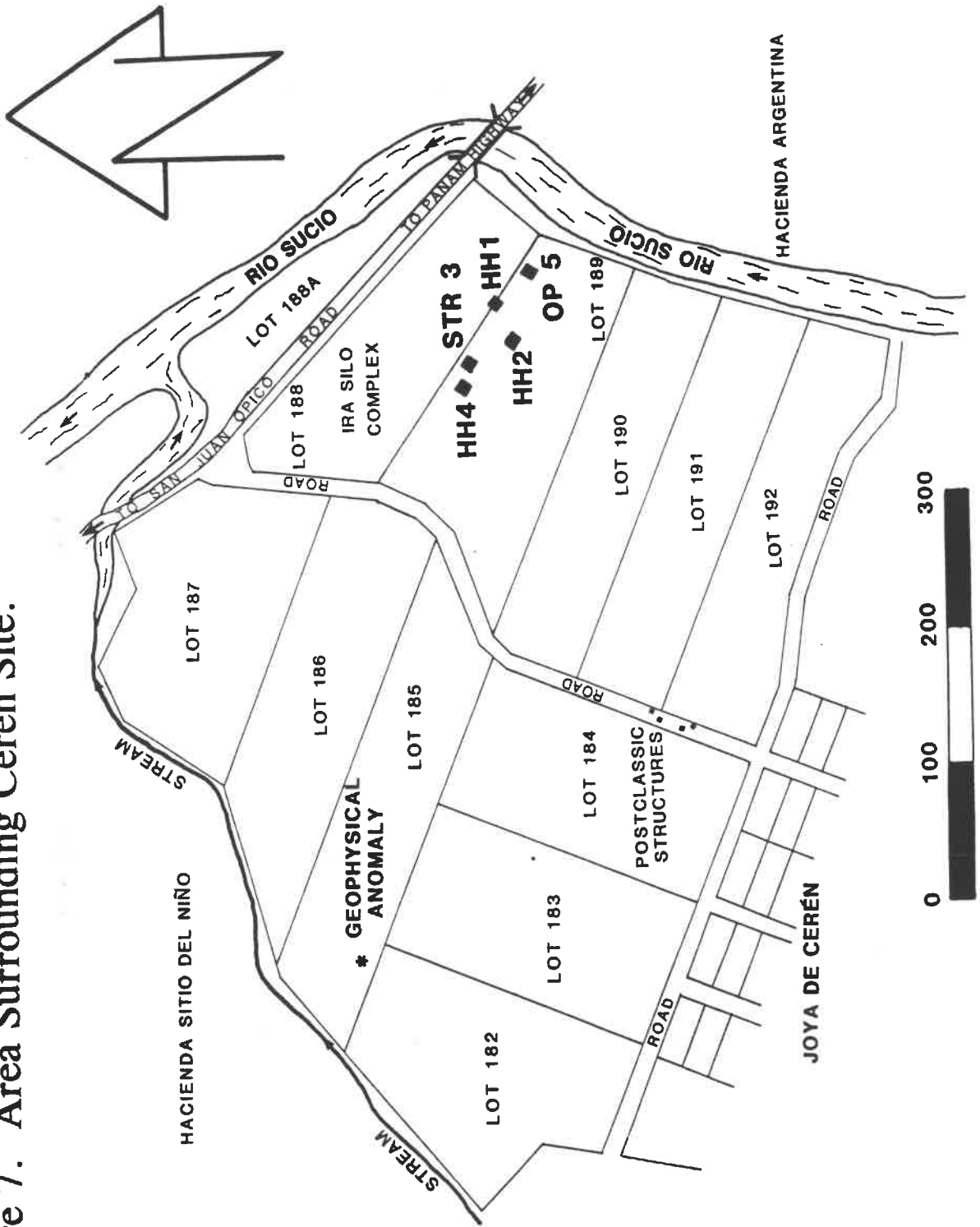
INTRODUCTION

Household archaeology focuses on the domestic co-residential group, and attempts to reconstruct activities regarding productive, sharing and redistribution, reproductive, and transmission functions (Wilk and Rathje 1982), on a synchronic or a processual basis. It is contributing to a democratization in Mesoamerican archaeology, as scholars shift from the elite emphasis of many earlier Mesoamerican projects, to investigate functioning prehistoric societies beginning with their basic building blocks. However, a major limiting factor inhibiting ample understanding and interpretation is the quality of data, often due to poor preservation. The agents of natural disturbance, particularly strong in tropical climates, deleteriously affect most sites, particularly sites of commoners. The agents include erosion, solar radiation, bioturbation of flora and fauna, and other deranging variables interposing themselves between prehistoric activities and the archaeologist wishing to reconstruct them. Gradual abandonments allow people to remove their most valued possessions, and later people "mine" the site for usable materials. This introduces biases that are difficult to detect and measure unless cases such as Ceren are known where such factors were not operable. Another weakness is, until recently, the paucity of household-oriented excavations and publications. As Flannery (1976:13) noted, there exists "not a single published plan of a complete Early Formative house" anywhere in Mesoamerica. Classic and Postclassic houses, and occasionally households, are somewhat better known. Research in Oaxaca (Flannery 1976, Spencer 1981, Whalen 1981) has provided a strong stimulus to household archaeology elsewhere in Mesoamerica.

The nature of volcanic preservation at the Ceren site (Fig. 7) provides an unusual opportunity to study southern Mesoamerican Classic Period households. The Laguna Caldera explosive eruption occurred with little or no warning, a characteristic of phreatomagmatic eruptions of basaltic magmas. Hot, fluid basaltic magmas migrating upward cause negligible earthquakes. The site evidence is in agreement, as round-bottomed pots remained on top of flat adobe wall tops, and adobe platforms and walls were not cracked. However, when the magma struck water, probably from the Rio Sucio, a series of violent steam explosions occurred. Structures, artifacts, plants, animals, and evidently people were enveloped by warm (almost 100° C) moist clouds of volcanic ash and gasses that were moving between 50 and 200 km/hour. The eruption rapidly buried the site with 5-7 meters of volcanic ash, sealing it from the factors of natural and human disturbance mentioned above. It also preserved organic materials, often to the cellular level. Those include palm and grass roofing thatch, roofing support posts and beams, grains in storage as well as the insects and rodents consuming them, and organic residues in food serving vessels and on food grinding and cutting implements.

Burial of the Ceren village was sufficiently rapid that the site was not abandoned by its inhabitants, in contrast to most prehistoric villages. The most common mode of village abandonment is gradual, in the present and the past, where people take their most valued possessions with them. After abandonment, subsequent people often remove artifacts and building materials from the remains. Dean (1987) notes the strong bias in material remains as modern households are gradually abandoned in northern Honduras and people remove many important items. Lange and Rydberg (1972) noted the same as a family left their domicile in Costa Rica. Wilshusen (1986) documented how the mode of abandonment affects preservation of artifacts and activity areas, and the superior nature of sudden abandonment for detailed reconstruction of Anasazi behavior. A wide range of abandonment modes

Figure 7. Area Surrounding Cerén Site.



are being explored by archaeologists; by comparison the Ceren site anchors an end of the spectrum, and in a sense has yet to be abandoned.

In summary, geophysical instruments have detected anomalies along the deeply-buried Classic Period ground surface, and some of them have been confirmed as prehistoric structures in samples brought up by core drilling. To date, most of the structures and associated activity areas of Household 1 have been excavated. Some of the structures of Households 2 and 4 have been excavated, along with the community building (Str. 3). The 1990 research program focused on excavations of structures in Households 1, 2, and 4. Households are being studied on five levels: artifacts, activity areas, structures, sustaining areas, and relationships with the larger community. Micro-volcanological studies relating structures and smaller features to components of the Laguna Caldera eruption are continuing. Biologists at the Salvadoran Jardin Botanico have agreed to identify flora and fauna encountered. When human remains are found, a biomedical team will study the bodies to determine sex, age, pathologies, anomalies, nutrition, body composition, and other factors, if preservation permits.

THE CONTEXT: PREVIOUS RESEARCH IN EL SALVADOR

Reviews of previous archeological research in El Salvador (Sharer 1978, Sheets 1984, Demarest 1986) and Salvadoran research related to volcanism (Sheets 1978, 1979, 1983a & c) are available, so only a brief summary is needed here. A number of Salvadoran sites and regions have been amply published (Sharer 1978, Andrews V 1976, Fowler et al. 1976, Demarest 1986, and others), allowing for regional processual reconstructions. Prior to the 1970's, Salvadoran prehistory was poorly known and even more poorly published, with only a scattering of brief preliminary articles, and Longyear's monograph (1944). The last two decades have witnessed the publication of numerous site reports, syntheses, and critiques (e.g. Demarest 1988). The sequence of explosive volcanic eruptions in central El Salvador is moderately well known (Hart 1983, Hart and Steen-McIntyre 1983), allowing for assessments of impacts of, and recoveries from, those events.

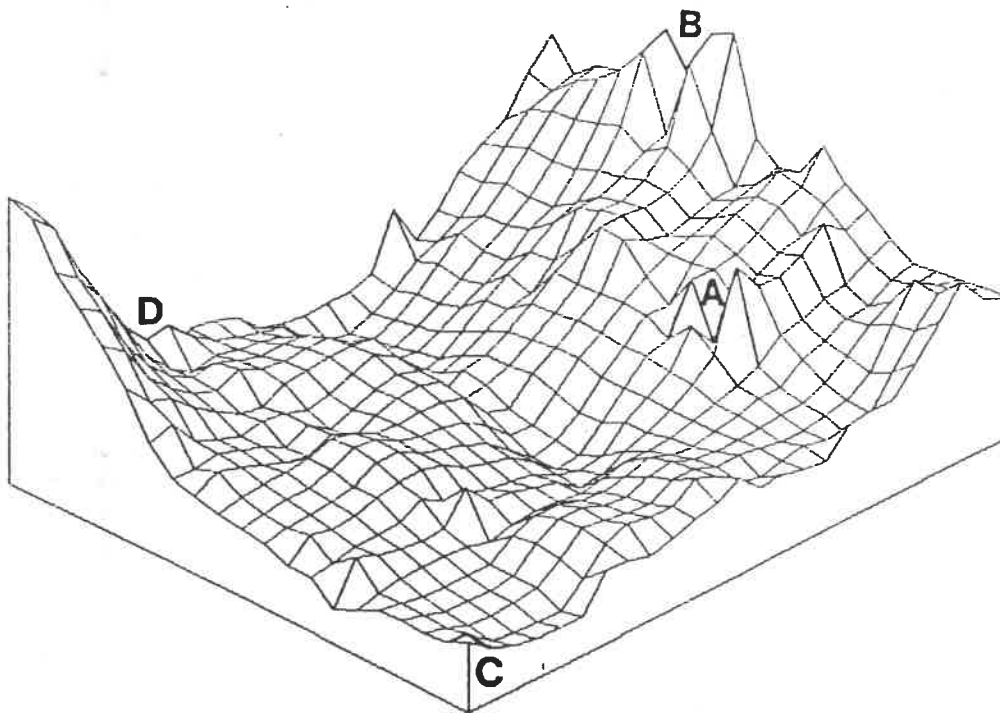
Fifteen percent of the 546 km² encompassing the Zapotitan Valley (Fig. 1) has been surveyed intensively, using a probability-based stratified random sampling design (Black 1983). The patterns of settlement are well known for the Classic and Postclassic periods, and ceramic (Beaudry 1983) and other artifact sequences are published. Thus, intensive research at the Ceren site can be conducted and interpreted within a regional framework. The known settlement patterns, artifact sequences, economies, and volcanological events provide context for the micro-analyses at Ceren.

Geophysical explorations in 1979, 1980, 1989, and 1990 at Ceren have utilized ground-penetrating radar, resistivity, and seismic refraction to discover anomalies (Figure 8) at depths of 4 to 7 meters (Loker 1983, Spetzler and Tucker 1989). Seismic refraction has proven to be cumbersome and barely effective. Fortunately, radar and resistivity have detected many anomalies, of which 8 have been judged appropriate for further investigation. Three of those have been confirmed as prehistoric structures by core drilling, 4 have not been confirmed as prehistoric structures and evidently are natural, and one has yet to be drilled. The latter is located on top of a small hill (Fig. 7), and may turn out to be a sizeable prehistoric structure.

The architectural similarities of structures excavated to date are significant, including consistent orientation of structures 30 degrees clockwise from magnetic north. The only exception is the kitchen in Household 1 which opens north. All buildings but the kitchen are on top of substantial adobe platforms, fired prior to occupation. The kitchen had a very modest fired adobe porch. The structures are specialized for particular activities; the communal structures of all three households have been excavated, and all have large solid adobe elevated benches for sleeping and daytime activities. The adobe domestic construction was surprisingly sophisticated, with wood-adobe lintels spanning doorways 1.5m high, elevated benches, cornices, and other features. Storage vessels were found on the floor and suspended from the roofing supports, with grains such as beans and corn inside. In spite of protective measures (whole and partial vessels as well as laja stones serving as lids) evidence of difficulties in food storage was found inside some vessels, as some pests got inside. Other fauna included domestic dog, domestic duck, and large freshwater snails.

The differences among households are potentially as informative as their similarities. The sizes of structures vary, within the walls, from only about 12 m² (Str. 1) to 40 m² (Str. 3). The size of benches also range from relatively small (Str. 1 at 2.4 m² and Str. 2 at 3.1 m²) to quite large

Figure 8. 3-Dimensional Graphics Representation of Resistivity Data from Lot 189A. Anomalies A-D are Indicated.



CEREN.RESISTIVITY.NW.30

(Str. 3 at 8.4 m² for both); Hh 1 and 2 have only one bench each, but Str. 3 has two. All buildings excavated in the complexes of Hh 1 and 2 have obsidian, yet the much larger Str. 3 has no obsidian whatsoever. The solid adobe wall construction in the large Str. 3 is very different from the column-and-bajareque construction of the other households. Str. 3 (Fig. 4) had four large niches in the walls, which almost penetrate them, whereas Hh 2 had one niche in the bench, and Hh1 had no niche at all. Surprisingly, the largest structure had the most independent roof from the structure. Principal support for the very large roof of Str. 3, covering over 80 m², was by vertical poles resting on adobe column bases and posts set into deep postholes. In contrast, the roofs of Structures 1, 4, 5, 11, and 2, all small buildings, were supported primarily by small posts set into the adobe construction itself.

Potential explanations for the differences among structures and their contents could emphasize economic, social, political, or demographic factors. Household 1 was agrarian (evidence: digging stick in house, garden and maize milpa adjoining) and craft oriented. They were making utilitarian pottery in the house, and likely trading it with other households (evidence: pottery working area, prepared hematite cylinders, petrographic correspondence of prepared clay and pigment with utilitarian ceramics). They also were making thread, likely of cotton, as evidenced by the small spindle whorls. Household 2 also was involved in domestic and agrarian activities, but the fine polychrome vessels and the better architecture may be an indication of status or wealth higher than Household 1. Household 1 had an extensive garden and a maize milpa. Structure 3 is unusual in its large size, substantial construction, and paucity of craft-related artifacts in the communal structure, and it probably is a multifamily or neighborhood communal building. Structure 4 is the bodega for Household 4, evidently a rather well-off family judging from the amount of stored foods and large amounts of cacao seeds.

HOUSEHOLDS: THE ANALYTICAL AND THEORETICAL FRAMEWORK

The theoretical framework for 1990 research is household archaeology, represented by the expanding methodological and theoretical literature primarily by ethnologists and ethnoarcheologists. Household archaeology has roots in settlement archaeology (Willey et al. 1965, Chang 1968), in ethnoarchaeology (Kramer 1982, Wauchope 1938), ethnography (Wilk 1988, Wisdom 1940), and in affiliated social sciences (Arnould 1986). It has changed from a field with a few isolated practitioners to one with ethnographic sophistication, improving archaeological recovery techniques, and an emerging corpus of appropriate method and theory (Netting, Wilk and Arnould 1984, Wilk and Rathje 1982, Ringle and Andrews 1983, and Wilk and Ashmore 1988). In contrast to migratory hunter-gatherers, households in sedentary societies are immersed in material culture (Wilk and Rathje 1982), allowing for functional interpretations to reveal the nature of household activities at Ceren. The household is here defined as the coresidential task-oriented social and adaptive unit intermediate in level between the individual and the neighborhood. Behavior is spatially focused upon the house structure(s) and includes activities inside and outside the house. In contrast to ideational-symbolic approaches, the behavioral-phenomenological emphasis exemplified by the major contributions of Netting, Wilk, and Arnould (1984) and Wilk and Ashmore (1988) are particularly appropriate to analyses and interpretations at Ceren.

Following Adams (1981), households will be studied as "adaptive vehicles," as units which adapt to their natural and social environments. As Laslett (1969) states, "a convincing case can be made out in favour of the household as the fundamental unit in pre-industrial European society for social, economic, even educational and political purposes.... (The components) make up an intricate adaptive mechanism which we are only now beginning to understand." Households are localized and enumerable (Arnould 1986), in contrast to families, which are kin-based and not necessarily localized (Netting et al. 1984). Therefore, households are more suitable units for archaeological study than families. Households share five spheres of activity (Arnould 1986): (1) production, including food, implements, vessels, and housing; (2) pooling, i.e. storage, distribution, maintenance, and curation of the common goods, including generalized reciprocity, which I extend to include exchanges between households and wider corporate units; (3) transmission of information, knowledge, materials, possessions, including inheritance and access rights to resources; (4) reproduction in biological and social-cultural senses, including the need for recruitment of spouses outside the household; and (5) coresidence-membership, with the activity areas of the domestic group revealing communal living and working.

Laslet's taxonomy (1972) of households is sensitive to the household developmental cycle, and should be applicable at Ceren. Each household is expected to be one of the following: solitaries (widowed, single), non-family (co-resident siblings or unrelated), simple family (married couple with 0+ children), extended family (extended laterally, upward, or downward), multiple family, or indeterminate "stem families."

Crucial data for determining household type(s) at Ceren are accurate aging and sexing (see Biomedical Research below). The time (day or night) of the eruption is significant for assessing household composition, as a more complete sample of household members would be preserved inside or near the house during a nighttime eruption. Data collected to date indicate a nocturnal eruption (Zier 1983, Sheets 1983, cf. Preliminary Report 1989).

What is the boundary of a household? This issue will be explored at all three households. A structural boundary is the house construction itself, but a functional boundary includes adjacent activity areas and outbuildings. Most Ceren structures excavated to date have more roofed area surrounding the structure than within it, providing roofed activity areas or walkways on all sides. A subsistence boundary includes the sustaining area, with contiguous fields and probable outfields. Field boundaries should be discernable by changes in vegetation, hedgerows, etc. An economic boundary encompasses the maximal geographic extent of commodities traded; this likely will extend to Guatemala (Ixtepeque obsidian) and the Pacific Coast (salt, shells). In this broader domain, household boundaries are expected to overlap considerably, and that overlap is an index of community and regional economic integration.

Research in Oaxaca provides comparative data and useful methods and concepts (Flannery 1976, Winter 1976). Winter (ibid:25) defines a "household cluster" as the houses, storage pits, graves, and associated ovens and middens of the co-residential group. The household includes these features along with the activity areas inside and directly outside the house. Thus the term household as used here includes the physical data and the interpretations of past human behavior of the functioning social unit. Oaxacan household clusters varied somewhat in their features and were commonly spaced 20 to 40 m apart. Winter estimates the individual Tierras Largas "household cluster" occupied 300 m², smaller than Ceren household areas.

Whalen (1981) excavated one of the best preserved houses to date in Mesoamerica; most of the house floor and contact artifacts were preserved by the adding of fill for a new floor. Cooking and weaving were done on the "right side" of the house, as viewed from the doorway, probably by females. There are disagreements about which artifacts were *in situ*, which were somewhat misplaced, and which were inadvertent inclusions in construction fill, with Spencer (1981) analyzing only artifacts partially impressed into the floor. Parry (1987) argues for a more inclusive approach. Fortunately, the sterile burial by 5m of tephra at Ceren obviates this problem.

Although still small, the number of excavated southern Mesoamerican houses has increased in the past decade. Ringle and Andrews V (1983) recorded hundreds of Formative residences at Komchen, and hundreds of other enigmatic smaller features of stone and soil, but excavated few. A range from small features to apparent housemounds to larger structures is representative of many Maya sites, and makes it difficult to distinguish residences from outbuildings. Eaton (1975) has identified farmsteads (one room stone walled houses with fenced enclosures) and housemounds (raised platforms supporting perishable structures) in the Rio Bec area. Blake's excavations (1987) at Paso de la Amada, Chiapas, uncovered surprisingly large houses of an Early Formative chiefdom. Hammond et al. (1979) report on an early apsidal structure at Cuello, the dating of which is not entirely clear.

The most significant advances in household archaeology in southern Mesoamerica have been accomplished at Copan and environs (Webster and Gonlin 1988). Maya commoners, as agrarian "producers," had very basic housing, usually consisting of multiple small rectangular structures per household, sometimes on a platform, and active use of the "peripheral spaces" surrounding each structure. Structures were consistently aligned. Maya households in Copan proper had more substantial construction and more "ideal" Maya architecture consisting of rectangular substructures with steps in front, terraces, and interior benches (ibid:186), when compared to houses in the periphery. Ceren architecture is more similar to the Copan core than to its agrarian periphery.

1990 RESEARCH OBJECTIVES AND ISSUES

Artifact Analyses & Conservation Program

Artifact analyses were done by industry, with specialists analyzing ceramics, chipped stone, bone, groundstone, wood, basketry, architecture, and other artifacts. Each was analyzed by form, by manufacture, by function, by context, and by style (e.g. Sharer 1978, Beaudry 1983, and Sheets 1978). Artifact industries are cross-cut by activity area and household studies to relate artifacts to their spatial context in order to reconstruct household activities, exchange, possible household specialization, and adaptation. Regional economics viewed from the household can be reconstructed. Clays used in ceramics and various pigments will be analyzed at the Conservation Analytical Laboratory of the Smithsonian Institution to look for groupings. Preservation is so complete at Ceren that many groundstone, chipped stone, and ceramic artifacts still retain organic residues from their last use(s). Those residues are being analyzed at the Institute of Pathology, Walter Reed, Washington DC.

A major emphasis of the 1990 research was conservation, particularly of architecture and artifacts. The visits of Neville Agnew and Nicholas Stanley Price, Getty Conservation Institute in 1989, and by Carlos del Mar Pacheco and Omar Benites Delgado from Peru in 1990-91, were helpful. A major effort of architectural conservation continued simultaneous to the excavations. The Ministry of Education hired a permanent crew of 8 workers, under the supervision of Victor Manuel Murcia, to do architectural conservation. To my knowledge they established an archeological "first" by consolidating the walls of Structure 4 before they were excavated. When only the very top surface of the walls were found, and before the ash from the sides of the walls was excavated, the conservation crew was able to insert wooden rods into the walls to replace the ones that had decomposed after the eruption. Architectural conservation was done on all buildings as excavations continued. With the assistance of Harriet Beaubien, Conservation Analytical Laboratory, Smithsonian Institution, a field laboratory for object conservation was established. Both nonperishable and perishable artifacts were treated, including ceramics, chipped stone, groundstone, baskets, painted gourds, cloth, twine, seeds, thatch, bone, antler, and other materials. Beaubien is creating a reference collection of the pigments used at Ceren, particularly those used on small fragile artifacts and other special applications. Each will be characterized chemically.

Cultural Affiliation

Southeastern Mesoamerican scholars have had some success in studying cultural affiliation in prehistory and in tracing interaction among cultures. Sharer (1988), Willey (1986) and Schortman (1986) have explored multicultural dynamics at Quirigua, Copan, and in the SE Periphery. Schortman's four behavioral systems for comparing ethnicity, i.e. technology, proxemics, ideology, and society, are pertinent. Gerstle (1988) has identified an enclave of Lenca elite at Copan. Her criteria for differentiating Maya and Lenca artifacts are being used to explore cultural affiliation of Ceren residents. Previously the Ceren inhabitants were considered Maya (Sheets 1983, 1986), but a critique (Demarest 1988) is well taken, and they may have been Lenca, or possibly Xinca or other. Research is continuing on cultural affiliation.

Subsistence

One of the most long-standing and intransigent problems of Maya and Intermediate Area archaeology is subsistence. Much has been learned during the past century of speculation and investigation, yet large lacunae persist. Mayanists are fortunate to have three recent summaries of prehistoric Maya subsistence, which serve as indices to the development and the present state of the field (Harrison and Turner 1978, Flannery 1982, Pohl 1985). Stephens (1843:137) was one of the first to describe contemporary Yucatecan maize swidden and to seriously propose it as ancient. The idea that Classic Maya subsistence was based on shifting slash-and-burn plots, focusing largely on maize production, grew to dominate 19th and 20th century thought (Turner 1978:13-21), with a few exceptions noted by Pohl (1985). Tsukada and Deevey (1967) tried to document maize swidden in highland and lowland contexts by paleolimnology and palynology. Their difficulties derived either from an actual lack of swidden in the sampled localities, the small core diameter which necessitated sampling intervals which were longer than the periodicities of swidden, or both. The implications of the maize-swidden thesis for

our understanding of the rise, functioning, and demise of Classic Maya civilization are detailed by Turner, Hammond, Harrison, Harris, Willey, and others in Harrison and Turner (1978).

A few scholars during the first half of the 20th century began to challenge the swidden thesis, including the Ricketsons (1937) at Uaxactun, but their arguments for more intensive forms of agriculture were largely ignored. The effective challenge to the swidden thesis began with regionally oriented research of the 1950s and 60s, particularly the work by Bullard (1960) in the northeastern Peten, Willey et al. (1965) in the Belize Valley, and Coe (1967) at Tikal. Dense habitation remains forced scholars to search for more intensive agro-economic alternatives. Tree crops, root crops, fish, and marine fauna were explored as possible subsistence components. More recent research has divulged a variety of intensive agricultural features such as raised fields (e.g. Siemens and Puleston, 1972) and agricultural terracing, both high in labor input and presumably in productive output. Two labor-intensive irrigation systems have been proposed for the Maya (Matheny, 1976; Crane 1986).

This is not to say that swidden was not practiced in the lowlands. It probably was, from the Preclassic through the Postclassic, but no longer can it be assumed to be the only, or even the principal, form of agricultural land use. Exceptional preservation at the Ceren site allows for an accurate assessment of productivity of infield-outfield systems and of individual cultigens. Qualitative and quantitative studies presently underway, identifying the species and the volume of each species stored per household, will allow for a reconstruction of components of the diet with a degree of accuracy rare in Mesoamerica.

The arguments for subsistence alternatives to maize, particularly root and tree crops, have been ingenious and well received. However, arguments for root and tree crops suffer from a lack of direct data, when closely examined. Harris (1978) was frustrated by the "paralyzing lack of information" on agricultural specifics in trying to understand Classic Maya cultivation systems. Carbonized remains of root and tree crops are largely absent from midden residues as well as from graphic portrayal in codices, on stelae, or on polychrome vessels, with only a few exceptions (Pohl 1985:14-16). Those exceptions are qualitative, and do not allow estimation of percentage of diet.

The volume Maya Subsistence (Flannery 1982) may be used as an indicator of knowledge of the field, and the potential contribution of excavations at Ceren. The principal achievements to date are in finding and interpreting large agronomic features such as raised fields, canals, and terraces. A persistent weakness is identifying smaller slope and water control features, and the specific cultigens involved, primarily because they were inherently evanescent, often being constructed to last only a few months. Rarely are accurate qualitative and quantitative data available on the plants cultivated.

The 1978 and 1989 Ceren excavations found corn plants growing in a milpa, and grains stored in large "scraped slip" utility vessels in Structures 1 and 6, sometimes preserved to the cellular level by the sudden tephra burial. The 1990 excavations of Hh2 and Hh4 are identifying the kinds and quantities of foods stored, especially in the bodegas of both households, and field excavations found foods being grown. Gardens near bodegas had a variety of field-identified plants including agave, flowers, manioc, corn, and other plants growing in them. Direct data on subsistence will be provided by analyses of food residues in ceramic vessels by pathologists.

Gender Issues: Sexual Division of Work

Vogt (1969:83-4) found a clear conceptual and behavioral segregation of work areas by sex within highland Maya households at Zinacantan. Female work and object storage areas clustered around the hearth, while male work and storage areas were located at the other end of the house, near the household altar. A few areas combine male and female artifacts-activities. That pattern apparently is widespread in SE Mesoamerica, both ethnographically and ethnohistorically. I have observed the same pattern in traditional households of rural El Salvador and highland Guatemala. Wisdom (1940) documents the practice in considerable detail for the Chorti occupying the southeastern Maya area. The contemporary Chorti not only sexually subdivide single structures, they often use multiple structures specialized as to activity or gender within the household. Numerous scholars are researching the importance of females in Precolumbian societies (cf. Miller 1988).

Identification of work areas by sex from the excavations to date indicates a segregation similar to the above sources. All activities performed within Str. 1 probably were female associated, including spinning, pottery-making, and food storage-processing. The elevated adobe bench likely was used as the

family sleeping area. The area above the bench had chiles hanging from the roof and grains stored in partial vessels on roof beams. Str. 5, the ramada-like building with its obsidian scatter, and the maize field, probably were male daytime activity areas. Str. 6, the storehouse and maize processing area, is probably female-associated. The cooking area, almost certainly a female work area, is inside the kitchen, Structure 11. Activity areas will be analyzed utilizing the archeological, ethnographic, and ethnoarcheological techniques developed by Kramer (1982), Kent (1984), and others.

The following chapters look in more detail at the excavations of a kitchen (Str. 11), two bodegas (Strs. 4 and 7), and two specialized buildings (Strs. 9 and 12). Other chapters focus upon other excavations in Operation 1, and certain types of artifacts by industry, with ceramic and chipped stone and ground stone artifacts being described in considerable detail. Volcanism, geophysical survey, biology, and paleomagnetism receive treatment in their own chapters, and other topics are covered as appropriate. The final chapter is an attempt to summarize the accomplishments of the 1990 research program.

SUMMARY

Explosive volcanism affected human settlements in the Zapotitan Valley at least twice during the first millenium A.D. The catastrophic eruption of Ilopango Volcano apparently eliminated human settlement for two or three centuries, particularly in lowlying areas. However, recovery of soils and vegetation was followed by human reoccupation by the 6th Century. The colonists, likely Maya or Lenca, established large ritual-habitation centers, large and small villages, and agrarian households. Laguna Caldera Volcano erupted explosively at about AD 600, when basaltic magma contacted water and began a series of steam explosions, vertical airfall deposits, and eruptive column collapses. The hot and rapidly-moving clouds of gasses and volcanic ash quickly buried about 20 km², preserving Classic Period households exceptionally well. The proposed research intends to excavate structures, artifacts, and features, in order to reconstruct the behavioral and demographic aspects of households, at a scale ranging from cellular studies of organic remains to the regional trading system in obsidian, shell, and other commodities. The research investigated subsistence by excavating agricultural fields, identifying cultigens stored inside structures and vessels, examining organic residues on obsidian tools, groundstone implements, and ceramic serving vessels, thus beginning to reconstruct the diet at Ceren in the middle of the Classic Period. The research is primarily synchronic, but it will be related to the changes in households over time (Goody 1958) and to the processual framework of cultural and ecological change in the Zapotitan Valley, in El Salvador, and in Southeastern Mesoamerica. The combination of focused, interdisciplinary research and the extraordinary preservation of organic materials, houses, artifacts, activity areas, and people is designed to yield unusually detailed information on households and how they adapted to their natural and social landscape in the 6th century A.D.

Chapter 2. STRATIGRAPHY OF VOLCANIC DEPOSITS AT CEREN: 1990 ADDITIONS

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INTRODUCTION

This report presents the results of two weeks of field work at the Cerén site during October and November, 1990. This investigation complements a similar two week visit to the Cerén site in the summer of 1989, during which the basic stratigraphy of the site and the relationships between volcanic deposits and structures were described (Miller, 1989).

The purposes of the 1990 visit were three fold:

- (1) To refine descriptions of major stratigraphic units, and, in some cases, to further subdivide units at Cerén;
- (2) To investigate the relationships between volcanic deposits and the walls, roofs, and other components of structures excavated since July, 1989;
- (3) To begin to measure and describe distal sections of the Cerén tephra sequence with the ultimate goal of producing isopleth and isopach maps of individual beds and determining exact source area(s).

For the purposes of the following discussion, all units from the ca. A.D. 600 eruption that buried Cerén will be referred to as "Laguna Caldera Tephra." The tephra may be from Laguna Caldera or one or more other sources (Hoblitt 1983).

MODIFICATIONS OF THE 1989 STRATIGRAPHY

In 1989, the Laguna Caldera tephra units were assigned sequential numbers based on their order of deposition (Figure 1). The earliest unit was defined as Unit 1, and the next as Unit 2, etc. Unit 14 was the final tephra bed of the Laguna Caldera sequence, and Unit 15 consists of all post-Laguna Caldera deposits. The Laguna Caldera deposits rest on tephra from the earlier (ca. A.D. 260) eruption of Ilopango volcano. This tephra is referred to as *Tierra Blanca Joven (TBJ)* because of its distinctive light color due to a highly silicic composition.

During the course of describing stratigraphic sections in the vicinity of Structure 4, it became obvious that recognition of boundaries of Units 1, 2, and 3 is difficult in many exposures outside of Operation 1, where the stratigraphy was first defined (Figure 1). One complication is the fact that there are several "coarse lapilli-fall beds" in the lower part of the section and it is difficult to determine which one is Unit 2. This study indicates that Unit 2 is about 8-10 cm thick, is the fourth lapilli-fall bed above the *TBJ*, and that it lies immediately under a distinctive series of brown ash beds that enclose a dark gray 2-cm-thick ash bed ("brown/gray/brown beds"). These fine-grained ash beds are now known to be the lowermost beds of Unit 3. Above the "brown/gray/brown" beds is a distinctive lapilli-fall bed with occasional ballistic scoria bombs. This bed is within Unit 3 and can be differentiated from Unit 2 by its presence above the "brown/gray/brown" beds and by the fact that, in addition to the scoria lapilli, it contains abundant light-colored accidental fragments, which are not present in Unit 2.

In order to recognize stratigraphic Units 1 through 14 in Operation 4 and at distal sites, and to properly correlate units at all sites, some additional time was spent identifying and designating stratigraphic units exposed in the walls of Operation 4. In addition, Units 1 through 14 were marked and tagged in the west wall of Operation 4.

Descriptions of Units 1 through 10 remain unchanged from Miller (1989). However, additional descriptive information for Units 11-15 as they are exposed in Operation 4, is presented below.

UNIT 11.

Unit 11 is more massive and shows little of the faintly laminated character seen at Operation 1. It is 40 cm thick and is faintly reversely graded. There is some faint bedding visible in the lower 20 percent of the section. Unit 11 has characteristics of a block and lapilli-fall deposit in this exposure.

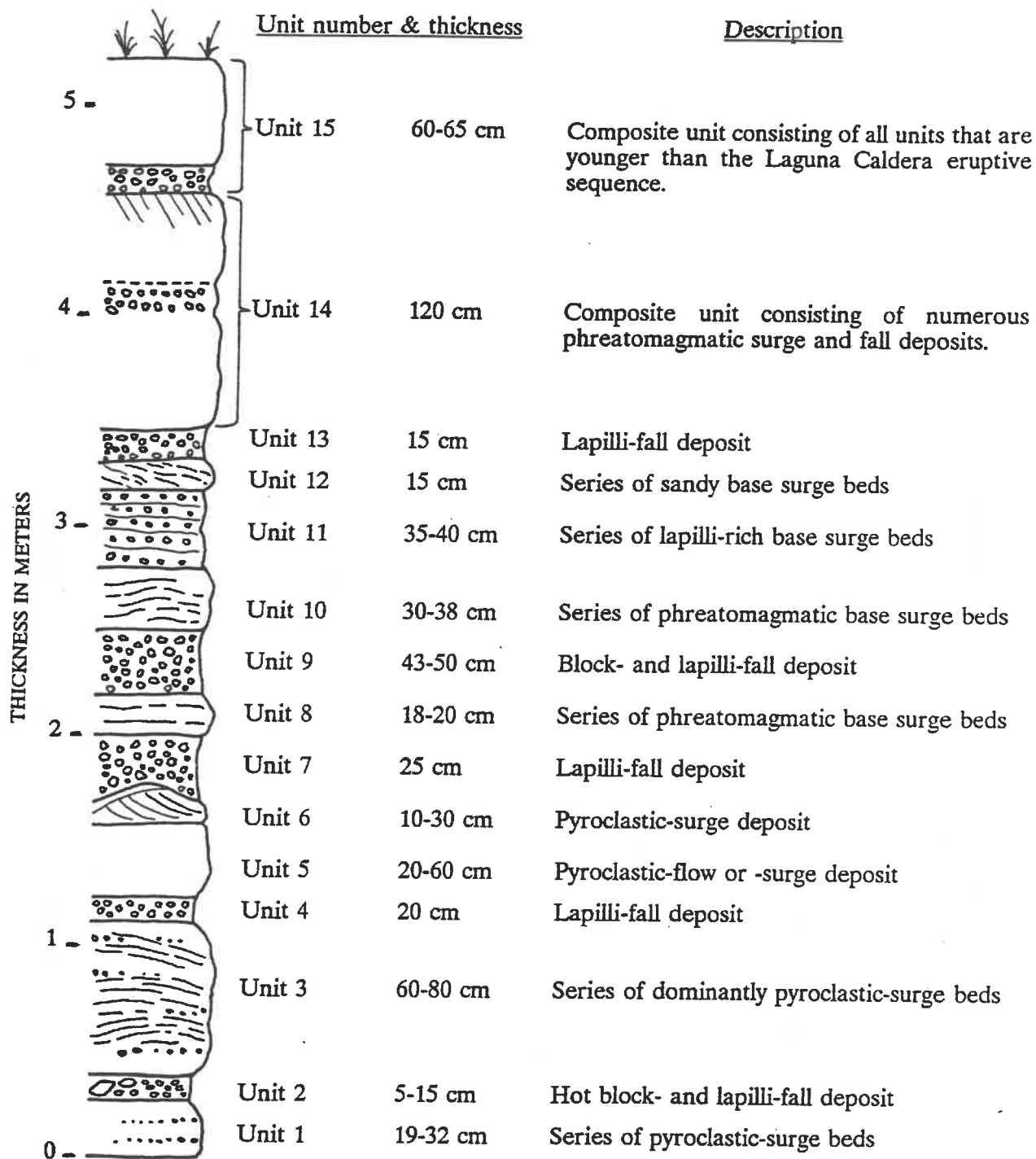


Figure 1. Generalized Stratigraphic Section of Pyroclastic Deposits at the Cerén Site.

UNIT 12.

Unit 12 consists of a series of "sandy" base surge beds. It is composed of alternating indurated, brown, fine-grained ash beds and coarser dark gray sandy ash beds. This unit displays long, nearly flat cross beds similar to Unit 10. The total thickness of the Unit 12 beds in the walls of Operation 4 is about 10 cm.

UNIT 13.

Unit 13 consists of two lapilli-fall beds. The total thickness of the unit in Operation 4 is 16 cm; the top bed is 6 cm thick, composed of scoria, and is very friable. The lower bed is of similar composition and texture, is 10 cm thick, and has a 2-cm-thick brown oxidized top which is noticeable in all of the operations at Cerén.

UNIT 14.

Unit 14 is a composite unit consisting of numerous phreatomagmatic fall and surge deposits. The thickness of Unit 14 in Operation 4 is about 60 cm. Unit 14 can be divided into 3 subunits, each roughly equal in thickness. The lower third of Unit 14 is about 20 cm thick and consists of laminated dark gray ash beds deposited by surges. The middle third is about 18 cm thick, composed of brown, hard, silty ash beds with a single friable ash bed 2 cm from the top. The upper part of Unit 14 is a series of 3 or 4 lapilli fall beds. Their total thickness is about 22 cm and they are separated by thin ash beds. This upper portion of the Unit 14 sequence is reddish brown in color, with the intensity of color increasing toward the top. At least part of this oxidation seems to be the result of soil formation processes; the remainder is probably the result of groundwater which passes through this part of the unit, being perched on top of the impermeable middle part of Unit 14.

UNIT 15

Unit 15 is a composite unit in Operation 4; it consists of two scoriaceous lapilli-fall deposits, each overlain by scoria-rich colluvium with faint soils. These two fall deposits do not seem to be related to the Laguna Caldera sequence and may be from the 9th-12th Century A.D. eruption of El Boqueron and the 17th Century eruption of Playon volcano, both described by Hart (1983).

RELATIONS BETWEEN LAGUNA CALDERA DEPOSITS AND STRUCTURES AT CEREN.

A significant part of my time while at Cerén was spent studying the effects of various volcanic deposits on structures. Such relationships were described by Miller (1989) for Structures 2, 3, and 6. Similar relationships are here described for Structures 4, 7, and 11.

STRUCTURE 4

Excavation of Structure 4 was well along during my visit which allowed me to compare the stratigraphy outside of Structure 4 with that inside, and to determine when the roofing thatch collapsed and when the south wall was blown over.

Relationships in a pit at the southwest corner of Structure 4 indicate that roofing thatch and associated wooden (roofing?) sticks, were dislodged from the structure during deposition of Unit 2, which is coarse, thick, and was presumably hot at this location. Much of the thatch is charred, especially where it is close to large ballistic bombs which were deposited along with Unit 2 tephra.

Stratigraphic relationships south of the platform of Structure 4 reveal the timing of roofing thatch destruction and when the south wall of the structure was blown down. Thick patches of thatch, some as thick as 7 cm, are found in the lowermost part of Unit 3, about 2 cm above the top of Unit 2. This thatch is about 50 percent burned, mostly where it is located near large bombs in Unit 2. However, some of the charred thatch can be found within Unit 3 (thought to have been no hotter than about 100° C.) and far from coarse scoria bombs. This suggests that the thatch may have been burned or burning when incorporated in Unit 3.

The south wall of Structure 4 is resting on about 5 cm of Unit 3 ash, above the prominent coarse lapilli-fall layer in Unit 3. This indicates that the wall withstood some of the early surge events in Unit 3 and fell well after the roof of the structure had been destroyed.

Partly charred roofing thatch is preserved in the lowermost part of Unit 3 in a section about 1 meter north of the platform of Structure 4. Small "stringers" of charcoal are associated with the lower contact of Unit 2, but most of the thatch seems to be located between 1 and 7 cm above the top of Unit 2. The hot clasts of the Unit 2 airfall may have ignited the roof, and some of it collapsed then. However, the majority collapsed early during the deposition of Unit 3.

The interior of Structure 4 is divided into north and south rooms and the only wall that fell during the eruptions was the south wall. As a result, thick accumulations of Unit 3 filled the interior of the structure. In the south half of Structure 4, Units 1 and 2 are represented by only 2-4 cm of fine ash which indicates that the roof over that part of the structure provided substantial protection from eruptive events. Roofing thatch and charcoal first show up immediately above Unit 2 and continue to be present in the lower parts of Unit 3; charcoal was found adjacent to coarse bombs in the prominent lapilli-fall unit in Unit 3. Some pods of the mysterious "buff unit" (Miller 1989) are present between Units 1 and 3 and in the lowest parts of Unit 3. The "buff unit" consists of a mixture of silicic ash (presumably from the Ilopango eruption) mixed with grass and water. It was found in Structures 2 and 3 in 1989, and its origins and the mechanisms of transport to its present locations are unknown.

The only barrier to the north of the north room of Structure 4 was the cane wall described by Gerstle (this volume). Units 1 and 3 are very well represented in this room, having been blown in as surge clouds. Unit 1 is 12-15 cm thick and is a laminated, fine ash. It is overlain by a poorly sorted mixture of lapilli in an ash matrix that is also 12-15 cm thick. This unit is dark colored and contains charcoal and burned thatch throughout, and may be related to Unit 2, although it is not an airfall unit. Its origin is unknown at present.

In the center of the north room there are numerous pots and pieces of broken bajareque (daub), which seem to be resting on Unit 1 and on or partly in the Unit 2? deposits. It is unknown at present how and where the pottery was suspended and from where the bajareque fragments came.

Unit 3 is greatly thickened in the north room of Structure 4. This is due to the room opening toward the source of the surges. The surges "piled" the ash into the corner of the structure. Units 4 and 5 are present in normal thicknesses high in the structure.

Essentially normal thicknesses of Units 3, 4, and 5 fill the south half of the interior of Structure 4, although they show unusual bedding and thicken and thin due to deposition against the walls of the structure.

The locations of roofing thatch outside of Structure 4 and the limited quantities of Units 1 and 2 inside of the south half of the structure indicate that the roofing was essentially intact through deposition of Units 1 and 2. Some roofing may have been charred and dislodged during deposition of Unit 2, but there was enough roof remaining to keep Unit 2 lapilli from falling inside the house. Large bombs associated with Unit 2, of course, did penetrate the roofs of all structures, causing damage to articles inside.

STRUCTURE 7

Structure 7 is somewhat anomalous with respect to structures uncovered so far at Cerén, because all of the corner columns and all of the walls were blown down by the eruptions. Furthermore, the directions that walls and columns fell are unusual considering that the inferred source of the surges and airfall deposits was to the north. The columns at the southwest and southeast corners and the south wall fell to the south. The west and east walls and the northeast column fell to the east, and the west wall fell inside the structure. What is surprising is that the northwest column fell toward the west and the north wall segments (on either side of the door) fell toward the north!

A pit down to the *TBJ* at the southeast corner of Structure 7 reveals the timing of the destruction of the roofing thatch and the collapse of the southeast column and the east wall. Under the column, roofing thatch is preserved in two places: at the base of Unit 2 and in thick patches in the lower part of Unit 3. Thatch at the base of Unit 2 makes a thin streak of charred material, while thick patches of partly charred thatch and open spaces with traces of unburned thatch suggest that thick bunches of thatch came to rest in the lower part of Unit 3 about 2-3 cm above the top of Unit 2. The southeast column rests on about half of the coarse lapilli-fall layer in the lower part of Unit 3, and thus was blown down slightly earlier than the south wall at Structure 4.

In the section under the fallen east wall, Unit 2 becomes finer and thinner toward the platform of Structure 7. Roofing thatch lies above Unit 2 on about 6-12 cm of fine, brownish, well-sorted ash of Unit 3. The thatch lies below the brown/gray/brown part of Unit 3, and is mostly unburned except where it lies closest to lapilli of Unit 2 and(or) to Unit 2 bombs. The east wall lies upon the coarse lapilli-fall bed of Unit 3 and on a few cm of overlying fine ash of Unit 3. The east wall was then buried under about 45 cm of the remaining beds of Unit 3.

An excavation at the northeast corner of Structure 7 exposes the timing of the north wall collapse. Unit 1 is banked up against the north side of the porch of Structure 7, where it reaches 40 cm in thickness! Unit 1 also forms a beautiful surge dune as thick as 18 cm on the porch. There are pods and a stringer of the "buff unit" in the middle of Unit 1 just north of the porch. Unit 1 is overlain by coarse scoria blocks and lapilli of Unit 2, which is as thick as 25 cm just north of the porch, but thins to nothing by the time it reaches 40 cm onto the porch. Roofing thatch, mostly unburned, is preserved 2-5 cm above Unit 2, in the lowermost part of Unit 3. Unburned thatch fragments are scattered about in Unit 2.

The north wall of Structure 7 is resting on the lower half of the coarse lapilli-fall layer in Unit 3. Thus, it fell at the same time as the column at the southeast corner of Structure 7, and slightly before the collapse of the east wall.

The west wall of Structure 7 was largely excavated before I arrived at the site, however, what is left of the west wall of the structure fell into the structure and lies on top of about 35 cm of Unit 3. The exact part of Unit 3 that lies under the west wall is unknown. The northwest column fell the opposite direction (to the west) and is resting on top of the "brown/gray/brown" part of Unit 3 and therefore was the first structural feature below the roof to fall.

A preliminary look at the stratigraphy inside of Structure 7 indicates that Unit 1 is very thin, a few centimeters normally, and is composed of fine, well-sorted ash. Unit 2, if it is present at all, is very scarce and consists of a few centimeters of dark scoria rich ash that is found occasionally.

In summary, the position of the roofing thatch outside of Structure 7 and the lack of extensive deposits of Units 1 and 2 inside of the structure suggest that the roof remained substantially undamaged throughout the eruption of Units 1 and 2. This is substantiated by the fact that Unit 2 is absent or very thin near the outer walls of the platform and porch of Structure 7 and thickens and coarsens away from the structure. These relationships suggest that Unit 2 scoria could only accumulate outside of the roof line of the structure.

The pattern of column and wall collapse suggests one of two obvious possibilities. The house may have collapsed due to heavy loading of the thatched roof by a thick accumulation of wet tephra. If such a collapse occurred between surges, the observed pattern could have occurred. A second possibility is that a surge may have removed the roof late during Unit 2 time or early in Unit 3 time, and support or connections for walls and columns were thus removed and collapse occurred later, during a pause between surges.

STRUCTURE 11

Structure 11 is somewhat anomalous at Cerén because much of the prepared floor of the structure, especially the northern part, seems to be overlain by complete or nearly complete sections of Units 1, 2, and 3. Preserved thatch is found very low in Unit 1, suggesting that the roof of this structure collapsed during the earliest eruptions of Unit 1. Thus, Unit 2 accumulated inside of Structure 11 and is the same thickness and grain size as a normal section outside of Structure 11. The presence inside Structure 11 of normal thicknesses of Units 1 and 3 suggests that at least the northern part of the structure had no walls, or that the walls were made of organic materials and collapsed early, at the same time as the roof. This could account for the deposition of the surge beds. Structures preserved on the platform around margins of part of the floor space for Structure 11 suggest that some kind of bajareque walls might have existed around the southern part of the structure. This is supported by slightly thinner than normal deposits of Units 1 and 2 south and east of the eastern column preserved at the structure. Unit 1 appears to be only 7-10 cm thick and buries and(or) encloses pottery, gourds, a mano, and other artifacts found on the floor. Unit 2 seems to be slightly thinner in this region than outside Structure 11, but covers the pottery fragments. Units 3 and 4 seem to be of normal thickness over the southern part of this structure, but Unit 5 thickens dramatically from about 13 cm near the west boundary of Structure 11

to more than 50 cm just east of the structure. This may be some kind of "lee effect" of Structures 6 and 11 on the pyroclastic flow/surge that deposited Unit 5.

DISTAL SECTIONS OF LAGUNA CALDERA DEPOSITS

Distal sections of the Laguna Caldera tephra and surge sequence were excavated and described at two locations south of the bridge over the Rio Succio and at one location in the village of Joya de Cerén (Figure 2). The purpose of these studies was to begin to collect data necessary to produce isopach maps of the thicknesses of the various units in the sequence. A secondary purpose would be to generate isopleth maps of maximum pumice and dense lithic clasts in the airfall deposits. Both types of maps are useful for determining the source vents for eruptions and for determining various physical parameters about the eruptions.

DISTAL LOCATION 1

Distal location 1 is located on the east side of the San Juan Opico highway 0.3 miles south of the bridge over the Rio Succio, and about 2.0 km south of Laguna Caldera (Figure 2). The sequence consists of 143 cm of Laguna Caldera deposits overlying 50 cm of *TBJ*, which lies on a pre-Ilopango *milpa* at this site. The Laguna Caldera sequence is still marked by reddish oxidation at the top of Unit 14, and is overlain by younger two scoria-fall deposits, each overlain by colluvium. These two younger airfall deposits total 110 cm in thickness and are not from the Laguna Caldera source.

All stratigraphic units present at the Cerén site except Unit 5 are present in this exposure, but are much thinner and somewhat finer in grain size at this location. Unit 5, which is mostly pyroclastic flow in character at the Cerén site, apparently did not reach this distance or this topographic location. A couple of centimeters or less of fine dark ash is visible occasionally on top of Unit 4 and may represent a surge related to Unit 5. Unit 4 is the dominant lapilli-fall unit in the section at this location and may be the most widespread of the airfall units present at Cerén.

DISTAL LOCATION 2

Distal location 2 is located on the east side of the highway about 0.7 miles south of the bridge over the Rio Succio and about 2.4 miles south of Laguna Caldera (Figure 2). At this location, about 70 cm of the Laguna Caldera sequence is preserved on the *TBJ*. The Laguna Caldera sequence is overlain by 120 cm of tephra and colluvium that consists of two lapilli-fall deposits, each overlain by colluvium. Individual stratigraphic units in the Laguna Caldera sequence are more difficult to recognize at this location, but Units 1 through 4 can be identified. Unit 4 is the dominant lapilli-fall deposit in this section. A centimeter or less of fine dark ash on top of Unit 4 may represent ashclouds associated with Unit 5, which otherwise is not represented here. Specific units above Unit 4 are difficult to identify, although the sequence still consists of interbedded phreatomagmatic base surge and ash/lapilli-fall deposits. Units 11 through 14 cannot be identified; however, the top of the sequence still has a reddish oxidized color, and is easy to identify.

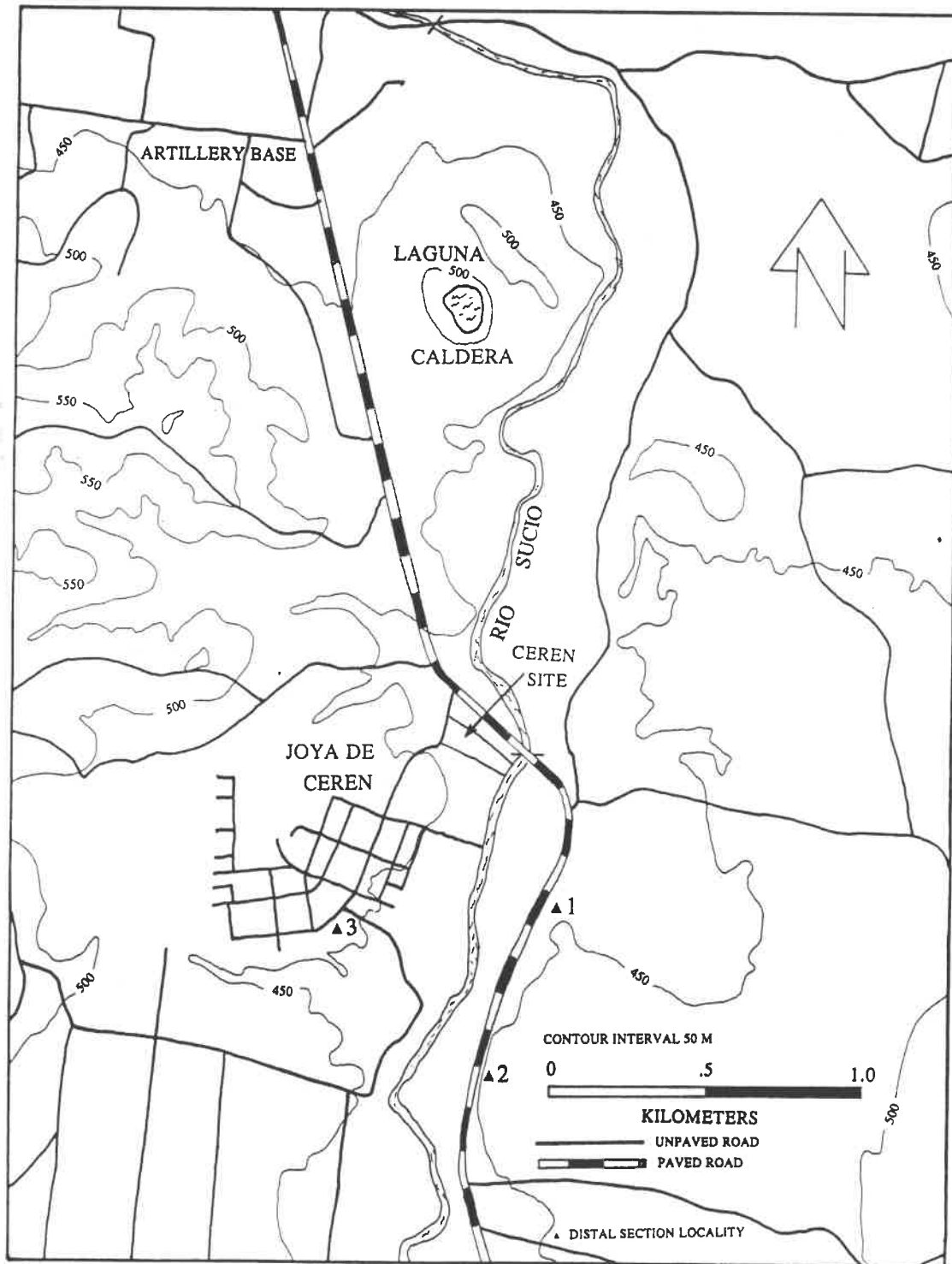
DISTAL LOCATION 3

Distal location 3 is located at the soccer field in the village of Joya de Cerén and is about 0.7 km southwest of the Cerén site and about 2.0 km southwest of Laguna Caldera (Figure 2). The Laguna Caldera sequence varies from about 93 to 97 cm thick at this location and overlies the *TBJ*. The Laguna Caldera sequence is overlain by colluvium about 60 cm thick, with no recognizable primary airfall units. Units 1 through 3 are thin but recognizable. Units 4, 9, and 11 are prominent airfall units. Of these, Unit 4 is thick, black and primary; Units 9 and 11 are browner, thinner and composed of more rounded clasts. Unit 5 varies in thickness and overlies Unit 4 in most places, and changes character from pyroclastic flow to surge at some locations. Units 12-14 cannot be distinguished, but the reddish top of the Laguna Caldera sequence is distinct.

CONCLUSIONS

The location of roofing thatch and support structures partially in the upper parts of Unit 2, and mostly in the lowest ash beds of Unit 3 outside of Structures 4 and 7 indicates that the roofs of these structures were destroyed late during the deposition of Unit 2 or early in Unit 3. This is substantiated at

Figure 2. Map of the Cerén Site, Laguna Caldera Volcano, and Surrounding Areas, Showing Locations of Distal Sections.



both structures by the absence or near absence of normal thicknesses of Units 1 and 2 inside of the structures. It appears that the roofs of Structures 4 and 7 were essentially intact throughout deposition of Units 1 and 2 and that the structures may have provided some protection and shelter for inhabitants of Cerén during these early eruptions. However, ballistic bombs erupted during Unit 2 penetrated all structures at Cerén and were locally devastating.

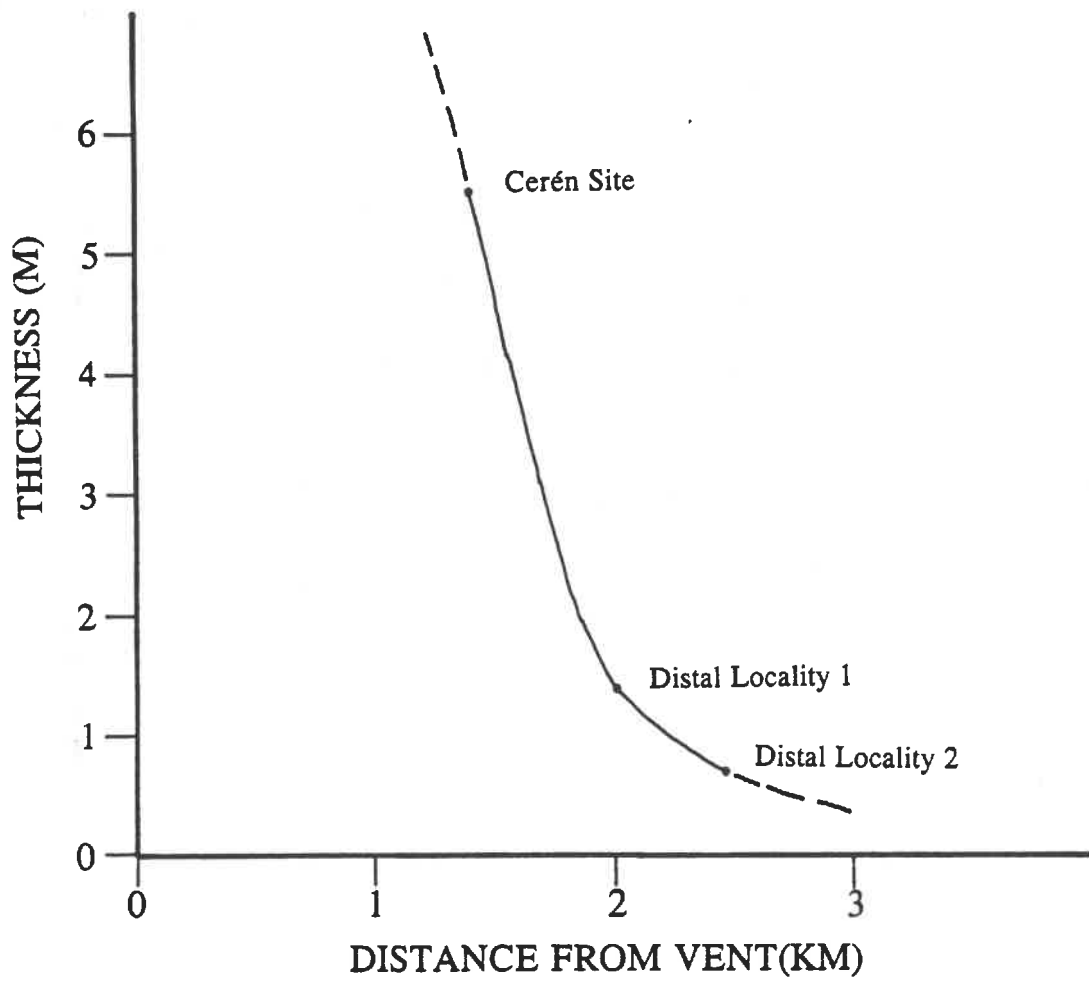
Stratigraphic evidence indicates that the roofs of Structures 4 and 7 were destroyed at the same time early during Unit 3 deposition, opening both structures to the effects of Unit 3 surges. The south wall of Structure 4 and all walls and columns of Structure 7 were destroyed during or immediately after deposition of the coarse lapilli-fall bed in Unit 3. Hot, wet surge beds of Unit 3 then buried the interiors of Structures 4 and 7, preserving roofing thatch, roofing poles, and artifacts on the floors of the structures.

In contrast, the roof over Structure 11 apparently was destroyed early during Unit 1 surges, allowing deposition of normal thicknesses of Units 1 through 3 on the floor of the northern half of the structure. The absence of thick, resistant walls and the early destruction of the roof at Structure 11 indicate that little protection from the eruption would have been provided for any inhabitants.

The limited information from distal stratigraphic sections indicates that the character of Laguna Caldera sequence changes very rapidly with distance from the inferred vent at Laguna Caldera. Figure 3 indicates a very rapid decrease in the thickness of the sequence as a whole. Several things are apparent from Figure 3. First, it appears that it will be difficult to obtain complete sections of the sequence north of the Cerén site--the deposits thicken dramatically toward the source. Secondly, it appears that except for a few tephra-fall deposits, particularly Unit 4, which may be a fairly widespread bed of tephra, the sequence as a whole is likely to die out within about 3 km of the vent in this direction. These limitations suggest that the most profitable prospecting for additional structures will be within about 0.5 km south of the Cerén site. Areas north of the site will be buried too deeply to reach with existing techniques, and the sequence thins to less than 1.5 m at a distance of 2 km from the vent.

Future research will continue to describe the effects of the eruption on the village and its inhabitants. We will also attempt to locate additional road cuts on all sides of the volcano in order to produce isopach and isopleth maps. With these data, we will be able to determine the location(s) of the source of the eruptive events, and will be able to explore locations appropriate for archaeological investigations in the future.

Figure 3. Thickness of the Laguna Caldera Sequence vs. Distance from the Laguna Caldera Vent.



Chapter 3. RESISTIVITY SURVEY OF LOT 189B, CEREN, EL SALVADOR, 1990.

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INTRODUCTION

Geophysical research was conducted at the Cerén site, El Salvador in November, 1990. The purpose of this research was to locate anomalies that correspond to prehistoric structures buried by tephra from the A.D. 600 eruption of Laguna Caldera Volcano or other nearby sources. Similar research was conducted in 1979 and 1980 (Loker 1983) and 1989 (Spetzler and Tucker 1989).

Geophysical techniques used in 1979 and 1980 included seismic refraction, ground penetrating radar, and resistivity. Seismic refraction was barely effective in penetrating the five meters of tephra overburden, but radar and resistivity were more successful. The 1979-80 research located four anomalies, two of which were confirmed as prehistoric structures by the use of a soil drill (Loker 1983).

Because of ease of transportation, low cost, and ease of use, resistivity was used again during 1989. Four anomalies were located (Spetzler and Tucker 1989) and tested with a soil drill, and one was confirmed as a prehistoric structure (McKee 1989) and excavated during the 1989 season (Gerstle 1989). A fifth anomaly was not tested due to access difficulty.

Resistivity was used again in 1990. Lot 189B, located immediately to the south of the excavations, was chosen for survey because of its proximity to the river and to the structures known through previous geophysical survey and excavation (Figure 1).

METHODS

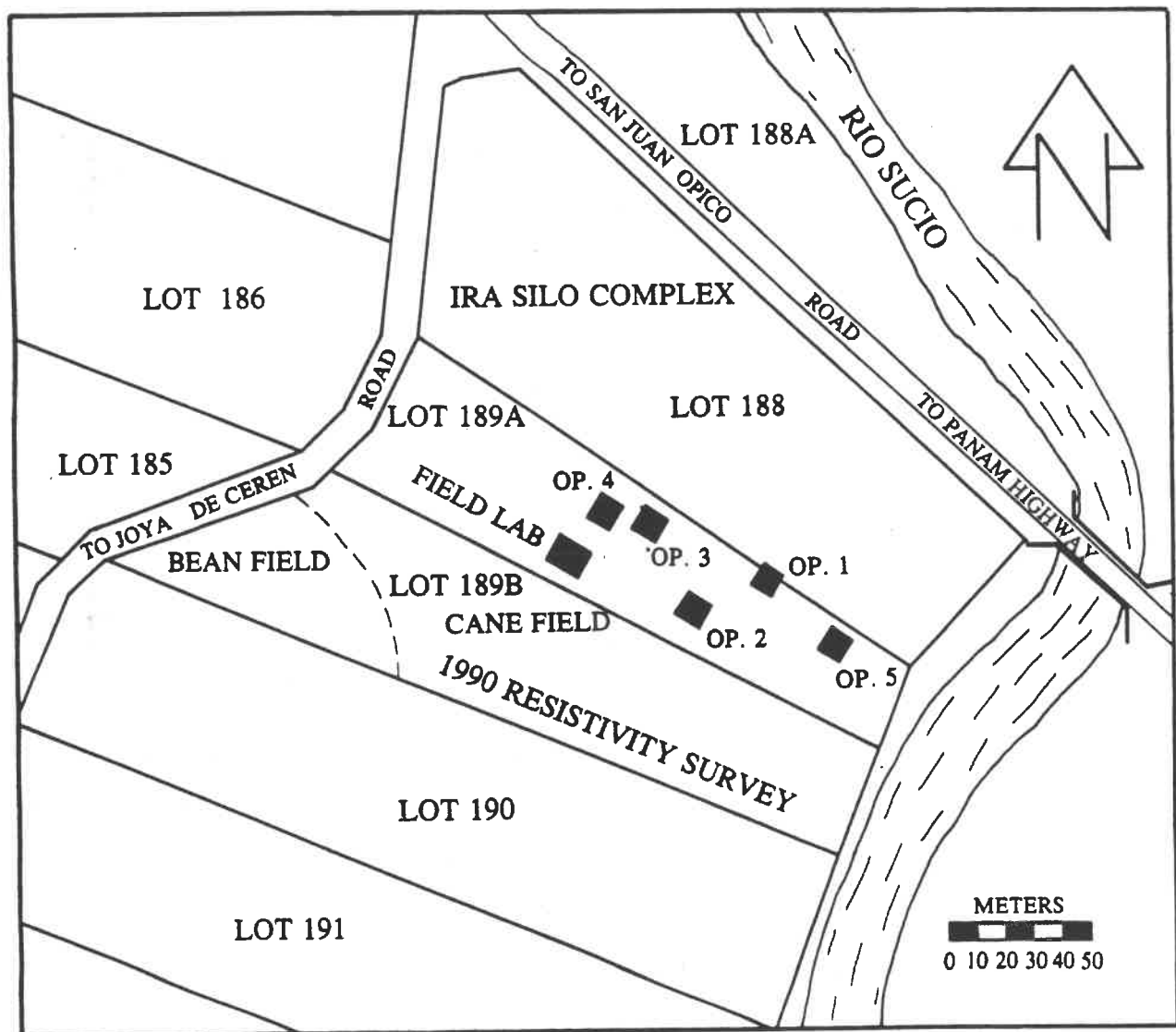
As in previous years, a Atlas Copco Abem Terrameter SAS 300 resistivity instrument was used. An external 12 volt car battery was used instead of the internal rechargeable battery. All readings were taken with the following switch settings: cycles=4; range=100 ohms; current(I)=2mA. The current electrodes were used as the outer electrodes and connected to the C1 and C2 terminals. The potential electrodes were connected to the P1 and P2 terminals. The spacing between the individual electrodes was always the same; i.e. a Wenner arrangement was used. If the spacing between adjacent electrodes was x , then the distance between the outer electrodes would be $3x$.

The most rapid and error free readings were made by a team of 6. Four men would plant the electrodes at marked spots along a string. The operator of the resistivity unit would press the *MEASURE* button and observe the display. The machine takes four readings and automatically computes the mean. Depending on the consistency of the readings they would be either accepted or repeated until there was no change greater than 1 in the least significant digit. If this could not be achieved within 2 or 3 sets of readings, the electrodes were pulled and replanted. On some occasions this procedure was repeated 2 to 3 times. In the majority of cases a single set of readings, i.e. pressing the *MEASURE* button once, would suffice. Quite often the resistivity meter would respond to a measurement attempt with an error message. Repeating the attempt and turning the instrument off for 10 to 20 seconds allowed a measurement to be performed. The error frequency seemed to be higher when the battery voltage was lower (< 11.9 volts) and when the temperature was higher. We found little correlation with the frequency of error measurements and other parameters. The temperature problem was significantly reduced by the person who was recording the data shading the instrument with an umbrella. An additional beneficial side effect was the shading of herself and the operator. The shading seemed important enough that we attempted shading of the instrument even between measurements when we moved to new locations.

THE SURVEY LOCATION

Figure 1 shows the location of the 1990 resistivity survey. The survey was made in Lot 189B, the sugar-cane field to the south of the field laboratory. The $x=0, y=0$ point is located in the field 19 m south of the SW corner of the field laboratory (Figure 1). Y increases to the south and x increases to the east. Data for twelve measurement lines were obtained at constant y values ($0 < y < 55.5$ m). The spacing between the lines was approximately 5 m (y values) and the spacing between the measurement points on a line (x values) was 5 m as well. The limits of x to the east were set by the slope leading to the river and to the west by the drop off to the road leading to Cerén.

FIGURE 1. LOCATION OF RESISTIVITY SURVEY AND SURROUNDING AREAS



At the line $y=40$ we re-measured each point with 7 different rod spacings (10m, 7m, 4.9m, 3.43m, 2.4m, 1.68m, 1.18m).

As the last portion of this season's geophysical research we looked in greater detail at the southwestern portion of the survey area ($x < -7.5\text{m}$ and $y > 30\text{m}$). Cane was not being grown in this area. The measurement grid was set up at 2.5 m intervals. We used both 5m and 2.5m rod spacings at each measurement point.

THE DATA

The data were initially inspected in graphical form. They were reduced with a mathematics software program called *MatLab*. The raw data, i.e. the data taken in the field, are in ohms. They are simply the ratio of the voltage measured by the inner electrodes divided by the current supplied by the outer electrodes. Depending on the electrode spacing, the raw data fall into a range from 10 to 100ohm, with the lower values corresponding to the smaller rod spacings. In order to interpret the data, we used effective resistivity values. These values correspond to the specific resistivity values of an infinite half-space yielding the measured values. Specific resistivity R units are ohm-meters and are related to the measurement value by:

$$R = 2 * \pi * a * r$$

where a and r are the rod-spacing and measured resistance respectively. The values of R range from approximately 400 to 1100 ohm-meter.

The effective resistivity values for the twelve lines that were measured in the 10 m rod spacing survey are shown in Figures 2 and 3. The figures were made using the Surfer 3-dimensional graphics program. The contour interval in Figure 2 is 40 ohm-meters. Figure 3 shows a 3-dimensional view of the resistivity data looking from southwest to northeast, at a 45° angle from the horizontal.

The survey conducted with different rod spacings and the intensive survey in the southwestern portion of Lot 189B were experimental, and were conducted to explore the effectiveness of different techniques. These surveys did not differ significantly from those conducted with a 10 m spacing, and therefore, the data are not presented in this chapter. The data are available through the Cerén Project.

TEST EXCAVATIONS

Two 2 x 2 meter test pits, named Kayla and Gabi, were excavated at the location of a large ridge of high resistivity values. Test Pit Kayla was centered at $y=38\text{m}$, $x=-38\text{m}$, and Test Pit Gabi was centered at $y=42.5$, $x=-35$ (Figures 2 and 3). The striking linear feature is accompanied by very low resistivity (high conductivity) values to the southwest. The thicknesses of the stratigraphic units in the two test pits are shown in Table 1.

The stratigraphy at test pit Gabi was similar to the rest of the site, although the total thickness was only 3.02 meters, compared with 4-6 meters in most other areas. This is presumably because of its location on a slope. Test pit Kayla showed unusual stratigraphy, however. Unit 5, the pyroclastic flow, had eroded away the entire thickness of Unit 4, and in parts of the test pit, portions of Unit 3. Pyroclastic flows are very dense flowage phenomena, moving at high speeds, and have the potential to cause significant erosion.

The pre-Laguna Caldera ground surface of both test pits consisted of the incipient soil formed on tephra from the Ilopango eruption. Faint undulations present roughly perpendicular to the slope in both test pits probably are the remnants of agricultural field ridges. If so, then they had been in fallow for a considerable time prior to the eruption. The ridges are much less marked than those in either the active or fallow field excavated in 1978 (Zier 1983). No artifacts were found in either test pit.

DISCUSSION, SUMMARY, AND CONCLUSIONS

It is uncertain what caused the anomalous resistivity values near the location of the test pits. The test pits were not centered on the anomaly, and it is possible that the underlying cause of the anomaly was missed. It is also possible that the anomaly reflected a large scale erosional feature created during the eruption, which we can see in test pit Kayla.

Figure 2. Resistivity Survey of Lot 189B.
 Contour interval = 40 Ohm meters.
 Test pit locations indicated by *



Canefield Resistivity Data in Ohm-meters.

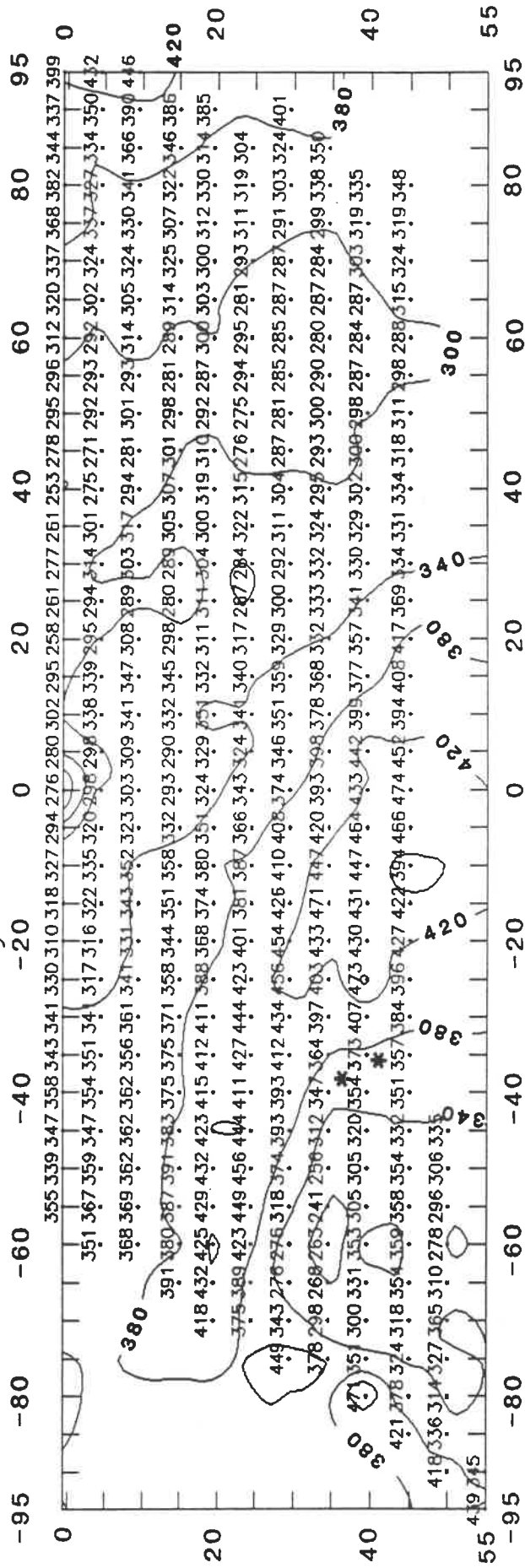


Figure 3. 3-Dimensional Plot of Resistivity Data for Lot 189B.

View is from Southwest to Northeast, at 45° from Vertical.

Test Pit Locations Indicated by *

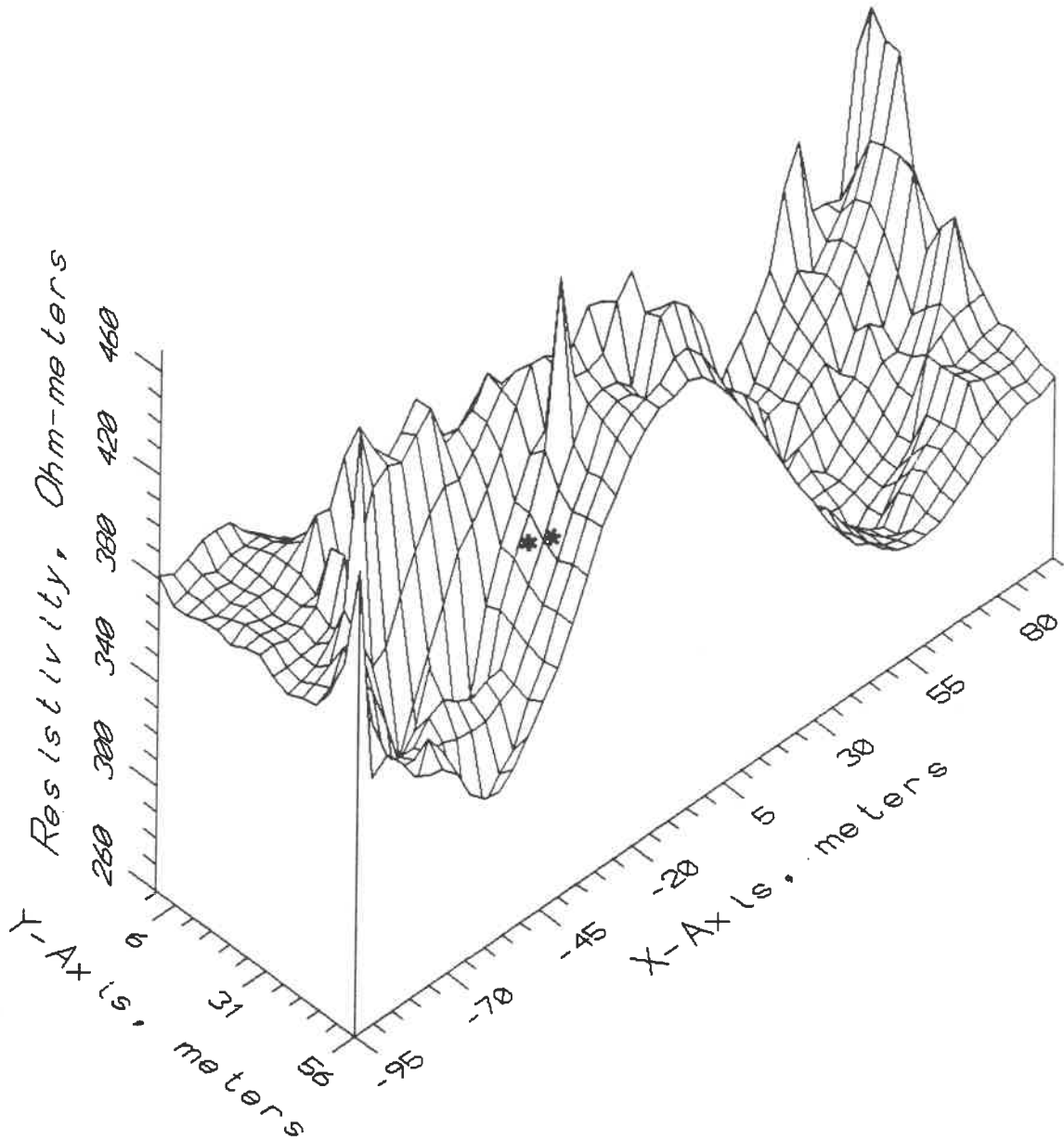


Table 1. Thicknesses of Stratigraphic Units (in cm) at test pits

Strat. Unit	Gabi	Kayla
14 and up	30	45
13	5	6
12	5	5
11	20-30	39-48
10	19-25	24-30
9	10	12-22
8	15-18	14-18
7	6-12	6-10
6	22-26	5-27
5	50-55	1-22
4	15-17	absent
3	55-60	63
2	3-5	2-5
1	20-25	20-30

It is important to realize that specific resistivity values of dry rocks and ceramics are many orders of magnitude larger than any values we have measured. The varying moisture contents of the various layers are probably the most important contributing factors to the changes in effective resistivity we observe. We anticipate that artificial or constructed barriers can trap moisture or prevent moisture from reaching certain areas. Therefore positive or negative resistivity anomalies can result from buried structures. Gradual changes in resistivity should be carefully compared with known changes in topography and recent (on a time scale of years) patterns of vegetation before expending a large effort in excavation.

The anomalies in the south west region of the greater survey area do not appear to be of topographic origin. Perhaps core drilling in the transition zones between very high and very low resistivity values could be most productive. Rather than random drilling systematic sampling across a transition region may be most productive. One must realize that moisture changes affected by a barrier may occur at some distance from the barrier.

Some general comments need to be made about the resistivity data. There are very good correlations from line to line both in the large survey and in the 2.5m spacing survey. After exploring the major anomaly it might be profitable to use the experience gained there and look for the smaller features apparent in the data. The changes in the "depth profiles" generated by varying rod spacings may be of particular importance, e.g. at $y=40$ $x=-45$ the resistivity maximum is reached for a rod spacing of 3.43m.

The 1990 resistivity survey has not yet succeeded in locating prehistoric structures in Lot 189B. It should be noted, however, that only 2 probes were excavated into areas of suspected prehistoric activity. The anomaly noted covers a large area, and further explorations, either through test pits or with the soil drill are necessary to understand its nature. Other, smaller anomalies should also be explored. The survey has helped to expand explorations at Cerén beyond the area of known habitation, and future geophysical investigations should help us to better understand the nature of prehispanic occupation of the area and further guide future research.

ACKNOWLEDGEMENTS

With the help of Kayla and Gabi Sheets, and four Salvadoran workers, an electric resistivity survey was completed in mid November 1990. Kayla participated in all phases of the resistivity study: from the measurements in the hot and humid sugar-cane field, to reading the data into the computer and finally to the moment of excitement when an anomaly was discovered; only to learn that the apparent anomaly was due to an input error. She persisted through the careful error checking and proof reading and the climax when the decision was made to dig test pits at locations which we felt were the best educated guesses for finding human-made structures. Gabi helped in her own very important way. She was responsible for keeping our spirits up. This included supplying the geophysicist with copious quantities of papaya. The test pits are deservedly named for them.

Chapter 4. **ARCHAEOMAGNETIC SAMPLE COLLECTIONS MADE AT CEREN DURING DECEMBER, 1990**

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INTRODUCTION

The archaeomagnetic dating method can provide precise and accurate dates for baked clay features and possibly, in some situations, volcanic ash and lavas found at archaeological sites. The method has been discussed in some detail (including collecting and laboratory procedures) in Wolfman (1984). Numerous archaeomagnetic results from Mesoamerica and their chronological, culture historical, and processual implications can be found in Wolfman (1990). Baked floors found at Ceren potentially provide good material for this dating method and the volcanic ejecta covering the site provides an opportunity to test the applicability of the method to such material. Samples were collected from the following five baked features and volcanic tephra units at Ceren between December 13 and 19, 1990.

SAMPLES COLLECTED

1. **SAMPLE NO.:** 12-13-90CE. This sample, consisting of nine individually oriented specimens encased in plaster cubes, was collected from a well-baked step on the NE side of Structure 1. This step apparently dates to the earliest known construction phase of the structure. The red color and the thickness of the baking suggest that this sample will provide a good archaeomagnetic result.
2. **SAMPLE NO.:** 12-16-90CE. This sample, consisting of ten individually-oriented baked clay specimens encased in plaster cubes, was collected from the floor on the NE edge of Structure 7 and immediately NE of the structure on a surface 15 cm below the structure floor. Although the red and orange color of the surfaces from which this sample was collected indicate good baking, the minimal thickness (1-3 mm) of the baked layer suggests that the sample may not provide a good result. Good results are rarely obtained from surfaces which show baking less than 5 mm thick. However, the importance of obtaining good archaeomagnetic results on material contemporaneous with the Laguna Caldera eruption warranted the collection of this and the following samples.
3. **SAMPLE NO.:** 12-17-90CE. This sample, consisting of eight individually oriented pieces of baked clay encased in plaster cubes, was collected from a surface at the base of the platform of Structure 7, near its NE corner. The time of baking was apparently the same as that of sample 12-16-90CE. While the baked material sampled was a little thicker than that on the surfaces sampled for 12-16-90CE, it was still quite thin (2-5 mm) and may not provide useful results.
4. **SAMPLE NO.:** 12-18-90CE. This sample, consisting of eight individually oriented blocks of ash encased in plaster cubes was collected from tephra Unit 5 SW of Structure 10. If the ash was ca. 580 degrees or hotter when deposited, there is a good chance that the ambient magnetic field direction at the time of deposition is recorded in this material. However, since the ash itself is so strongly magnetized that it distorts the modern geomagnetic field several degrees at this location, the accuracy of this record may not be perfect. Thermal demagnetization procedures will be used in the processing of this sample in an attempt to keep errors at a minimum.
5. **SAMPLE NO.:** 12-19-90CE. This sample consists of four individually oriented pieces of basalt bombs from stratigraphic Unit 7, which were embedded in Unit 6 southwest of Structure 10. As with the preceding sample, work on this material is somewhat experimental. If the temperature of these bombs was 580° C or above when they landed, they are magnetized in a direction approximately parallel to that of the ambient geomagnetic field. However, since these basalt bombs are very strongly

magnetized they distort the modern field considerably. Consequently orientation of the individual bombs was accomplished using a theodolite set up some distance away, rather than a Brunton compass right on the material as is the normal practice with archaeomagnetic samples. As with the preceding sample, thermal demagnetization procedures will be used in an attempt to determine the direction of the geomagnetic field at the time of the Laguna Caldera eruption as accurately as possible.

Chapter 5. 1990 EXCAVATIONS IN OPERATION 1, CEREN, EL SALVADOR

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University of Colorado

Work in Operation 1 during the 1990 field season began with the objective of completing excavations in that area. However, the area was found to be far more complex than originally thought, and the discovery of at least three more structures in the area immediately to the east of the Household 1 complex led to new objectives. The initial objectives were to excavate a wider area around Structures 1 and 6 (formerly 1b), to excavate the remaining part of Structure 6, and to excavate the area to the south of Structure 6 in order to locate the border between the domestic area of the household and the garden or milpa area. When two more structures were located immediately to the east of the Household 1 complex, the additional objective of excavating one of these structures, Structure 11, was added. The results of each of these lines of investigation will be discussed in this report.

EXCAVATIONS IN STRUCTURE 1

Structure 1 at Cerén had been excavated in previous years, and was examined only minimally in the 1990 field season. However, early in the season it was noted that the northern edge of the structure, which had been previously damaged by heavy equipment, had been slightly eroded. In this area, a number of potsherds had eroded out of the platform fill, suggesting that the platform was constructed with pre-existing trash deposits. This in turn suggests that there was earlier occupation at the site; that is that Structure 1, in its final form, does not represent the initial occupation in a newly colonized area.

Given this observation, it was decided to clear away the eroded part of the platform, and to create a clean profile to examine phases of construction of the structure. An area approximately 10 to 20 centimeters wide and the entire east-west length of the structure was excavated. This small excavation revealed much about the construction history of Structure 1. At least three different phases of construction/remodeling were identified (Figure 1).

The first identified phase of construction of Structure 1 consisted of the main part of the platform supporting the interior room and the front porch area contained within the four columns and walls. This structure had a large adobe block which served as a front step, and which is still in place against the original platform edge.

The second phase of construction saw a low raised area added to the front of the house, which was constructed of sandy fill and capped with a layer of sandy adobe. This raised area was 20 to 30 centimeters lower than the platform surface. The adobe block was partially buried in this new raised area, but the top 10 centimeters of the block remained exposed and still functioned as a step onto the platform. Immediately adjacent to the step and near the platform to the main part of the structure was a post hole. Although this surface was only minimally exposed, I would suggest that the second phase addition was a terrace similar to that in front of Structure 3. A posthole near the platform may have held a roof support post, however its function cannot be verified without further excavations in the structure.

If the roof of the structure was supported by posts set along the front of the original platform, then the third phase of construction would have required changes in the roofing. This third and final construction phase consisted of the addition of more fill and a new adobe surface on the north side of the house, creating an area which was only a few centimeters lower than the level of the original platform, and which probably functioned as a new front room. This is the area called Area 2, and previously described by Zier (1983: 124-129). This new addition completely buried the adobe step, and was completely under the roof of the structure. It is likely that Area 5, the addition on the east side of the structure was added at this time or later, since it is abutted to the third phase platform addition..

Potsherds and broken obsidian blades were found in all the levels of platform fill exposed in these excavations. These artifacts were clearly not intentionally placed in the platform fill, but rather were the result of the use of fill dirt which incidentally contained trash. However, none of the fill from the initial phase of construction was removed, and whether it contains trash or not is not clear. This would be of some interest in determining whether Structure 1 was a new structure in a minimally occupied area or whether it was built in an area where recent occupation had allowed for an accumulation of trash which would be used as fill dirt.

LEVELS:

3rd Phase { 1. Adobe flooring
 2. Sandy fill

2nd Phase { 3. Adobe flooring
 4. Sandy fill

1st Phase Adobe step

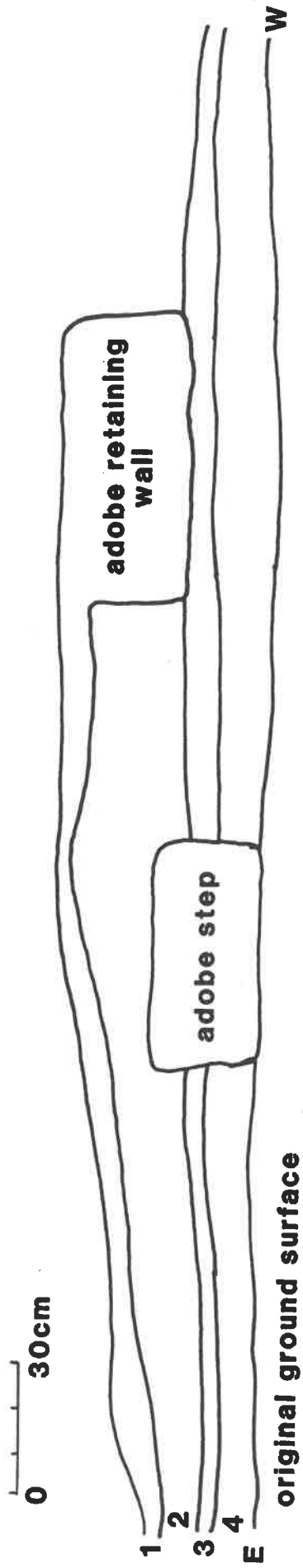


Figure 1. Profile of construction sequence on north side of structure 1.

While the sequence of constructional events is clear from these excavations, the time interval between each episode of construction cannot be determined. Archaeomagnetic samples taken from the different surfaces will help determine the intervals, as well as the length of time of overall occupation of the structure (Wolfman this volume).

EXCAVATIONS AROUND STRUCTURE 1

Excavations in 1989 identified several activity areas immediately around Structure 1. Artifacts were especially concentrated against the structure on the east side in an area labeled Area 7. This area was under the roof of Structure 1, and was the locus of some food preparation; a metate still in place on horquetas and several pottery vessels were found in this area (Beaudry and Tucker 1989:31). Excavations were conducted on the eastern edge of this area in 1990 to identify the edge of the activity area and the edge of the roofed area.

Some information about the construction and destruction of Structure 1 was gained in the 1990 expansion of Area 7. Immediately to the east of Area 7 part of the collapsed wall of Structure 1 was found. This section of wall had collapsed during the deposition of Unit 3. Below this, but also in Unit 3 were found fragments of the roof. The remains of the thatch extend in a somewhat regular mass to a distance of 86 centimeters from the eastern edge of the platform. This probably represents the edge of the roofed area.

Very few artifacts were found beyond this roofed area. In further excavations to the east only a few potsherds were found lying on the prehistoric ground surface. However, the lack of artifacts does not preclude use of this area. The ground surface beyond the roof line was smooth and hard packed, suggesting that this area received heavy foot traffic, although there is no formalized walkway in the area.

The only other artifact found around Structure 1 was a metate (FS#295-1-214), which was in Area 6, between Structure 1 and Structure 6. This metate was not placed on horquetas, but was lying inverted on the ground surface. Two post holes on either side of the metate suggest that it may have at some point been set up on horquetas in that location. However at the time of the eruption the horquetas were not present. Placing the metate face down on the ground surface near its location of intermittent use may have been a means of storing the metate, which would have protected the surface, but would have required minimal movement of the heavy stone. The presence of this stone near the previously excavated metate in Area 7 adds support to the interpretation of this area as a locus of food preparation activities.

EXCAVATIONS IN STRUCTURE 6

Structure 6, the bodega of the Household 1 complex (formerly Structure 1b), was not completely excavated in the 1989 season (Beaudry and Tucker 1989). Therefore one of the first tasks of the 1990 season was to complete excavations of this structure. This was quickly accomplished, as only a very small area of the floor of the structure remained to be excavated, and very few artifacts were found (Figure 2). The structure extended only 20 centimeters beyond the 1989 excavation limits on the southern edge, and 1.10 meters beyond the previous excavation on the northern edge. The fallen east wall covered part of the floor. Three artifacts were found in the remainder of the exposed floor area: a metate fragment (295-1-211), a flat worked stone (295-1-213), and a doughnut stone (295-1-212). The doughnut stone was beneath the roof fall, but was not in floor contact. The other artifacts were in floor contact, along with three unworked stones.

The east wall of Structure 6 was completely collapsed but intact. Unlike the other sides of Structure 6, the east had a bajareque wall of full height (at least 1.8 centimeters.) The door to the structure was found in this wall off set slightly to the south of center. One ceramic handle in the wall next to the door at a height of 88 centimeters may have provided a means for attaching a door, however unlike in other structures, the handle is placed horizontally rather than vertically. Its proximity to the doorway suggests that the purpose of the handle was similar to those in other structures, despite this different orientation.

How this wall connected with the others, or why this structure had only one full bajareque wall is not clear. It is possible that the other walls were full height but made up of only poles. Another possibility is that the roof sloped steeply, so that the side walls were very low, but the front wall was much taller, and tapered to the sides (similar to an A-frame structure). If this is the case the west wall

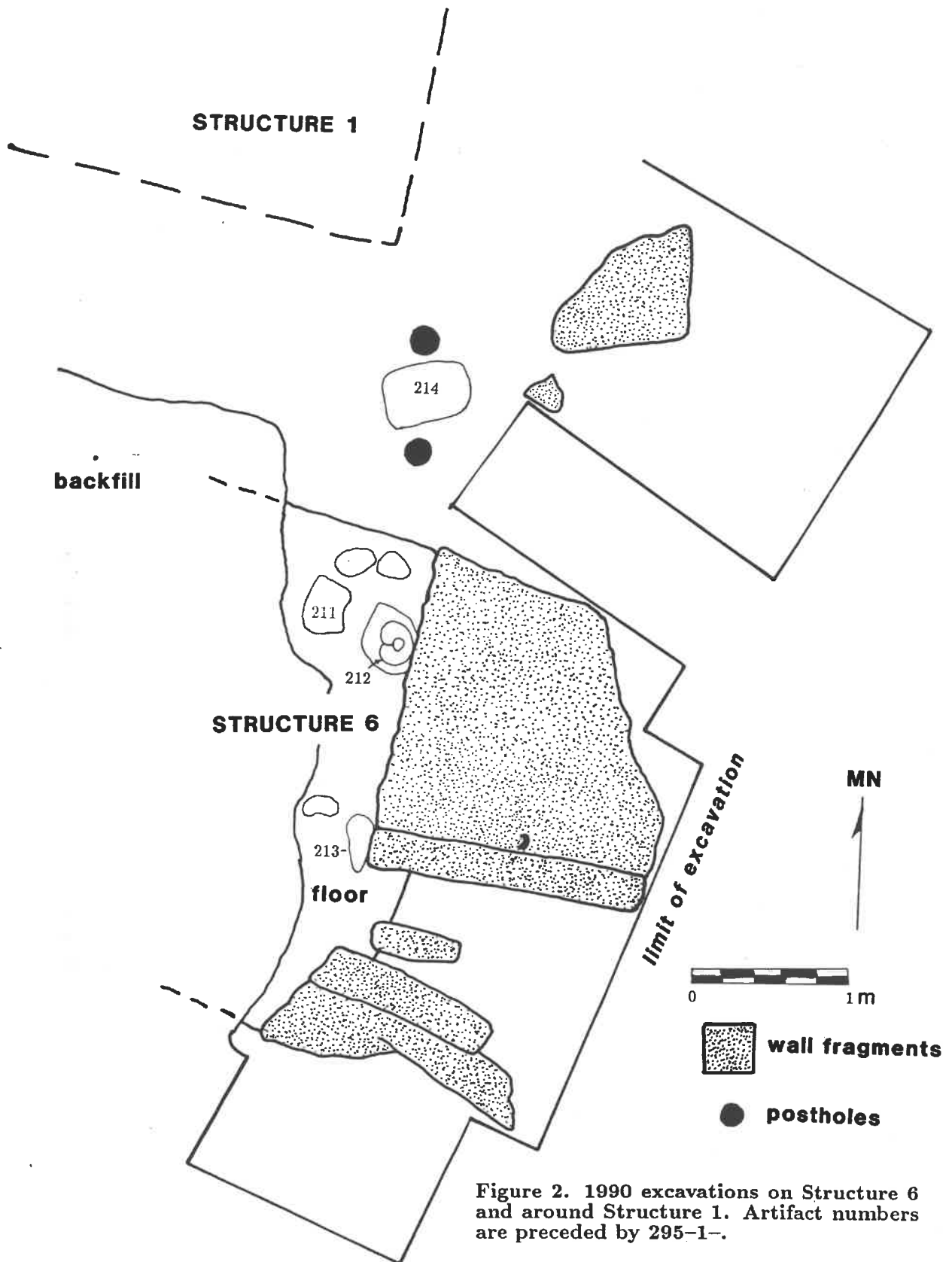


Figure 2. 1990 excavations on Structure 6 and around Structure 1. Artifact numbers are preceded by 295-1-.

must have been constructed of poles. Because the top part of the east wall was broken up in the collapse, it is not clear what the original shape was, so this problem cannot be fully resolved.

EXCAVATIONS TO THE SOUTH OF STRUCTURE 6

Excavations were expanded to the south of Structure 6 in order to define the relationship between the milpa or garden area and the domestic area surrounding the house and bodega. An area 2 meters north-south by 4 meters east-west was excavated, immediately adjacent to the excavations around Structure 6 (Figure 3). These excavations did not connect the milpa with the structures, but did encounter a garden area. Two rows of plants were found running parallel to the south wall of Structure 6. The plants were preserved as cavities in the ash, which were filled with plaster to create a cast of each plant. At least three different species of plants have been found in these rows, but have not as yet been identified to species. However, the proximity of these plants to the structures, and their linear arrangement indicates that they were intentionally planted, and it is probable that they were of economic value. The southern and western limits of this garden area are not known, however the eastern and northern limits are defined by the presence of structures. The plants are within 1 meter of Structure 6 and 1.5 meters of Structure 11. The rows are approximately a meter apart, and the plants are spaced approximately every 75 centimeters apart.

EXCAVATIONS IN STRUCTURE 11

During the initial stages of expansion of Operation 1, a slight rise in the tephra units, corresponding to a cavity were noted on the east side of Structure 6. It was suspected that this might indicate a structure, so Operation 1 was expanded to the east with a backhoe, and two 1 meter square test pits were placed in the area where a structure was thought to be. These test pits exposed areas of thatch and broken pottery, thus confirming the presence of Structure 11. In expanding the area, the backhoe also uncovered a column top still further east than Structure 11. This was labeled Structure 10. Because of time limitations, only one of these structures could be excavated, and Structure 11 was chosen because of its proximity to previously excavated areas in Operation 1.

ARCHITECTURE

Architecturally, Structure 11 is unique among the structures excavated to date at Cerén (Figure 4). It is built on a very low and irregular platform, and the adobe flooring in places is very thin or lacking. The structure is circular with a square porch area which was apparently roofed but not enclosed by walls. At the entrance to the main room from the porch, two stubs of bajareque served as informal columns. These are preserved to their full height, approximately 1.31 meters. A large pole set in each bajareque column forked at the top of the bajareque and presumably served as support for horizontal beams. These bajareque columns were attached to the walls of the circular portion of the structure which were made up of close-set poles about two centimeters in diameter. Larger posts about 8 centimeters in diameter were set at wider intervals and provided greater structural support for the pole walls. The average spacing between small poles was 23 centimeters, average spacing between larger posts was 1 meter. Cavities left by the posts and poles indicate that this wall stood to a height of at least 1 meter above the floor. This does not represent the full height of the walls, but only gives a minimum figure. This wall was covered with thatch, and sections of the thatch were found in place along the base of the wall in the eastern and southern parts of the structure.

The structure was oriented almost directly north, unlike all other structures excavated to date at Cerén, which are oriented approximately 7 degrees east of true north. The orientation of Structure 11 suggests that it is related to the Household 1 complex (Structures 1 and 6.) In fact, the eastern doorway of the bodega (Structure 6) would have allowed very easy access between the two buildings, and movement between Structure 11 and the activity areas on the east side of Structure 1 would have been easy as well.

While the type of construction is in many ways less substantial than other structures at Cerén, Structure 11 is a large building, the circular area measuring 4.48 meters in diameter at its widest. Total length of the structure from the south wall to the front of the square porch area is 5.10 meters. Thus although the structure was simply constructed, it provided a very usable space and was undoubtedly functionally very effective.

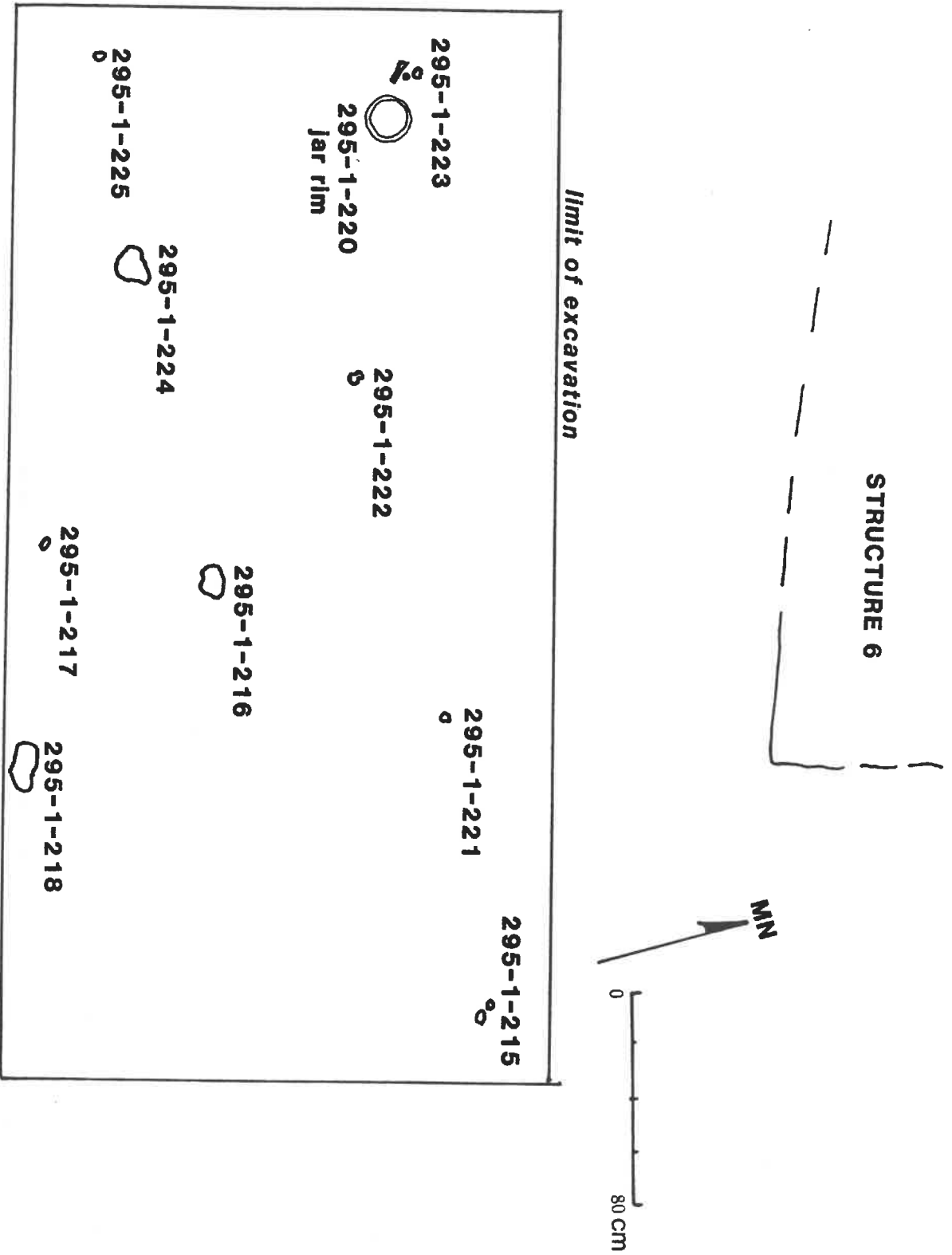
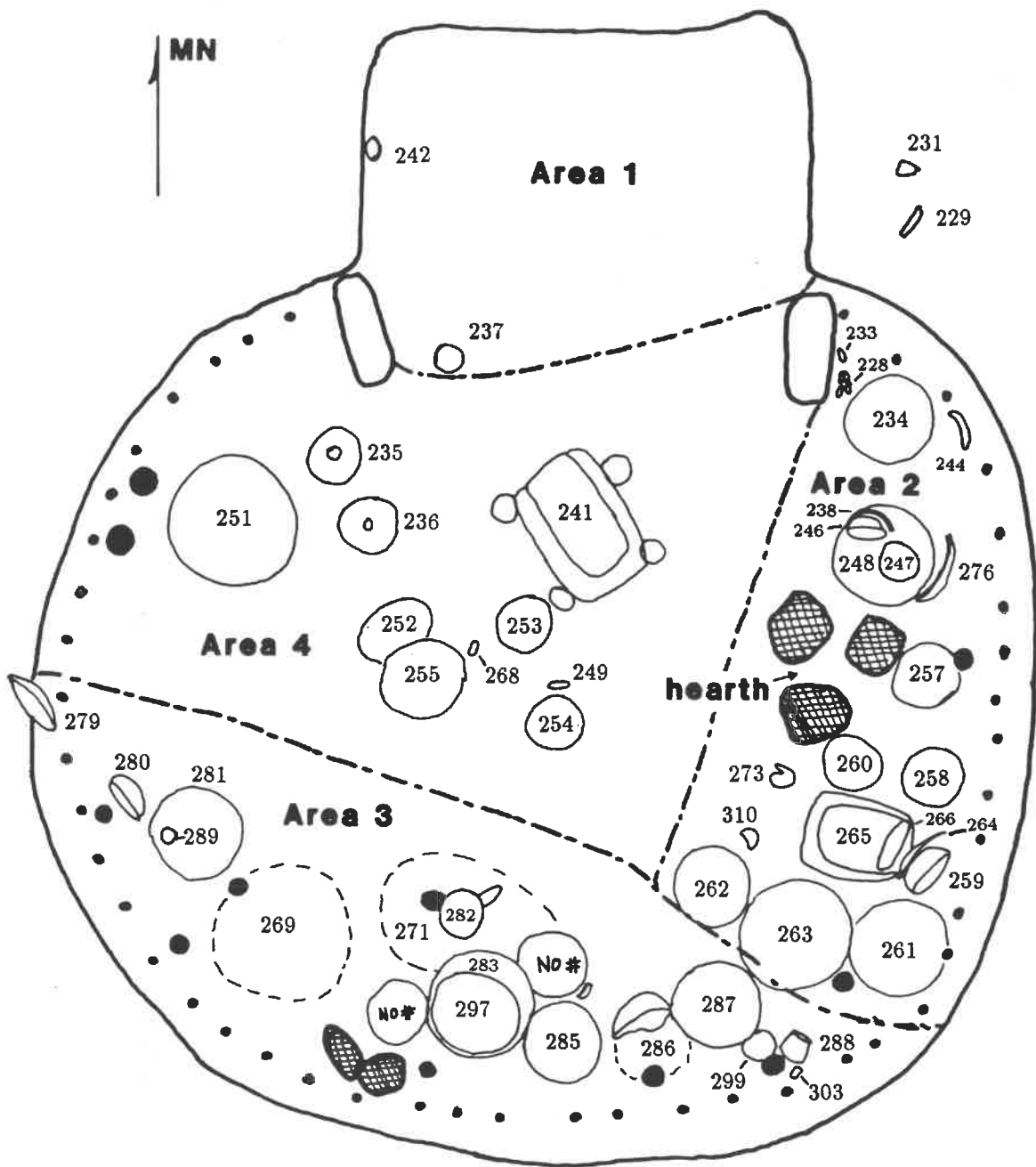


Figure 3. Garden area directly south of Structure 6.



0 60 cm

KEY

 **stones**

 **postholes**

Figure 4. Structure 11 with artifacts. Artifact numbers are preceded by 295-1-. A key to artifacts can be found in tables 1-4.

PERMANENT FLOOR FEATURES

Along the south side of the structure was a feature which appears to be a raised shelf or table which was supported by posts set into the floor and which was placed against the wall. This feature is preserved in the southeastern part of the room only as a series of postholes, and some charred horizontal poles which formed the surface of the shelf, and which had collapsed. Although the poles had collapsed, a number of vessels which were supported on fiber rings (yaguals) were still resting directly on the poles. From 2 to 5 centimeters of ash had accumulated on the floor prior to the collapse of the shelf.

Although the eastern end of the shelf collapsed in the eruption, it appears that the western end did not. Cavities left by horizontal poles were preserved in the Unit 3 ash, and extended from the wall of the structure eastward; the longest was 95 centimeters. One vertical post (corresponding to posthole A in Figure 5) also left a cavity. This post had a forked top, and the full height of the post, 24 centimeters, was preserved by the cavity. Nothing was found on the shelf in this area; all the artifacts in this corner of the structure were resting directly on the floor, and were apparently stowed under the shelf.

Other permanent floor features in Structure 11 indicate of the function of the structure. On the east side of the entrance is a small three stone hearth. In this hearth and in the general area around it was found a substantial layer of wood ash and charcoal which was in direct contact with the floor and separated from roof fall material by a few centimeters of ash.

Immediately to the south of this hearth was a metate which rested on a rock embedded in the floor. Near the center of the structure was another metate which was set on horquetas. These somewhat permanent floor features indicate preparation and cooking of food, a conclusion which is further supported by portable artifacts within the structure.

PORTABLE ARTIFACTS

Artifacts were concentrated mainly along the east and south walls of the structure, with relatively few artifacts in the center of the room. These artifact distributions seem to be directly related to the permanent floor features already described--the hearth, shelf and metates (Figure 4). The structure can be divided into four areas which correspond to artifact distribution and represent functionally different areas. These four areas are: Area 1. the porch, Area 2. the east side, around the hearth and metate, Area 3. the shelf and surrounding area, Area 4. the northwest quadrant.

Area 1. The porch.

The rectangular porch was relatively clear of artifacts. Three items-- an obsidian scraper, a long bone of a large mammal, and a fragment of a bone tool-- were found in the fallen roof thatch on the east side of the porch. A slightly worked handstone was found on the floor on the western edge of the porch floor, and the remains of a painted gourd was found on the floor near the entrance to the circular room. These were the only artifacts on the porch, and do not seem to represent any specific activity which was carried out there. The porch appears to be an area kept mostly clear for easy access into the structure. Table 1 lists the artifacts found on the porch.

Area 2. The east side.

Artifacts along the east wall of the structure were concentrated around the hearth and one of the metates and were densely packed. These were mainly ceramic and organic vessels. On the north side of the hearth, near the bajareque column, were found an obsidian blade and five lumps of red pigment which had been stored in the roof thatch. This obsidian blade is the only cutting implement found within the structure. On the floor in this area was found a tightly woven basket. Between the basket and the hearth was a large juacal, in which were nested two polychrome bowls and a painted gourd. Inside the gourd and the juacal were the impressions of whole ears of corn, however it is not clear whether these were stored in these containers at the time of the eruption or whether they had fallen in from elsewhere. Between the hearth and the wall were two jars which were extremely fragmented. Between the hearth

TABLE 1. ARTIFACTS ON PORCH

295-1-	DESCRIPTION	LOCATION
229	Animal bone	Roof fall
231	Obsidian scraper	Roof fall
232	Worked bone	Roof fall
237	Painted gourd	Floor contact
242	Handstone	Floor contact

and the metate was a small jar which had been protected by the stones around it, and which was whole. Near this were two painted gourds, one of which was completely smashed. A large sherd and a small but thick-walled bowl were placed between the wall and the metate. No preserved contents were found in any of these vessels. Finally, to the south of the metate and in front of the shelf were three large jars, one of which contained kernels of corn. The sherds from the base of this jar were covered with a yellow-to-white film which appeared to be the residue of a liquid, which leaked out when the jar was broken. It is possible that the corn was being soaked in water and ash prior to grinding.

All of the vessels in this area were resting directly on the floor of the structure. Four vessels and the large potsherd were covered with thick layers of soot on the exterior, indicating their use as cooking pots. Not surprisingly, all of these but one were clustered very near the hearth. The concentration of painted gourds in this area may indicate a similar utilitarian use within the sphere of food preparation activities.

The metate in this area was much more worn than the other metate in Structure 11, and had a matching mano lying on its surface. The extensive use of this metate, the associated mano, and the concentration of artifacts around both the metate and hearth indicate that this was the main food preparation area in the structure. Table 2 lists artifacts found in Area 2.

TABLE 2. ARTIFACTS IN HEARTH AREA

295-1-	DESCRIPTION	LOCATION
228	Pigment cylinders	Roof fall
233	Obsidian blade	Roof fall
234	Basket	Floor contact
238	Bowl	In vessel 248
244	Large potsherd	Floor contact
246	Bowl	In vessel 248
247	Painted gourd	In vessel 248
248	Large open vessel	Floor contact
257	Jar	Floor contact
258	Jar	Floor contact
259	Bowl	Floor contact
260	Jar	Floor contact
261	Jar	Floor contact
262	Jar	Floor contact
263	Jar	Floor contact
264	Large sherd	Floor contact
265	Metate	Floor contact
266	Mano	On metate
267	Corn kernels	In vessel 262
273	Painted gourd	Floor contact
310	Painted gourd	Floor contact

Area 3. The shelf.

Artifacts were densely placed along the south wall of the structure, and were apparently placed both on and under the shelf. Two large jars, a greenstone celt, and two smaller polychrome jars were on the shelf. The two larger jars rested on fiber rings for support. Inside one of the large jars was a tripod vessel, which had fallen into the jar, breaking both the jar and the tripod vessel. Near the polychrome jars on the eastern end of the shelf was a painted object which was hit by a lava bomb and almost totally destroyed. Samples of paint were taken (See Beaubien, this volume), but nothing else was recoverable from this artifact. Also near this was a lump of red pigment mixed with a crushed sheet silicate, lying immediately on top of a lump of pure red pigment. The use of these artifacts is not clearly known, although it is possible that the sheet silicate was being mixed with red pigment to create an effect similar to that of specular hematite.

Another large jar was apparently suspended from the roof in this area, over the shelf. Fragments of the string netting which suspended the vessel were found beneath it.

The remainder of the artifacts in this area were on the floor beneath the shelf. These included two baskets of coarser weave than the one found near the hearth, an incensario, a large jar, and a small bowl. Inside the jar was a miniature jar which contained red pigment. This miniature jar was broken and apparently had fallen into the larger vessel. It may have been stored on the shelf.

Also beneath the shelf in the western end of the room is an area in which the floor is covered with an organic material. A number of beans were found on this matting and in the surrounding area on the floor and in the jar nearby. It seems likely that the organic material was laid on the floor as an expedient matting and the beans were piled on it. These beans are of three distinct sizes, and represent at least three varieties of bean which were being kept in the structure.

In the extreme southeastern side of the structure a rodent skeleton was found. This probably came from the roof thatch, but a lava bomb very near the skeleton disrupted artifacts in the area. It is possible that the rodent was on or under the shelf. A second rodent skeleton was found beneath the incensario on the floor.

Unlike the area around the hearth, this area was clearly used for storage. A variety of foodstuffs were found in this area in pots, on the floor, and in the ash slightly above the floor. Fragments of chiles and thousands of chile seeds were scattered throughout the area around the incensario. These had fallen to the floor, but whether they were on the shelf or hung from the roof of the structure is not clear. Three of the large jars (two on the shelf, one under the shelf) also contained various types of seeds. These have not yet been identified to species, but represent at least three other plants--possibly achiote, cacao, and pumpkin. None of the vessels found in this area were covered in soot as were those surrounding the hearth. Table 3 lists all artifacts found in the area of the shelf.

Area 4. The northwest quadrant.

The use of the northwestern part of Structure 11 is not as clearly definable as that of the hearth area or the shelf. This area contains a number of artifacts loosely clustered in the area between the western wall and the metate. Three partial jars and two large juacals were found in this area, all resting on the floor. The largest juacal and one of the jars were soot-covered on the exteriors and especially on the bases, indicating use as cooking vessels. The other vessels had not been used for cooking. No organic materials were found in any of these vessels.

Other artifacts in this area included two doughnut stones, lying a few centimeters off of the floor, fragments of a shell lying on the floor, and some carbonized seeds in the roof fall. The metate on the edge of this cluster of artifacts was placed on horquetas. It was not heavily used, and a mano was not found with it. However the mano found on the metate in the hearth area fits the grinding surface of this metate equally well, and may have been used on both.

Three rodent skeletons were found in this area. Two were in the roof thatch in an area where small seeds were found; the seeds may have attracted the rodents to that part of the roof. The third skeleton was found under a jar near the middle of the room.

This area seems to be a locus of food preparation, as is the area around the hearth. However, activities represented here are more limited, and I would suggest that it is a secondary area, and most of the food preparation was done in the hearth area. This area may have

been for the initial preparations of food, and the final preparation was conducted near the hearth. Table 4 lists all artifacts found in this part of the structure.

TABLE 3. ARTIFACTS IN THE AREA OF THE SHELF

295-1-	DESCRIPTION	LOCATION
269	Beans	Floor contact
270	Seeds	In vessel 281
271	Chile seeds	Floor contact and above
272	String fragment	Floor contact
274	Rodent skeleton	Roof fall
275	Red paint/silica	Floor contact
276	Large sherd	Floor contact
279	Large sherd	Roof fall
280	Bowl	Floor contact
281	Jar	Floor contact
282	Incensario	Floor contact
283	Jar	On shelf
284	Celt	On shelf
285	Jar	Roof fall
286	Jar	Shelf
287	Jar	Floor contact
288	Recurved bowl	Shelf
289	Miniature jar	In vessel 281
290	Beans	In vessel 281
291	Rodent skeleton	Floor contact
297	Tripod vessel	In vessel 283
298	Seeds	In vessel 283
299	Cylinder vessel	Floor or shelf?
301	Bone fragments	Floor contact
303	Painted object	Floor or shelf?
304	Beans (cast)	In vessel 279
307	Seeds (cast)	In vessel 286
No #	Basket	Floor contact
No #	Basket	Floor contact

TABLE 4. ARTIFACTS IN THE NORTHEAST QUADRANT

295-1-	DESCRIPTION	LOCATION
235	Doughnut stone	Above floor
236	Doughnut stone	Above floor
241	Metate	On horquetas
245	Rodent skeleton	Roof fall
249	Seeds	Roof fall
250	Shell fragments	Floor contact
251	Large open bowl	Floor contact
252	Ceramic vessel	Floor contact
253	Jar	Floor contact
254	Jar	Floor contact
255	Large open bowl	Floor contact
256	Rodent skeleton	Under vessel 255
268	Rodent skeleton	Roof fall

AREAS AROUND STRUCTURE 11

Only a very small area was excavated around Structure 11; nothing can be said about the area to the east, and only limited statements can be made about the areas to the north and south. To the north of the structure the original ground surface is smooth and hardpacked, similar to the area on the east of Structure 1. Very few artifacts were found on this surface, only a few small sherds and one piece of obsidian which had been trampled into the surface. By contrast, the area to the south of Structure 11 was much rougher, and contained more trash, mainly broken sherds. Against the south wall of the structure were a handstone (FS# 295-1-300) and a spindle whorl (FS# 295-1-278), suggesting that some outdoor activities were conducted on the south side of the structure, although no activity areas are definable. Also outside the structure on the southwest is a large potsherd which contained a few beans, and which was mixed in the roof fall. It is possible that this sherd was actually inside the structure and may be a part of the highly fragmented jar found in that corner of the structure.

Immediately to the west of the structure is the garden area, and the milpa is no more than 2 meters to the southwest of the structure. The proximity of these garden areas to the structure suggest that these could have been kitchen garden areas rather than major agricultural fields. Of course, more information on the extent of the cultivated areas and the species of the plants being grown is necessary before further conclusions can be drawn.

PRELIMINARY CONCLUSIONS

The 1990 excavations in the Household 1 area added new insights into the history of the site and the activities carried on in the complex. Structure 11 represents the first kitchen as yet found at Cerén, and as such offers a new range of information about household life. The simplicity but functionality of the structure, the orientation of doorways between the bodega and kitchen, and the proximity of garden areas are all elements of a practical design for an intensively used structure. This structure may well have been the center of female activities in the household complex, just as the ramada (Structure 5), on the other side of the house, was a locus for male activities.

While most of the artifacts within Structure 11 were simple and clearly utilitarian in design, the painted gourds and the lumps of pigment add bits of color, literally and figuratively, to our understanding of women's daily role. As part of the kitchen assemblage, they do not represent ritual or high art, but show us the female role in the creation and appreciation of types of folk art which are rarely preserved in the archaeological record.

The presence of at least three unexcavated structures to the east of Operation 1 indicates that work in the Operation 1 area is far from complete, and that Household Complex 1 can no longer be viewed as a discrete unit, but is enclosed in a much larger complex, the limits of which are as yet undefined. However, the 1990 excavations have brought us one step closer to understanding the daily repertoire of a prehistoric household at Cerén.

Chapter 6. INVESTIGATIONS IN OPERATION 1, FEBRUARY AND MARCH, 1991

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INTRODUCTION¹

Continued excavations in Operation 1 were conducted in February and March, 1991. Following this period, many days were spent in the field recording and mapping within the operation. Time was also spent analyzing the artifacts from previous field seasons, though the results of this analysis will be presented elsewhere at a later date.²

Initially, there were four objectives for this phase of investigations (Figure 1): 1) Re-excavate, as requested by the Patrimonio Cultural, the portion of Structure 6 that had been backfilled in 1989 to protect the structure from the elements. 2) Connect the Operation 1 excavations with the Test Pit 2 excavations of 1978. 3) Investigate the possibility that the area behind (to the SW) of Structure 6 was a location of refuse disposal. 4) Excavate as much as possible to the N and E of Structure 11 to investigate the possibility that this area was used as an open, multi-activity, clear area or *patio* between structures (cf. Killion 1990:203-204). These four objectives were accomplished to varying degrees. Furthermore, three additional objectives were added to, and accomplished in this program: 5) Record and map the exposed architecture of Structure 10. 6) Record and map a fragment of column that had been exposed during the excavation of a drainage canal S of Structure 12. 7) Record further observations concerning the condition and disposition of the structures of Operation 1.

Methods

The 1991 excavations were conducted with a crew of five Salvadoran workers; Moises Arturo Gevara, Hector Armando Gevara, Jaime Moran, Rodrigo Canton, and Elias de Jesus Rivera. Additional help was occasionally provided by members of the conservation crew, under the direction of Victor Manuel Murcia. Basic excavation was begun by the removal of 1 to 2 meters of volcanic ash using shovels, picks, and *azadones* (large, heavy hoes). Most of the overburden had been previously removed by a backhoe in 1989, so there was no Post-Classic component to investigate. Trowels were used once plant molds were discovered, or in the lowest 10 centimeters of the excavation.

Plants and other organic materials are often preserved at the Cerén site in the form of voids. In the case of the 1991 excavations, plant voids were found primarily in the Unit 1 and less frequently in the Unit 3 tephra strata. These units have been identified as base surge deposits with a relatively fine matrix (Miller 1989) that adhered to and packed around the plants that existed at the time. During the following fourteen hundred years, the plant material decomposed and left only a void. Utilizing dental quality plaster, we are able to fill these voids, and later excavate them. In many cases, the detail preserved is fine enough to enable the identification of the plant species. The method of casting has been described in detail by Murphy (1989) with the following exceptions: we utilized a plastic bag with a small hole in one corner to direct the flow of the plaster rather than a syringe, and we dealt with the problem of Unit 2 slightly differently. Unfortunately for the plant molds, Unit 2 was a coarse airfall unit that did not pack around the plants very well. Plaster tended to be absorbed by this unit, forming a large, amorphous clump. In 1989, this was avoided by casting the Unit 3 mold separately from the Unit 1 mold. This year, we allowed Unit 2 to absorb the plaster so that the Units 3 and 1 molds would remain together in situ. Excess plaster was partially removed by chipping or sawing carefully. All voids were filled soon after they were found, and allowed to cure at least one day before excavation. All plant castings were left in situ, with only loose or broken pieces collected, with the exception of three groups of corn plants that were collected to make room for a barrier that was placed in the trench to the 1978 Test Pit 2 (explained below.) Plant groups were assigned numbers (e.g. 91-25) and described. Descriptions included number of stalks, maximum and minimum diameters of stalks, height above the ground surface, and reconstructible height if any stalks had fallen during the eruption. This information is presented in Tables 1, 2, and 3.

The grid system begun in 1989 (Tucker 1989) was again employed for the 1991 excavations. Mapping nails that had been left in Structure 6 when it had been backfilled were used as reference points to extend the grid out over the entirety of Operation 1. To begin excavations, trenches were laid out to grid south and grid west, radiating out from the 1990 2 by 4 meter test pit south of Structure 6 (see

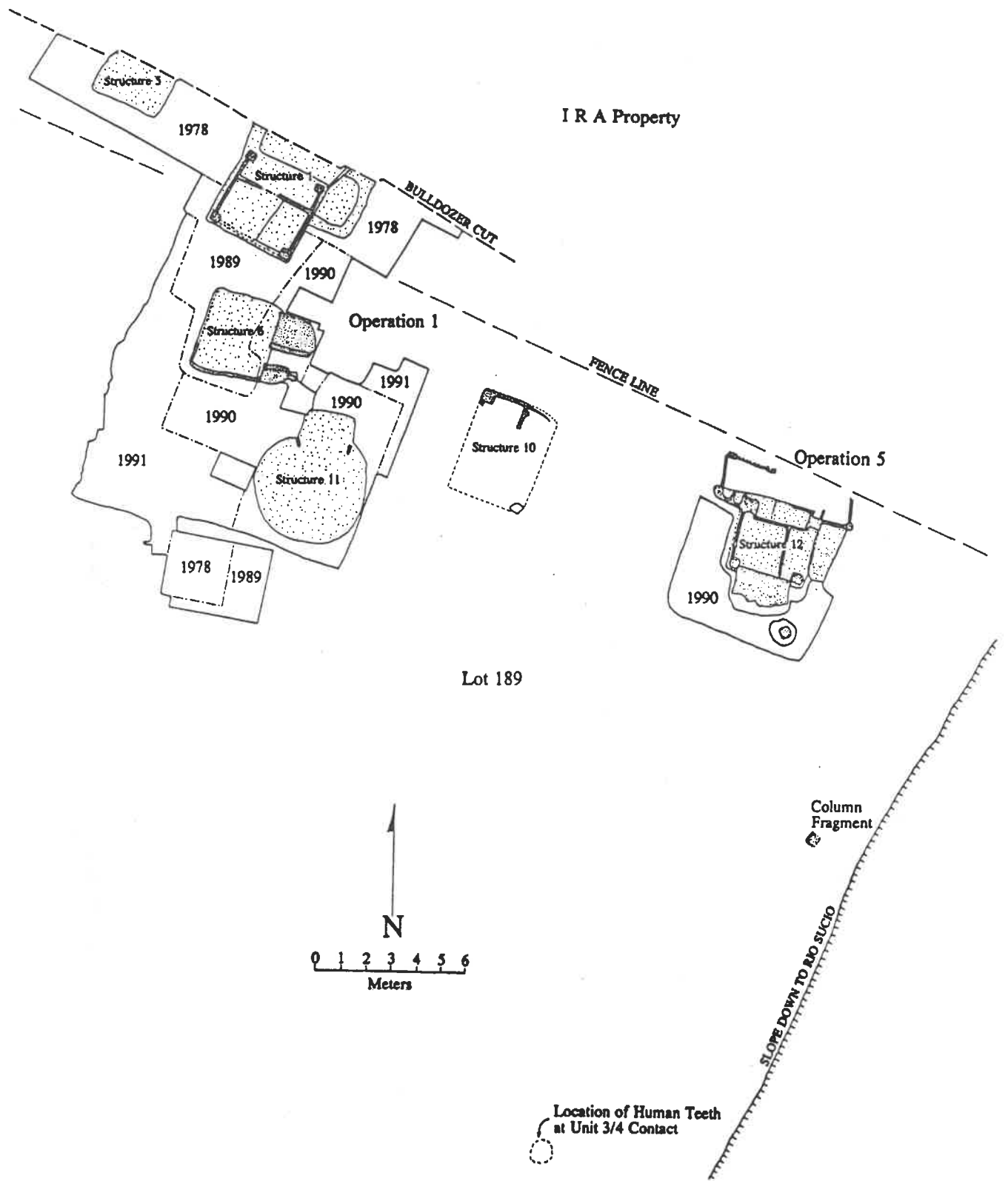


Figure 1: Plan map of the northeastern corner of Lot #189 showing Operations 1 and 5. Also shown are the locations of human teeth found in 1990 and a column fragment found in 1991. Dates refer to the year of excavation of the areas indicated. Stippling indicates architectural elements.

Mobley-Tanaka this volume). Excavating in this manner made mapping much easier. All maps were drawn at 1:10 scale, and included Structures 6 and 11.

During the re-excavation of Structure 6 and the area immediately surrounding it, an interesting observation was made. Occasionally, additional artifacts were discovered resting on the *Tierra Blanca Joven* (TBJ) in areas that had been excavated, mapped, and collected in 1989. There are several possible explanations for this. This could be the result of careless collecting in 1989, but this seems unlikely, as a similar observation has been noted in recently exposed and collected areas of Operation 2. More likely, the ancient ground surface was an active horizon, with artifacts being slightly buried prior to the deposition of the Laguna Caldera ash as the result of treadage, bioturbation, or other processes by which artifacts can move downward through a soil matrix. As the excavated surface is scraped with trowels or brushed during re-excavation or routine cleaning, more artifacts are sure to be discovered. Unfortunately, permission was not granted to explore below the surface, so the extent to which artifacts lie below the surface remains unknown.

Furthermore, it was noticed that there was a discrepancy of between 0 to 6 centimeters in elevation of the TBJ surface between the 1989 excavations and the 1990 excavations at the SE corner of Structure 6 (see Figure 6 for location). The profile of this discrepancy shows clear signs of bioturbation. It seems likely that the 1990 excavations were halted at the first indication of the TBJ color, while the 1989 excavations continued until the color change was complete. Artifacts have been found on both surfaces. These problems with definition of the ancient ground surface seems to only occur where the soil had lain relatively undisturbed by treadage, cleaning, or tillage for some time prior to the eruption of Laguna Caldera, giving time for soil formation processes to deposit and mix a darker organic matter into the TBJ. The soil at the SE corner of Structure 6 was mounded up against the platform of the structure somewhat, and much activity probably did not occur there. Excavations in 1989 removed the upper few centimeters of original surface, while those in 1990 did not.

Conservation problems of the areas exposed by these excavations are minimal compared to newly exposed structures. The roof that already existed over Operation 1 was extended by six meters to cover these areas. The conservation crew erected a low wall of metal posts along the south end of the roofed area, where it would be most exposed to the rain, and built a sloping embankment against this wall to direct the run-off away from the pit. The surface of this embankment was reinforced against erosion with a mixture of TBJ and cement. In the trench to Test Pit 2 that had extended out from under the roof, a wall of metal posts were built and the trench was backfilled. Drainage over the whole site will be a problem for the conservation crew to maintain during the rainy season, but these excavations fortunately generated few additional problems beyond what already existed in Operation 1. Further conservation measures will be discussed as specific areas of this investigation are described below.

Excavations

1991 investigations followed a fairly simple plan (Figure 2). Before new excavations were begun, Structure 6 was re-exposed so that it could be assessed as a complete unit for conservation. To begin new excavations, a 2 meter wide by 3 meter long trench was positioned due south of the 2 by 4 meter 1990 pit S of Structure 6 to attempt to encounter the 1978 Test Pit 2. When the test pit was not encountered, a 1 meter wide trench was extended an additional 2 meters south. The NW corner of Test Pit 2 was encountered in the first meter of this trench extension, so only this meter was completed. The southernmost meter was backfilled as described above. A 2 by 3 meter trench was excavated to the west of the same 2 by 4 meter 1990 pit. These trenches were connected by completing the block to the SW. As much of the area to the west of Structure 6 was excavated as the roofing allowed. The south trench and Structure 11 were connected, as were the doorways of Structures 6 and 11. Finally, excavations were extended to the north and east of Structure 11.

These excavations revealed a large area that had been under cultivation at the time of the eruption. Two methods of cultivation are apparent in this area, one consisting of a mixture of plant types grown together in the same area, and the other consisting of only corn cultivation. Following Killion (1990) I will use the term House Lot Garden or Garden to refer to the mixed species area, a term which he defines as residential horticulture that focuses on the individual plant and consists of mixed useful and ornamental species (1990:202). The area where only corn was cultivated might best be defined as an infield agricultural plot, with the emphasis being on whole crop production, rather than the



Figure 2: Plan map of Operation 1 showing areas excavated in 1991 as discussed in the text.

individual plant (*ibid*). However, the term *milpa* has been used for this area at Cerén (Sheets 1982:113; Zier 1983), and I will continue to use this term with the understanding that *milpa* generally refers to an agricultural parcel at some distance from the home (Evans 1990:131). For the area N and E of Structure 11, I will use the term *patio*, which Killion (1990:203) defines as an extramural zone that is frequently swept and maintained clear of debris.

To facilitate the following discussion, the 1991 excavations are divided into 4 areas. The cultivation rows identified in the 1978 Test Pit 2 end rather abruptly in the southern extent of the 1991 excavations. Only corn plants have been recovered, therefore I will refer to this southernmost area as the milpa. The rest of the cultivated area excavated contains a variety of plants and will be referred to as the garden area, with a drainage ditch dividing it into north and south halves. All excavations to the north and east of Structure 11 are considered to be in the patio area (Figure 3).

The Milpa

This year's excavations (Figure 4) encountered the NW corner of the 1978 Test Pit 2. This test pit had come within 1.5 meters of Structure 11. Immediately to the north of the test pit, the cultivation rows end. Excavations discovered the ends of 6 additional cultivation rows. In addition to the plant voids found in 1978 and 1989, 9 other groups of plants were found and cast in dental plaster, 8 of which could be identified as corn on the basis of their round, segmented stems, the occasional presence of a vertical groove, and V-shaped marks where leaves grew from the stems. Other similar plants found in the garden area sometimes had juvenile ears of corn preserved. Furthermore, phytoliths from the 1978 season were identified as maize (Zier 1983:135).

Three of the corn plants in the milpa area were removed so that the south trench extension could be backfilled. The preserved height of the corn ranges from 10 to 28 cm above the surrounding surface, though some stalks had fallen, and were consequently preserved, giving a reconstructible height range of between at least 12 to 76 cm (Table 1). The cultivation rows were evenly formed and relatively high, with 55 to 75 cm between the crests. Drainage ran to the south.

One additional, unidentified, plant was located very close to the end of a cultivation row, but not directly on it. This small plant (#91-7) had a round stalk, about 0.9 cm in diameter, with a single branch sticking out perpendicular from it. Its preserved height was 8 cm. Its location suggests that it may not have been intentionally planted, and was possibly a weed.

A total of 11 ceramic fragments were collected from this area, representing a light scatter of trash artifacts. Zier (1983) makes no mention of artifacts found in either Test Pit 1 or 2.

South Garden

This portion of the garden area is bordered on the south by the milpa, on the east by Structure 11, on the north by Structure 6, and on the north half of the west border by a drainage ditch (Figure 5). The south half of the west border remains unexcavated; however, there are two groupings of partially excavated corn plants, that I consider to be a part of the milpa, located there, which may indicate that the milpa extends further to the N. The south garden is made up of 6 cultivation rows running perpendicular to those of the milpa. Most of the two northernmost rows were excavated in 1990 (see Mobley-Tanaka this volume).

The cultivation rows are generally smaller than those of the milpa, with a shape that thickens and thins around the plants, probably due to soil being packed around the base of the plants to help support them. The rows are spaced 75 to 100 cm apart from crest to crest. Slope is to the west, and terminates in a drainage ditch that begins between Structures 6 and 11 as a slight depression. This depression becomes slightly deeper as it runs along the south side of Structure 6, and drops to as deep as 35 cm when it enters the garden. It curves and continues toward the southwest.

Identification of the plants preserved in the south garden is difficult in spite of the high degree of preservation. In no case is there a single, complete plant preserved. The tephra packed around the plants was not able to preserve the most fragile details, so identifying characteristics were often lost. Yet enough details remain that similar plants can be grouped together and described as separate unidentified types. Types I, II, III, and IV are categories of unidentified plants that occur more than once in the garden area, and have enough identifying characteristics to separate them from other plants. Single occurrences of other plants are treated as unknown types.

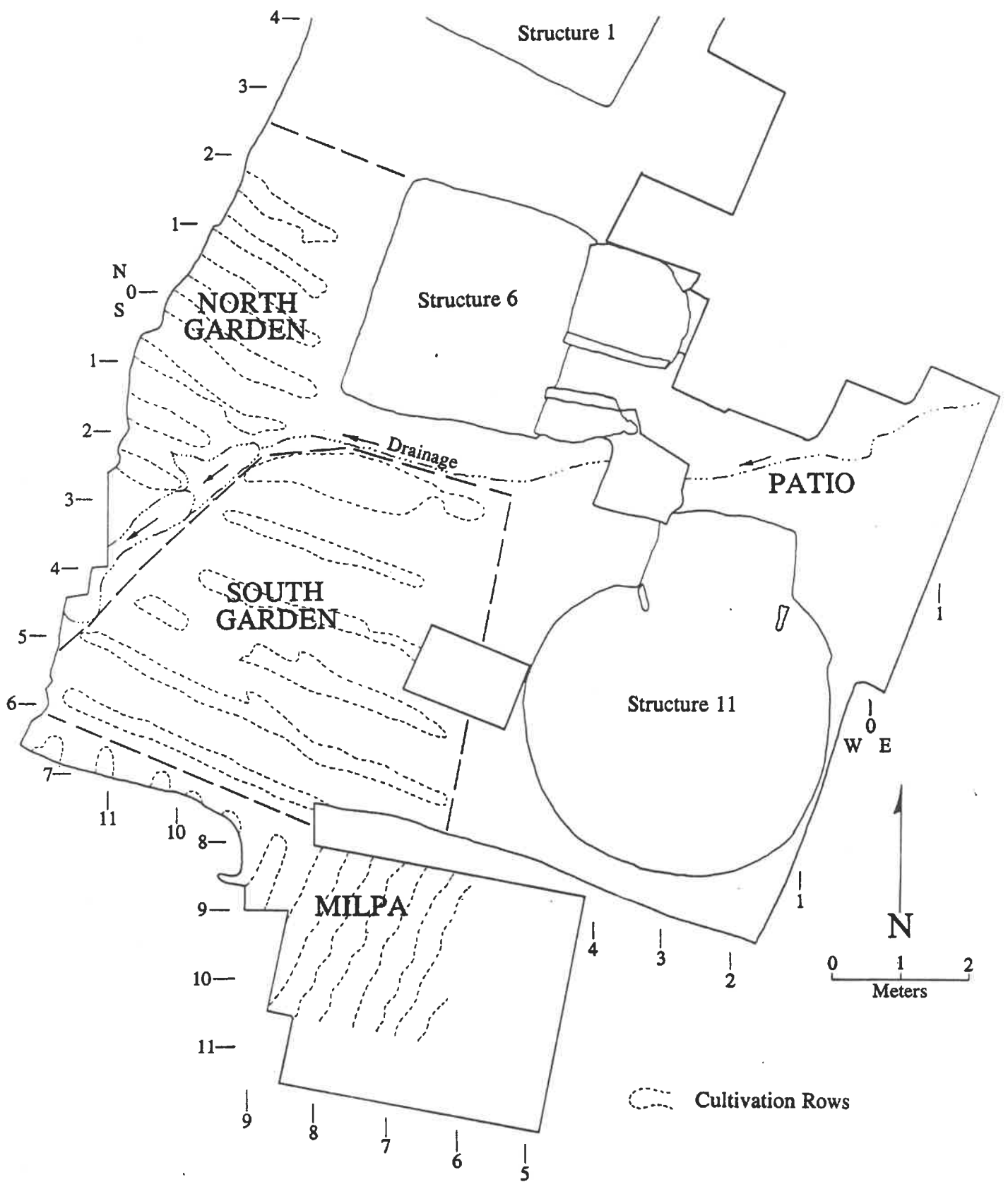


Figure 3: Plan map of Operation 1 that delineates the Milpa, North and South Garden, and Patio areas.

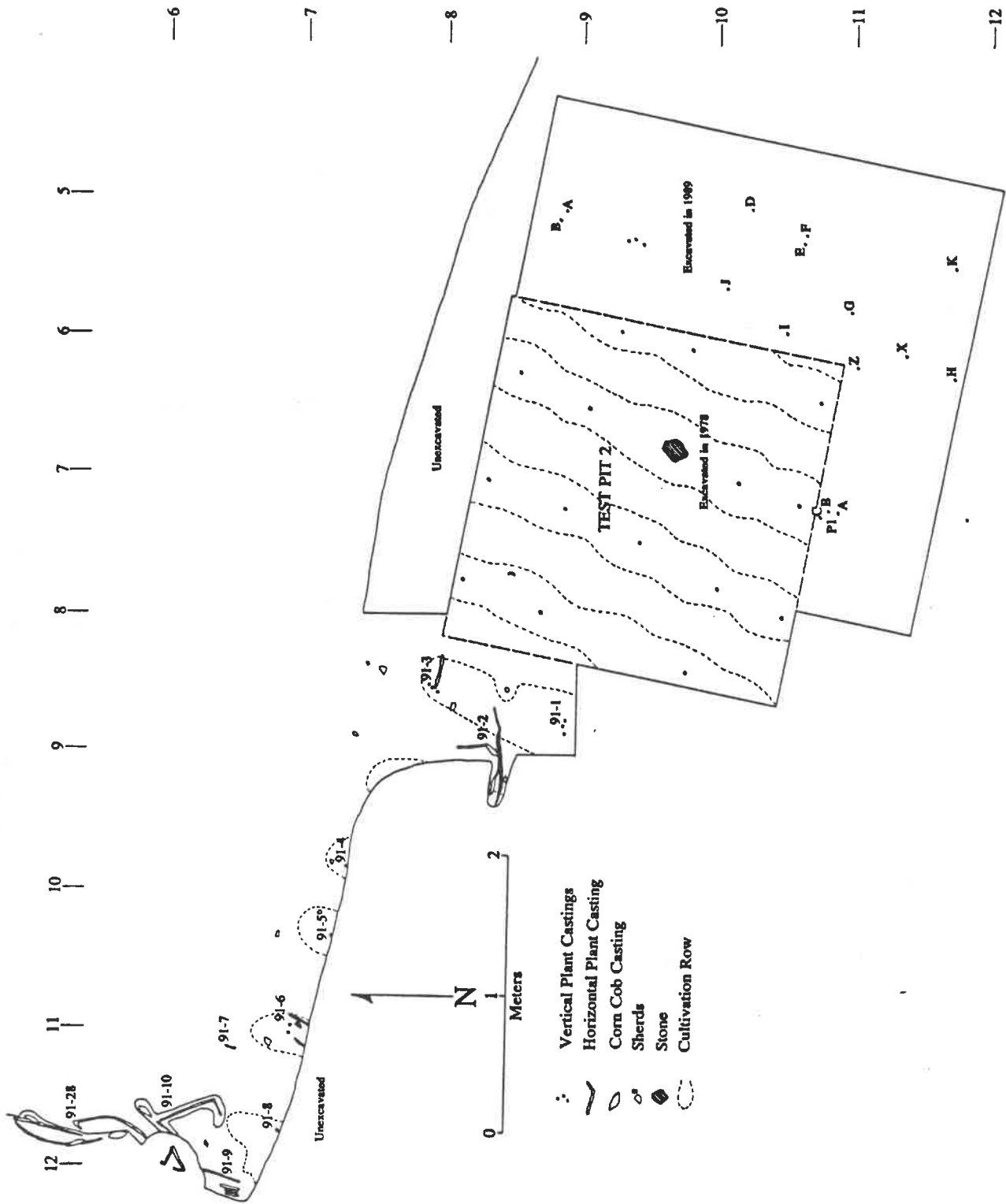


Figure 4: Plan map of the Milpa area showing *in situ* artifacts uncovered in 1991 and plant castings. Numbers are 1991 designations for plant castings while letters are designations from 1989.

Table 1

Plant descriptions from the Milpa Area, Operation 1

Plant # 91-	# of stalks	Cross section	Min. dia.	Max. dia.	Present height	Max. height	Fully Exposed?	Field I.D.
1	3	rnd, segmented	0.8	1.1	13	>13	Yes	Corn
2 ^a	5	rnd, segmented	0.5	1.7	18	>76	Yes	Corn
3	4	rnd, segmented	1.2	1.9	14	>24	Yes	Corn
4	2	rnd, segmented	0.7	1.5	12	>12	No	Corn
5	1	rnd, segmented	0.5	1.9	10	>10	No	Corn
6 ^b	4	rnd, segmented	1.0	1.7	23	>23	No	Corn
7 ^c	1	round	0.3	0.9	8	>8	Yes	Unkn.
8	1	rnd, segmented	1.5	1.9	28	>28	No	Corn
9	8	rnd, segmented	1.1	2.0	10	>38	No	Corn
10 ^d	4	rnd, segmented	0.7	2.0	55	>78	No	Corn
28 ^e	2	rnd, segmented	0.7	1.3	9	>70	No	Corn

^a All stalks horizontal in Unit 1. One juvenile cob preserved.

^b Two stalks horizontal, one in Unit 1, one in Unit 3.

^c Has single preserved branch perpendicular to stalk. Branch length 9 cm.

^d One stalk horizontal at TBJ contact. One horizontal in Unit 2 with cob.

^e Both stalks horizontal in Unit 2. Three juvenile cobs preserved.

Notes:

Plant # 91- = Field numbers were assigned to groups of plants preserved with dental plaster.

of stalks = Indicates the number of plants in each grouping.

Cross section = Short description of plant stem shape.

Min. dia. = Minimum preserved diameter of plant casting. In centimeters.

Max. dia. = Maximum preserved diameter of plant casting. In centimeters.

Present height = Preserved height of casting above TBJ. In centimeters.

Max. height = Maximum reconstructible height. This figure will be greater than the Present height if there are stalks preserved horizontally. Actual height of living plant would have been greater than this, because the uppermost portions of plants were not preserved well enough for casting. In centimeters.

Fully exposed? = Whether or not the plant casting was completely excavated.

Field I.D. = Identification made in the field

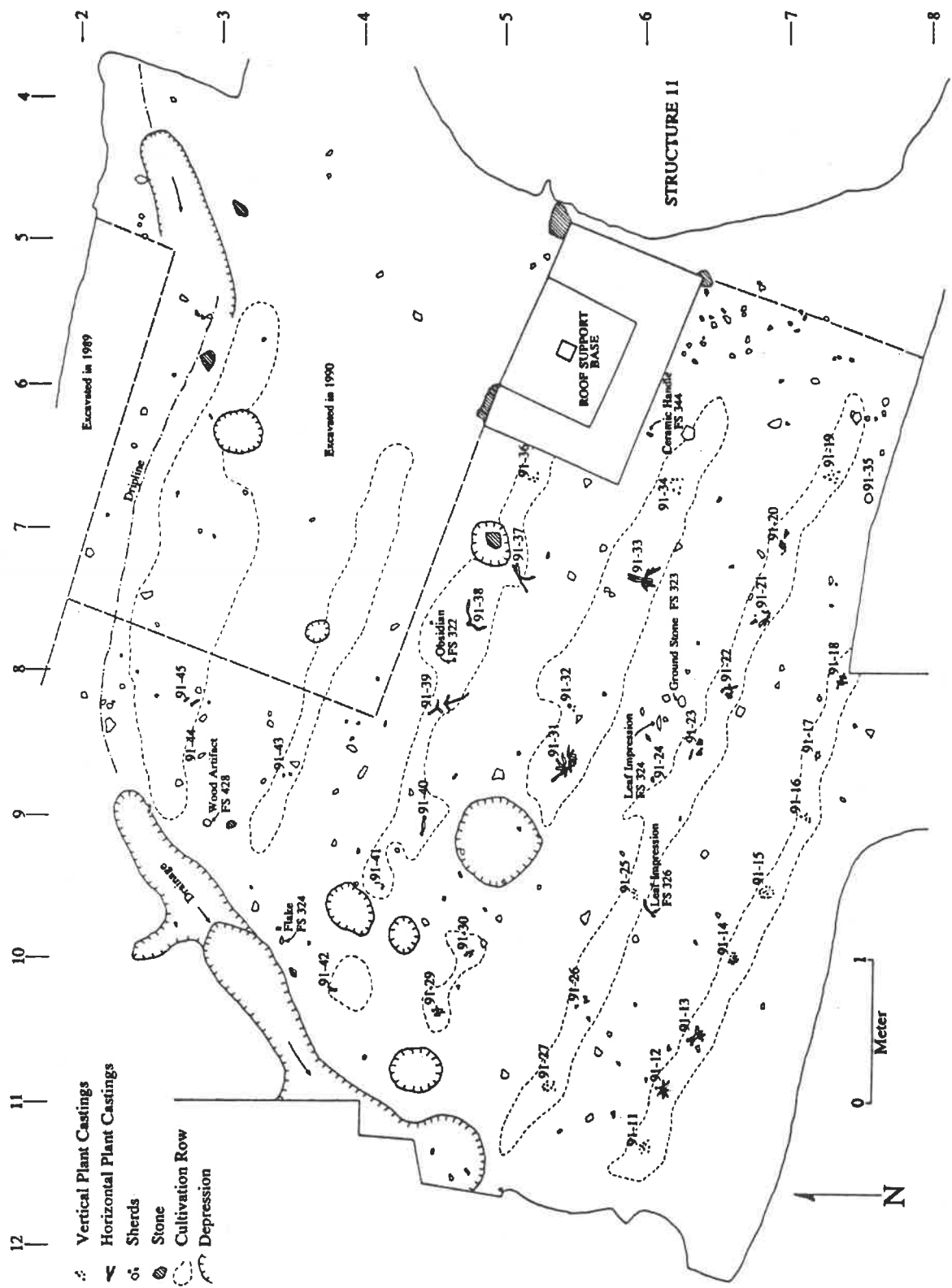


Figure 5: Plan map of the South Garden area showing *in situ* artifacts and plant castings uncovered in 1991. Numbers are 1991 designations for plant castings.

The garden area contains a number of different plants, most of which are found in the south half (Table 2). Already mentioned are the two groupings of corn in the SW corner. There are 16 plants, and possibly 6 others that have been cast but not excavated, that fall into the Type I category. Type I plants are small plants that have many small stems with crescent shaped cross sections. The thick crescent shape closes to a circle toward the base. Many stems originate from one base, but there seems to be from 4 to 8 bases planted in tight clusters. These plants are only preserved in the volcanic Unit 1 to a height of from 6 to 10 cm.

There are 6 plants, and one additional unexcavated plant that fall into my Type II category. Type II is very similar to Type I, in that it has crescent shaped stems, but there are fewer stems to each grouping, and they are somewhat larger. Maria Luisa Reina de Aguilares from the Jardin Botanico suggested that these could possibly be a type of Piña Silvestre, a native plant sometimes used in atol or for a medicine. However, this is only a preliminary identification.

Four plants are thick and round in section and are preserved up into the Unit 3 ash. Some of these have one or two branches, and remind me of small trees. However the identification of these plants remain unknown. These plants are not necessarily the same type, and are not assigned a separate category.

One cast was made of a plant (#91-35) near Structure 11 that was entirely under the TBJ. It appears to be a tuber of some sort, though no above ground stem was preserved. It was generally spherical, with a flattened bottom and a slight depression in the center of the bottom. It was 4 cm in diameter. It may have been from a previously cultivated root crop that was missed during the harvest.

At least 2 small plants with round cross sections remain completely unidentified.

Additional plant remains were recovered in the form of leaf impressions (295-1-324 and 326) within the Unit 1 tephra deposit. Both impressions were lying about 10 to 12 cm above the ancient ground surface. It is unknown whether these leaves came from nearby plants or were blown in from further away.

A small spherical object (295-1-428), 7 cm in diameter was recovered from TBJ contact near the drainage ditch. It seems to be of a dark purple material with a distinct wood grain to it. This may be a discarded wooden artifact of some sort that underwent a mineral replacement process.

Artifacts in this area consist primarily of a scattering of ceramic sherds, slightly more dense than in the milpa. There is a heavy concentration just to the east of Structure 11. Additionally, 1 obsidian blade fragment (295-1-391), 1 obsidian flake (295-1-322), one mano fragment (295-1-323), and one andesite flake (295-1-324) were recovered in this area. All artifacts were found to be lying at various angles in the ground surface. It seems likely that the act of tilling the soil worked to mix up the artifacts considerably, as well as bury a number of them completely. It is unknown to what depth cultivation went.

A small ceramic handle fragment (295-1-344) was recovered just to the east of Structure 11 at the Unit 1/2 contact. This artifact may have been deposited when the roof of Structure 11 collapsed and may belong to one of the many pots found within.

North Garden

This portion of the garden area (Figure 6) is not as varied in plant types as is the southern portion. The predominant plant is corn, with 20 plants, and possibly 5 others identifiable as corn (Table 3). In one case, a corn cob was preserved without a husk. Half of it was exposed, with 5 rows, the longest of which had 12 kernels.

Three plants are placed in the Type III category. These were wide (from 2.3 to 4 cm), had flat stems, and were slightly biconvex in cross section. They were found in groups of from 1 to 3, and were only preserved to a height of from 3.8 to 8 cm. From their positions on the sides of cultivation rows and scattered among the corn, these may represent an unintentional plant or weed.

Three more plant groupings represent the Type IV category. These are small stemmed, about 1.3 cm in maximum diameter with a fat biconvex cross section. These are in groupings of from 2 to 3 stems, and are preserved to a height of 7 to 10 cm. These are all found in the northernmost portion of this area.

The cultivation rows of the north garden are similar in shape and height to the south garden area. However, they are slightly closer together, from 65 to 75 cm between crests. There are 7 rows that have

Table 2

Plant descriptions from the South Garden area, Operation 1

Plant # 91-	# of stalks	Cross section	Min. dia.	Max. dia.	Present height	Max. height	Fully exposed?	Field I.D.	
11	c.10	unknown	-	-	11	>11	No	Type I?	
12	13	sm crescent	0.3	1.0	7	>7	Yes	Type I	
13	19	sm crescent	0.4	1.2	9	>9	Yes	Type I	
14	14	sm crescent	0.3	1.0	7	>7	Yes	Type I	
15	8	sm crescent	0.3	1.5	8	>8	Yes	Type I	
16	10	sm crescent	0.4	1.3	9	>9	Yes	Type I	
17	11	sm crescent	0.3	1.0	10	>10	Yes	Type I	
18	5	lg crescent	0.5	1.5	10	>10	Yes	Type II?	
19	c.7	unknown	-	-	15	>15	No	Type II?	
20	6	lg crescent	0.5	1.2	10	>10	No	Type II?	
21	7	lg crescent	0.7	1.8	7	>7	Yes	Type II	
22	4	lg crescent	0.9	1.8	9	>9	Yes	Type II	
23	6	lg crescent	0.6	2.1	9	>9	Yes	Type II	
24 ^a	1	round	0.5	1.4	36	>36	No	Unknown	
25	11	sm crescent	0.3	0.9	8	>8	No	Type I	
26	c.4	sm crescent	0.3	0.8	4	>4	No	Type I	
27	c.10	unknown	-	-	10	>10	No	Type I?	
29	5	sm crescent	0.2	1.0	6	>6	Yes	Type I	
30	5	sm crescent	0.3	1.1	8	>8	Yes	Type I	
31	3	lg crescent	0.5	1.8	13	>13	Yes	Type II	
32	3	round	0.7	2.2	8	>8	Yes	Unknown	
33	8	sm crescent	0.3	2.3	8	>8	Yes	Type I	
34	Un.	unknown	-	-	13	>13	No	Unknown	
35	0	spherical	1.5	4.0	0	Un.	Yes	Unknown	
36	c.5	unknown	-	-	5	>5	No	Type II?	
37 ^b	3	lg crescent	0.5	1.0	5	>20	Yes	Type II	
38	1	round	1.1	3.0	60	>60	No	Unknown	
39	2	lg crescent	0.9	2.5	11	>11	Yes	Type II	
40	1	round	1.8	2.0	36	>36	No	Unknown	
41	5	sm crescent	0.4	0.8	3	>3	Yes	Type I	
42	1	round	1.5	1.6	41	>41	No	Corn?	
43	2	round	1.1	1.5	11	>11	Yes	Unknown	
44	0	juvenile corn cob resting on TBJ - 2.8 x 8.0 cm							
45	2	sm crescent	1.1	1.8	6	>6	Yes	Type I?	

^a This stalk breaks into three branches near the top.

^b Disturbed by volcanic bomb.

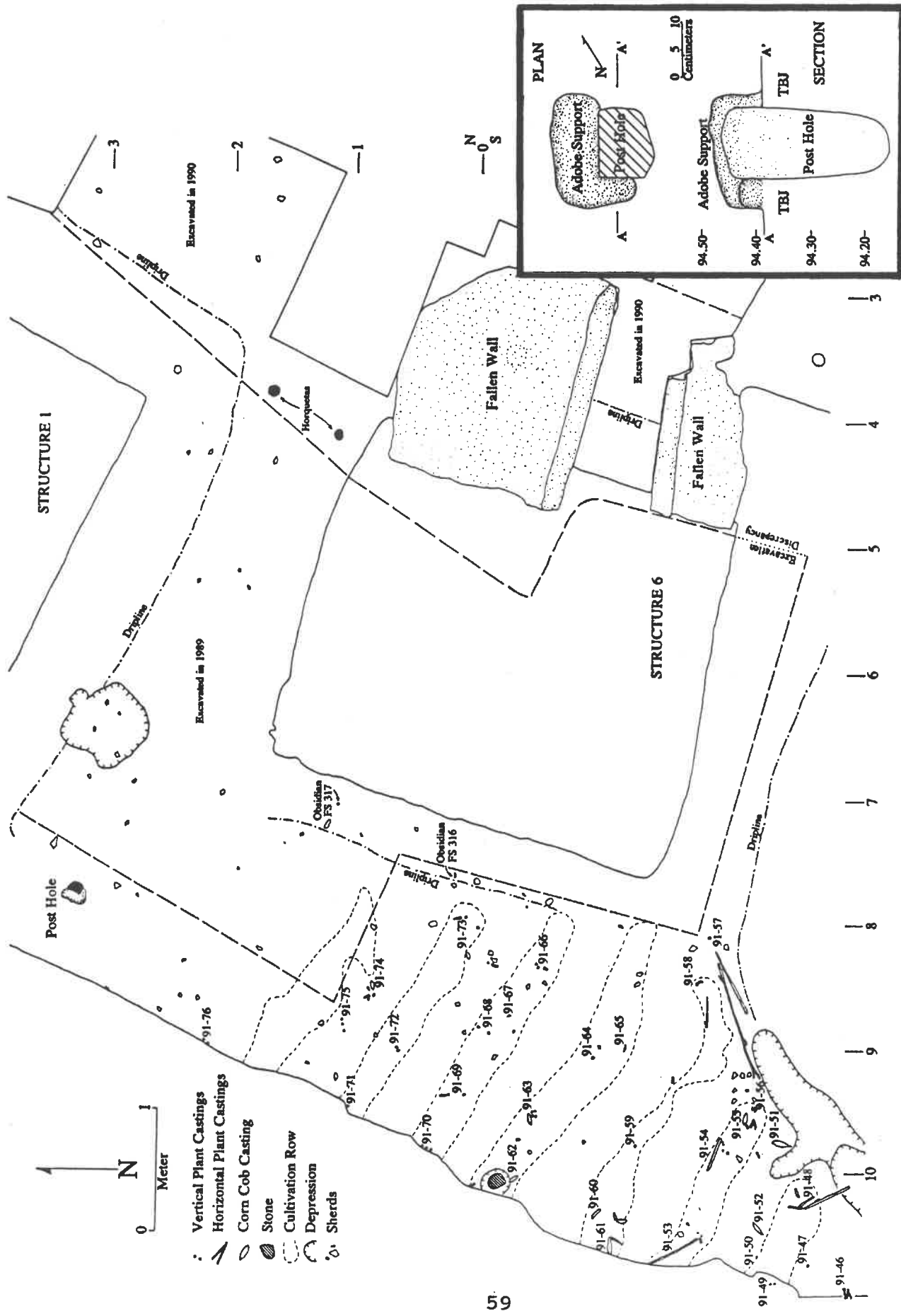


Figure 6: Plan map of the North Garden area showing *in situ* artifacts and plant castings uncovered in 1991. Numbers are 1991 designations for plant castings. **Inset:** Detailed plan (top) and section (bottom) drawings of the post hole south west of Structure 1.

Table 3

Plant descriptions from the North Garden area, Operation 1

Plant # 91-	# of stalks	Cross section	Min. dia.	Max. dia.	Present height	Max. height	Fully exposed?	Field I.D.
46 ^a	3	rnd, segmented	1.2	1.6	10	>10	Yes	Corn
47	1	unknown	-	-	41	>41	No	Unknown
48	3	unknown	-	-	60	>60	No	Unknown
49 ^b	2	round	0.9	1.3	38	>38	No	Corn?
50	6	rnd, segmented	1.0	1.5	51	>111	No	Corn
51	0	juvenile corn cob resting in Unit 1 - 3.6 x 14.0 cm.						
52	1	juvenile corn cob resting in Unit 1 - 3.4 x 10.0 cm.						
53 ^c	4	rnd, segmented	1.0	1.6	39	>52	Yes	Corn
54 ^d	3	rnd, segmented	1.3	1.9	12	>29	Yes	Corn
55 ^e	3	rnd, segmented	1.2	1.8	8	>11	Yes	Corn
56 ^f	3	flat biconvex	0.4	4.0	3.8	>3.8	Yes	Type III
57 ^f	2	rnd, segmented	0.8	2.0	21	>143	Yes	Corn
58	3	rnd, segmented	0.7	1.4	57	>57	No	Corn
59	2	rnd, segmented	1.4	1.8	17	>17	No	Corn
60 ^g	1	rnd, segmented	1.5	1.5	14	>14	No	Corn
61 ^h	1	rnd, segmented	1.0	1.5	31	>67	No	Corn
62	1	rnd, segmented	1.9	1.9	6	>6	No	Corn
63 ⁱ	2	rnd, segmented	1.1	1.5	30	>30	No	Corn
64	1	round	1.5	1.5	8	>8	Yes	Unknown
65	1	flat biconvex	1.0	3.0	6	>6	Yes	Type III
66	3	rnd, segmented	1.2	1.8	14	>14	Yes	Corn
67	1	flat biconvex	0.7	2.3	6	>6	Yes	Type III
68	2	round	1.2	1.8	26	>26	No	Unknown
69	1	unknown	-	-	38	>38	No	Unknown
70 ^j	4	rnd, segmented	1.0	1.5	38	>59	No	Corn
71	1	rnd, segmented	1.0	1.0	5	>5	Yes	Corn
72	3	rnd, segmented	0.6	1.2	28	>28	No	Corn
73	3	rnd, segmented	0.7	1.5	14	>14	No	Corn
74	3	thick biconvex	1.0	1.2	10	>10	Yes	Type IV
75	3	thick biconvex	1.0	1.3	9	>9	No	Type IV
76	2	thick biconvex	1.0	1.0	7	>7	No	Type IV

a Support rootlets are preserved.

b One stalk horizontal in Unit 1.

c One stalk horizontal at Unit 1/2 contact.

d One stalk horizontal at TBJ contact.

e Disturbed by volcanic bomb in Unit 1.

f Both stalks horizontal at TBJ contact in drainage ditch.

g Includes a corn cob in Unit 3 - 3.4 x 13 cm.

h This stalk is bent in Unit 3 with a cob - 4.1 x 19 cm.

i Includes mature cob without a husk in Unit 3 - 3.0 x 6.5 cm.

j One stalk horizontal in Unit 3

been uncovered in the area to the west of Structure 6, from south of Structure 1 to the drainage ditch. The rows continue for an unknown distance to the west. Drainage is generally to the west, away from Structure 6.

Artifacts are again a scatter of ceramic trash, and two obsidian blade fragments (295-1-316,317). This trash scatter continues up to the west edge of the platform of Structure 6, and the cultivation rows begin about 40 cm W of the platform. This would give very little room to walk, indicating that people probably did not often walk behind Structure 6.

Patio

Investigations in the patio area between Structures 6, 11, and 10, extended the extramural excavations in that area further north and east than had been excavated in the 1990 field season (Figure 7). These extensions were limited by the extent of roofed area available, and a desire to not excavate any portion of Structure 10. We began in a 1 by 1.6 m area north of Structure 11. Following this, a 1 by 1 test pit was excavated along the eastern balk to see if thatch from structure 10 would be encountered. Thatch was discovered extending about 10 cm into the eastern part of this test in the Unit 2 ash layer, as was a small post hole in Unit 3. This post hole was filled with coarse ash, so its depth is unknown. Consequently, the line of excavation was moved back to the west by 50 cm, and the excavation proceeded to expose an area 4.5 by 0.5 m area. Additionally, a 60 by 75 cm area adjacent to a support post for the present roof over the structures was excavated to study the access area to the entrance to Structure 6.

The area was clear of features, and only contained a light scatter of ceramic sherds. All of the sherds were found lying flat and pressed into the surface. The surface was relatively hard and a medium brown color, as opposed to the softer, lighter surface in the garden and milpa areas.

Additional Investigations and Observations

Structure 1

Several observations were made regarding Structure 1. As had been noted in the 1989 field season, a "raised walkway" ran along the south side of the structure (Beaudry and Tucker 1989:31). The southern edge of this walkway can be reinterpreted as possibly being the result of water dripping from the thatch roof. This drip line can be further traced around to the east side of the structure where it is considerably more shallow and ephemeral. Nevertheless, a slight depression can be seen here (see Figure 6) that runs parallel to the east side of the Structure 1 platform about 84 to 91 cm away. This is comparable to the extent to which thatch was found in this area in the 1990 excavations (see Mobley-Tanaka this volume).

Hayden and Cannon suggest that drip lines of structures might be a valuable location to recover charred and uncharred organic remains as well as pollen or phytoliths, based upon their ethnographic observations of sweeping behavior (1983:130). However, no soil samples were collected this year because I felt that the most likely areas had been exposed too long to provide reliable information. In the future, samples should be taken soon after discovery and analyzed in order to test this assumption.

A post hole was discovered near the southwest corner of Structure 1. The center of the post hole is 1.35 m from the south edge of the Structure 1 platform, and lies approximately in line with the west edge. This hole is interesting for several reasons. It is large, 13 by 10 cm, and relatively shallow, 27 cm deep (Figure 6, inset). The south and west sides of it are flat, indicating that the post was made from cut and dressed wood on two sides. These same two sides were supported by a partial ring of adobe 5 cm wide and 7 to 10 cm high. The hole contained samples of partially decayed wood that was collected for future analysis (295-1-315), otherwise the hole was filled with a loose mixture of fine and coarse tephra, probably resulting from coluvial deposition of the overlying volcanic units into the void left by the post itself. Similar deposition occurred in other large voids at Cerén, such as the horquetas and post holes in Structure 6 (Beaudry and Tucker 1989). The purpose of this post remains unknown. It could have been a structural support for the roof over Structure 1, although no other similar posts have been found at the SE corner of the structure where, assuming symmetry, one would expect to find them. It could represent the corner of a wooden frame structure that was located to the SW of Structure 1,

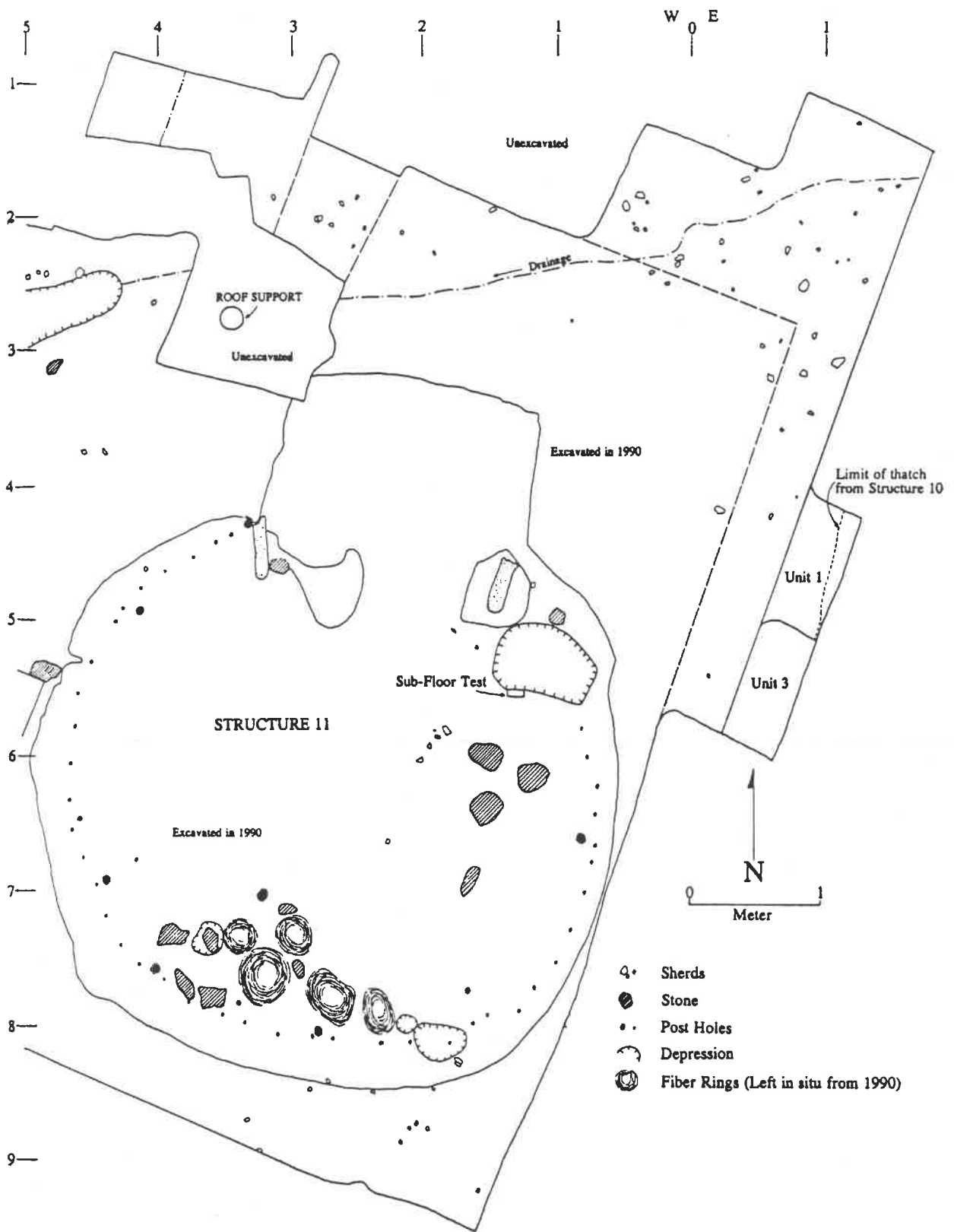


Figure 7: Plan map of the Patio area and Structure 11 showing *in situ* artifacts uncovered in 1991. Also shown is the location of the sub-floor test in Structure 11 discussed in the text.

possibly a rack or shelf of some sort. Future excavations along the west side of Operation 1 should search for more evidence.

The floor of Structure 1 was suffering badly from the effects of being exposed for nearly two years. Many openings can be seen where burrowing animals have dug into the platform. The walls are almost completely gone, and due to the slumping of the cutbank in 1983, the northern columns are no longer present. Rain has destroyed the north part of the platform, in addition to the damage incurred when the structure was first discovered by bulldozers in 1976. For these reasons, I would suggest that this structure is a prime candidate for investigations into construction phases and techniques used in the structures of Cerén. This would be a valuable avenue of investigation, as very little is now known about the length of occupation or construction techniques at this site. After a program of trenching the platform, the structure could be rebuilt as it originally stood, making a good interpretive exhibit for the future archaeological park of Cerén.

Structure 6

One of the first activities of these investigations was to uncover the portions of Structure 6 that had been backfilled at the end of the 1989 field season. The backfilling processes had consisted of placing scraps of cloth as a padding over the surface of the structure and the low walls. This in turn was covered by fine grained Tierra Blanca Joven to a depth of about 3 to 5 centimeters. Also TBJ was packed around the base of the walls and the outside of the platform to act as support. The entire structure was then covered with black plastic sheeting. A layer of volcanic ash was placed over this to about 50 to 75 cm depth. Grass was allowed to grow to prevent erosion.

Reversing this process this season proved interesting. The black plastic had served to prevent rootlets from reaching the structure, but had also trapped moisture against the structure. However, this moisture had not been damaging, no more so than the effects of normal ground water. The padding had protected the structure very well. All in all, the structure was almost exactly as it had been left a year and a half earlier. Backfilling serves to return a structure to similar conditions that had preserved it for fourteen hundred years. Backfilling prevents a structure from becoming too dry, and protects it from the damaging effects of insects, plants, burrowing animals, and even minor earthquakes. Backfilling should not be overlooked as a viable means of preservation.

The 1991 investigations did not deal with Structure 6 beyond uncovering it. However, it was noticed that there is a slight depression to the east of the structure, between where the north and south halves of the east wall had fallen, that may be the drip line from the roof. This line runs parallel to the base of the platform about 54 cm to the east (see Figure 6).

Structure 11

While cleaning the platform of Structure 11, a few additional sherds were discovered (Figure 9). These sherds were mapped and collected (295-1-395,407,409-412). The sherds may have been slightly buried beneath the surface of the platform, and only revealed through removal of a very thin layer of the surface during cleaning. This suggests that the floor of the platform was periodically replaced during its lifetime, and that artifacts would eventually be incorporated into the platform as fill. This suggestion is supported by observations of the part of the platform that had been block lifted with the basket (295-1-234) in 1990 (see Mobley-Tanaka this volume). These observations were made when the conservator flipped the basket and excavated to the bottom of it. The platform here appears to have two general strata. The uppermost stratum was light brown with charcoal flecks in it. This is compact and hard, but not as hard as would be expected if the floor had been wet-laid. The stratum below is a darker brown, and only loosely consolidated. Ceramic fragments (295-1-311) were found throughout both strata, though they seemed to concentrate at the contact between the strata.

This suggests that while the platform may have been built using fill that contained many artifacts, it may also be the result of a series of resurfacings with layers of Tierra Blanca Joven. If this were true, this would be a surface that would likely trap and collect micro-refuse from food preparation activities. Experiments have been done in similar situations (e.g. Metcalfe and Heath 1990; Stahl and Zeidler 1990) where distribution of bone, plant and lithic material were mapped and interpreted. I performed a small experiment to see if Structure 11 could provide similar data.

I excavated a small 5 by 10 cm test probe down into the floor immediately adjacent to the pit in the floor formed when the basket was removed (see Figure 7 for location). This probe was located very near to the location of the hearth, so this would be a likely spot for the accumulation of micro refuse. The matrix was collected in 4 cm levels. Each sample was passed through a 2 mm screen while dry, then passed through a 1 mm screen with the aid of water. The results are given in Table 4. I noted in the 1 mm screen a few small white bits of material that floated up in the water. I was unable to collect or to identify those white bits. They may be bone or plant material, but were not obviously so.

Table 4. Fine Screen Test results from floor of Structure 11

Level Below Surface	Sample Size	2mm Screen	1mm Screen
0 - 4 cm	100 ml	charcoal noted	charcoal noted
4 - 8 cm	126 ml	charcoal noted 1 obsid. flake	charcoal noted
8 - 12 cm	111 ml	-	charcoal noted
12 - 18 cm	190 ml	1 andesite flake 1 ceramic sherd	charcoal noted

Artifacts were collected as FS#s 295-1-426 (Obsidian flake) and 295-1-427 (Andesite flake and sherd).

The results of this experiment are not very encouraging. If there is bone or plant material in the floor of Structure 11, it will take careful flotation and microscope work to find it. This may be a project suitable for a future date. However, there is a strong possibility that bone and plant material does not preserve well in this environment. The presence of charcoal flecks in every level suggests that charcoal was present in the construction fill, that charcoal from the hearth has migrated downward, or that charcoal was incorporated into the floor during resurfacing events.

Structure 10

In 1990, a small backhoe was used at the site to remove overburden in various areas as selected by the Project Director. During the course of this work, Structure 10 was discovered. Little damage to the structure occurred as a result of the backhoe, only a few centimeters were removed from the top of the column. One column, one exterior wall, a part of an interior wall, and three post or beam molds were exposed after clearing. Additionally, the edge of the fallen thatch and one more post or beam mold was discovered in the 1991 excavations. None of these molds lie either vertically or horizontally, rather at various angles. Therefore, assuming that the roof collapsed to some extent as in other structures at Cerén, it is impossible to tell whether they represent vertical support posts or horizontal beams until the structure is excavated.

Architectural elements were carefully mapped (Figures 8 & 9). Most of the elements that still remain buried are under Unit 8. A swelling in the surface of Unit 8 toward the southeast probably indicates the location of the southeast column of the structure. The northwest column is exposed, and is joined by two walls on the south and east sides. This column is fairly large, 51 cm north-south by 54 cm east-west. These dimensions are considerably larger than any other column found at Cerén to date. It may be missing the uppermost section, because the highest point of the northern wall is 54 cm above the highest level of the column. The northern wall is generally 13 cm wide, with seven vertical interior wall poles (*bajareque*) holes exposed in the top. The eastern most portion of this wall, though partially covered by Unit 8, seems to be leaning to the south, indicating that it is partially dislodged. A horizontal probe excavated under Unit 8 may have located the northeastern column, but it is difficult to know the exact location. The very small portion of the west wall that is exposed adjacent to the northwest column, is 16 cm thick. It is of unknown length. Overall exterior dimensions of this structure would be about

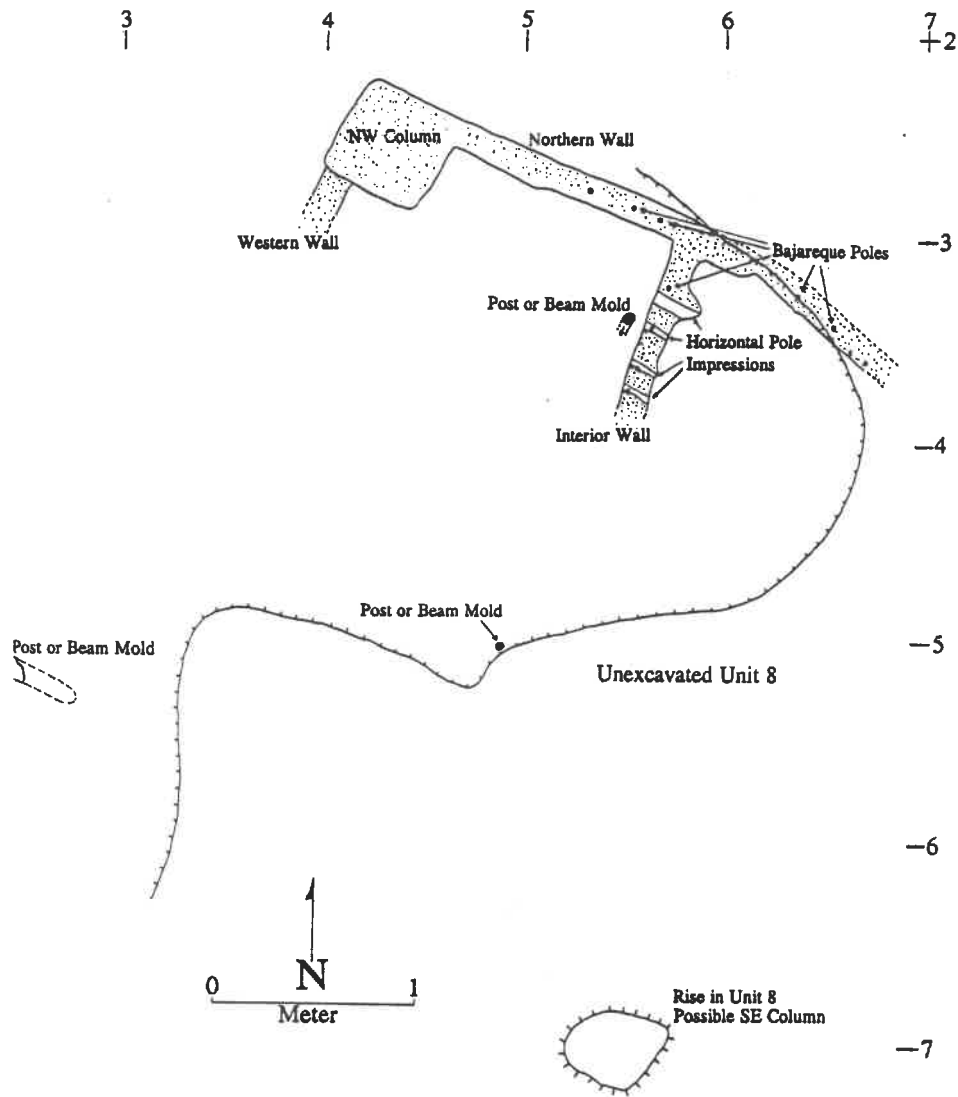


Figure 8: Plan map of architectural elements of Structure 10 uncovered by a backhoe in 1990. This structure is currently unexcavated.

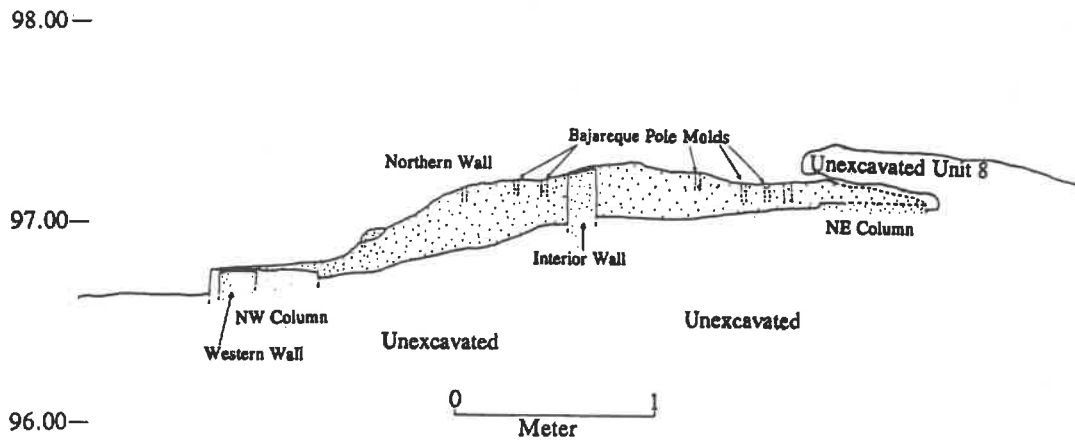


Figure 9: Elevation drawing of the northern wall of Structure 10 as exposed by a backhoe in 1990. View facing approximately 25 degrees east of north.

4.2 m north-south by 3.5 m east-west. The structure is oriented about 23 degrees east of magnetic north, consistent with most of the other structures at Cerén.

Interior features of the structure include an interior wall that is 14 cm thick, and is placed 176 cm to the east of the western side of the structure. There are 4 *bajareque* holes exposed. Four horizontal pole impressions in the top of this wall may indicate that this wall supported an adobe covered shelf (a *tabanco*), embedded about 25 cm below the highest point on the north wall. Just to the west of the internal wall, there is a post or beam mold that slopes down to the southwest at about a 70 degree angle. This mold is about 5 cm in diameter, and is mostly filled with ash. Another mold is located very near what would be the center of the structure. It is 4 cm in diameter, nearly vertical, and at least 61 cm long. A third post or beam mold was exposed by the excavation cut to the west of the structure. It is 8 cm in diameter, is 26 cm long, and angles upward toward the east at about 25 degrees.

The extreme western edge of the burned and fallen thatch roof of Structure 10 was discovered in the patio excavations north of Structure 11. The thatch rests in Unit 2, and is about 2.4 m west of the western side of structure 10. In this same area, a post mold was found in Unit 3, 6 cm wide, that angled down to the northeast, but it was mostly filled with ash.

Permission was granted to have the exposed portions of Structure 10 reburied to prevent destruction from animals, roots, rain water, and the effects of drying. The post or beam molds were filled with insulating foam, and the *bajareque* holes were plugged with strips of cloth. The most delicate parts of the exposed walls will be treated with a light consolidating mixture of water and the resin of the *escobilla* plant. After this has dried, the architecture will be protected with geotextile and layers of cloth strips. Fine TBJ will be used to back fill the entire structure to a depth of 50 to 75 cm. A wooden wall will be built around the post mold in the excavation cut, and this will then be backfilled. It should be noted that reburial of structures is a viable, efficient, and inexpensive means of preservation.

Column, south of Structure 12, Operation 5

During the excavation of a drainage canal south of structure 12 in February, a fragment of a column was discovered in the balk (Figure 1). This fragment lies approximately 9.5 meters south of Structure 12, but does not appear to be associated with that structure. The uppermost portion lies 180 cm below the present ground surface, and the lowermost portion rests in Unit 5 (the pyroclastic surge unit), indicating that it fell sometime during that eruptive phase. Unit 6 drapes over the top of the column and thickens to the south of it. The whole fragment is resting mostly horizontally, with a slight tilt down to the southeast.

The column is exposed fully on one side, and partially on another side. The fully exposed side is 40 cm wide, with 14 cm exposed on the adjacent side. The sides are smoothed, but the corner appears damaged. The length from top to bottom is 29 cm. The bottom feels slightly concave, while the top is slightly convex. The top may be finished, indicating that this could be the top of the column. The column is a reddish color, similar to most other columns at the site, with the exception of the cream colored columns of Structure 12.

To the west of this column, there appears to be no stratigraphic evidence of a structure that this column could have come from. The only likely location for a structure would be to the east, closer to the Rio Sucio and probably in close association with Structure 12. This would mean that the column fell toward the west or southwest; against the general force of the eruption. However, this is not an unusual occurrence, as Structure 7's columns fell in almost every direction.

Due to the column's location next to the drainage canal, the conservation crew decided to protect it from water as well as possible. A cover of black plastic was placed over it, and this was in turn covered by a thin layer of adobe made from the clay that underlies the TBJ tephra, mined from the cutbank of the Rio Sucio. This was followed by a thick layer of concrete mixed with adobe to form a hard shell that will only be removed when the structure is excavated.

Preclassic Occupation at Cerén

Very little can be said about the Preclassic occupation at Cerén. Whatever once may have been there was covered by the eruption of Ilopango in AD 260 (Hart and Steen-McIntyre 1983). No investigations at Cerén have yet excavated to the bottom of the TBJ. However, some sherds have been

recovered from the clay mining cut in the bank of the Rio Sucio made by the conservation crew. These seven sherds were collected as FIELD SPECIMEN# 295-1-429 and await analysis.

Summary and Preliminary Interpretations

The 1991 investigations succeeded in accomplishing each of the initial objectives. Structure 6 was re-excavated, and the preservation after being backfilled was assessed. The 1978 Test Pit 2 was connected to the structure complex as a whole. The garden area was further explored as was the plaza area. Additionally, other observations were made in and around Operation 1, including the mapping of Structure 10.

The only objective not fully accomplished was the search for a refuse disposal area. Trash was disposed of in Operation 1 to a certain extent by scattering over the garden and milpa areas. Trash accumulated mostly near structures, but not in areas of high traffic. People did not want to walk on and live with trash. Yet some trash did remain in areas of high circulation. But a few flat, small, pot sherds apparently did not constitute a hindrance. What constituted a hindrance and what did the people of Cerén do with this bothersome trash? The Rio Sucio is a likely location for refuse disposal. Also, if the drainage ditch in the garden area continues to become deeper toward the southwest, this may also have been a good place for disposal.

These excavations will help us to understand the subsistence base upon which the ancient inhabitants lived. If the plant materials are reliably identified, we will be in a much better position to reconstruct an important aspect of life at Cerén.

When Structure 10 is excavated in the future, I would strongly recommend opening up an expansive area around it. I feel it is important to connect Operations 1 and 5, as well as connect both operations to the river bank. Having the entire area open from Structure 1 to the river would give us a substantial area upon which we can base interpretations about how people interacted between structures.

The value of extramural excavations are clear. At Cerén, the preservation of artifact and activity areas is superb. This gives us the chance to investigate questions about Classic period life that could not be approached at other sites. We know that ethnographically, many production, subsistence, and craft activities took place outside of structures. Extramural excavations are a valuable course of scientific inquiry that can be taken at Cerén. Household archaeology stands to benefit greatly from these investigations. I hope that future investigations will cover a broad range of questions, including those answerable by excavations such as these.

Acknowledgements

There are many people without whom this work could not have been possible. The salvadoran workers, too numerous to mention, are the best excavators I've ever worked with. V. Manuel Murcia gave much valuable advice. I am deeply indebted to the people of the Patrimonio Cultural as well as of the Patronato Pro-Patrimonio Cultural. Brian McKee provided many hours of delightful conversation, as well as insightful discussions on the Nature of Science. Payson Sheets kindly encouraged me to work in El Salvador, an experience I hope to repeat as often as I can.

Notes:

1. These investigations were carried out with the financial support of two small grants to the author: The Graduate School Dean's Small Grant Award, University of Colorado, and the Mesa Verde Regional Research Center Fund. Also, some benefit was received from the 1990 US National Science Foundation grant to Payson Sheets. However, the largest percentage of support came from the author's personal funds.

2. I intend to use the results of this analysis in a thesis that will be submitted to fulfill part of the requirements for the Degree of Master of Arts, Department of Anthropology, University of Colorado.

Chapter 7. EXCAVATIONS AT STRUCTURE 7

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INTRODUCTION

Archaeological investigations in Operation 2 at Cerén (Figure 1) began with the excavation of Structure 2 in June and July of 1989. The structure complex was first detected in 1979 as an anomaly during the geophysical survey of Lot 189, and was confirmed as a prehistoric structure with a soil drill (Loker 1983). Structure 2 is a two room *bajareque* (wattle-and-daub) building that measures approximately 3.5 x 4.2 meters and has a pole and thatch roof. It has a raised adobe bench containing a niche in the southern room. The low artifact density and architectural features, including the bench, indicate that Structure 2 was probably the residential structure (domicile) of the family inhabiting the household complex at Operation 2 (McKee 1989).

Structure 7 is located southwest of Structure 2. Evidence of the structure was first encountered during the final week of the 1989 field season. The eastern portion of the northern wall and the northeastern corner of the platform were excavated during that week, but due to time constraints, excavated areas were covered and backfilled until the 1990 season. The backfilling successfully protected the portion of the structure excavated in 1989. No cracking due to drying occurred, and no growth of algae or efflorescence of mineral salts was visible when the buried areas were uncovered. Formal excavations at Structure 7 continued from September 19 to December 8, 1990.

Structure 7 is a *bajareque* building that measures approximately 3 x 3.2 meters (Figure 2). The artifact density was much higher than that encountered at Structure 2, leaving little floor space available for most activities. The artifact density and the nature of the assemblage indicate that this structure was probably a *bodega* (storehouse).

Structure 7 is located 1.2 meters southwest of Structure 2. Areas excavated include the floor of the structure, the fallen walls and columns, and surrounding areas to the east and west. The area north of Structure 7 was excavated in 1989 (McKee 1989).

FIELD METHODS

The uppermost layers of tephra above Structure 7 were mechanically removed with a backhoe during June, 1989. Between the 1989 and 1990 field seasons, employees of the Patrimonio Cultural excavated the volcanic tephra over Structure 7 to the top of the resistant stratigraphic Unit 8, known locally as the "*capa dura*" (hard layer). During August and September of 1990, Operation 2 was covered with roofs donated by the Ministry of Education of El Salvador. After the excavations were roofed, the tephra was rapidly removed to a level mid-way through stratigraphic Unit 5 using hoes and shovels, and areas excavated in 1989 were uncovered. The distinctive volcanic stratigraphy allowed rapid digging through the upper, usually sterile layers until the culture-bearing lower levels were reached.

Digging in Units 3, 2, and 1 was slower and finer tools were used. The main platform and porch were defined and excavated first, and then the fallen walls and surrounding areas were excavated. The provenience of all artifacts was recorded in three dimensions, using the grid established in 1989 (Tucker 1989), and the stratigraphic location of each artifact was also recorded.

ARCHITECTURE

Structure 7 is oriented approximately 30 degrees east of magnetic north (Figure 1), as are the majority of structures excavated at Cerén to date. In the following discussion, this direction (N30E) will be referred to as north unless otherwise noted. The structure is built on a solid adobe platform (Figure 2). Poles from the *bajareque* walls extended into the platform, and solid adobe columns were present at the corners. A lower platform or porch extended to the north of the main structure. The porch was roofed, but not walled.

SUBSTRUCTURE

A shallow, mounded layer of unfinished clay is the lowest construction at Structure 7. Its thickness is uncertain, but a similar layer surrounding parts of Structure 2 varied between 2 and 7

Figure 1. Plan of Excavations in Operation 2. Structure 2 and Surrounding Areas Were Excavated in 1989. Other Areas were Excavated in the 1990-91 Field Season.

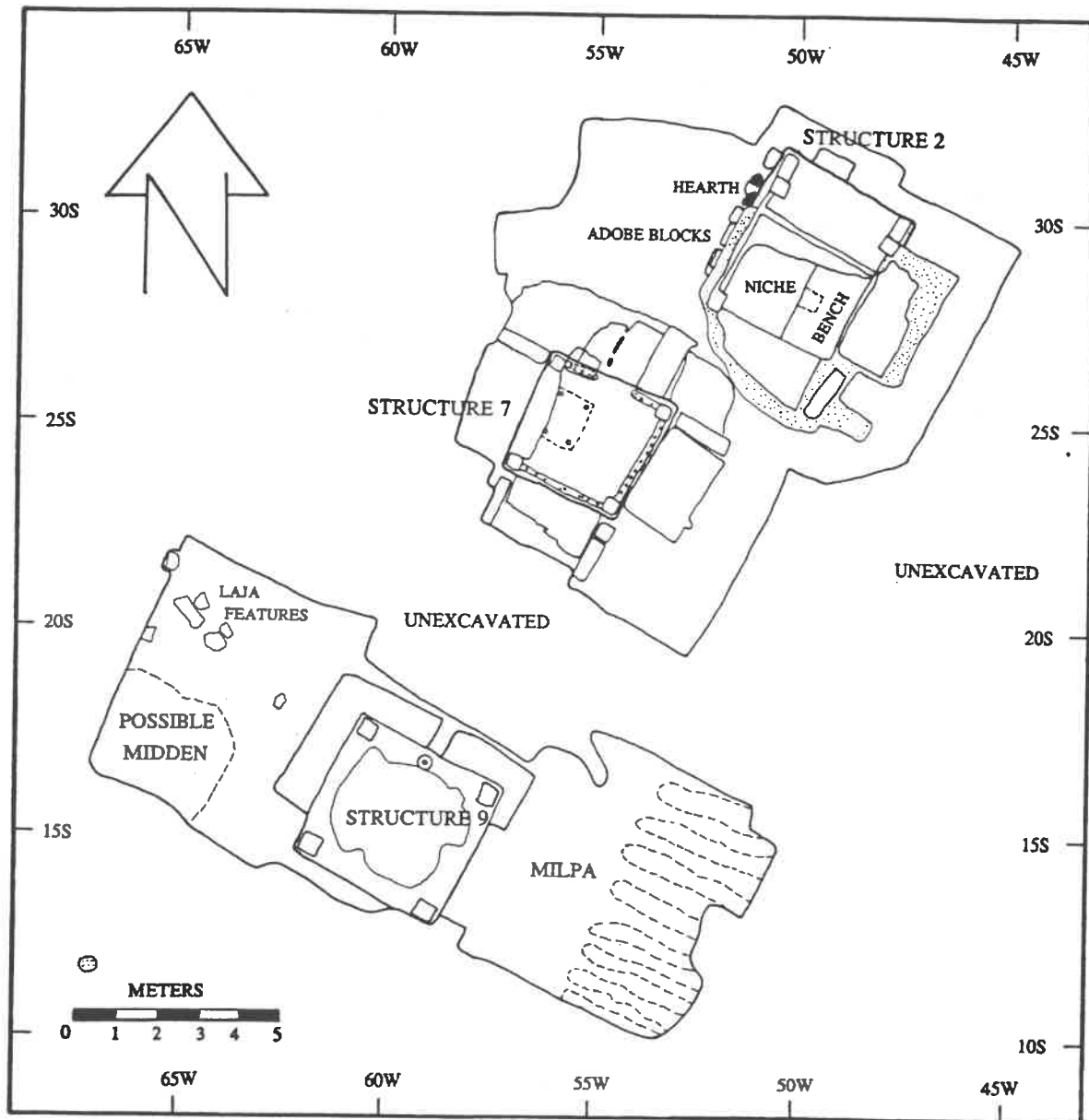
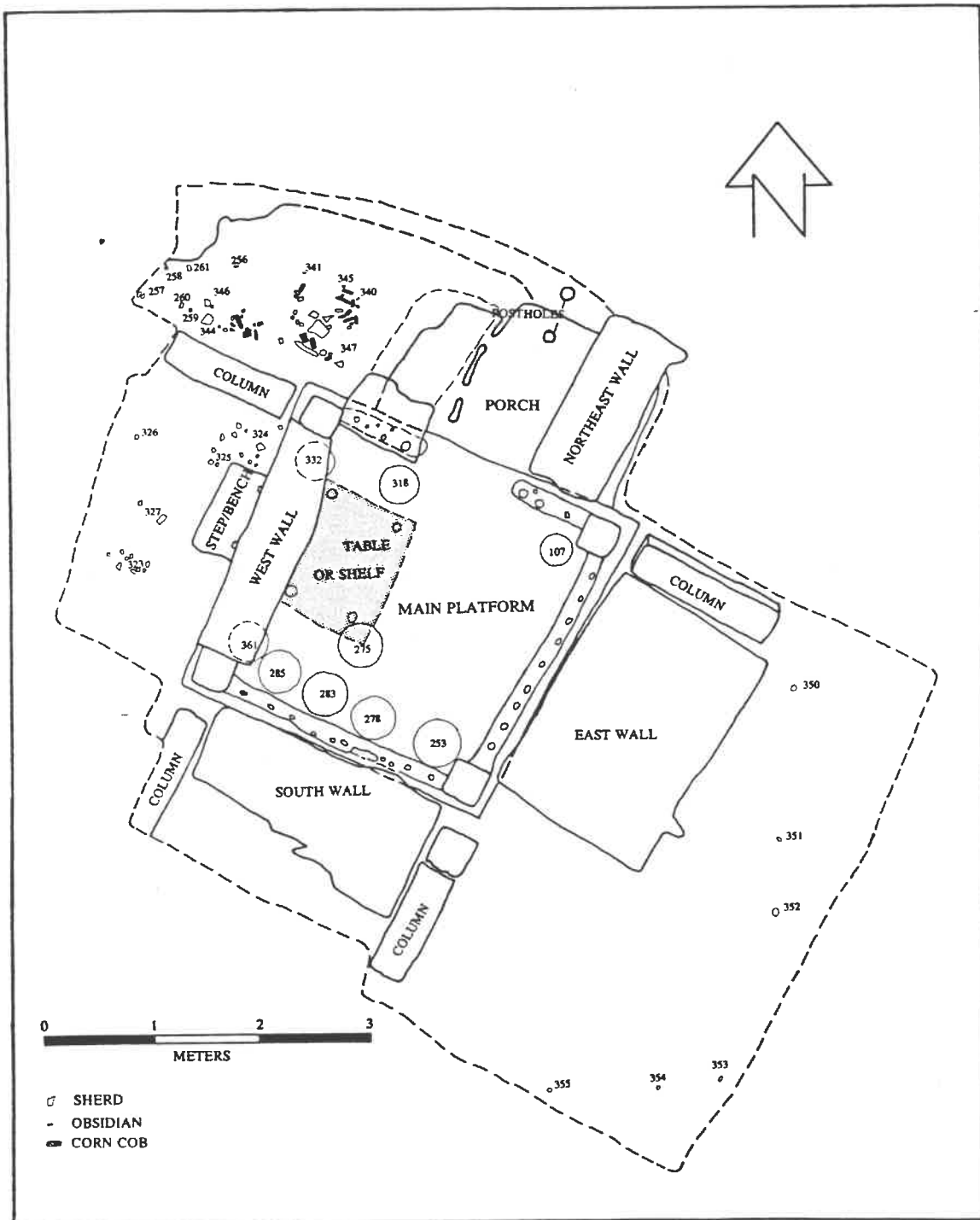


Figure 2. Plan of Structure 7 Excavations Showing *in situ* Artifacts.



centimeters. This layer is present on the northern and western sides of Structure 7, and slopes gently away from the structure in these directions. The surface extends at least 1.7 meters west from the western edge of the platform, to the limit of the excavations, and extends at least 3 meters northwest of the structure. The clay surface is not present on the northeastern side, where the prehistoric ground surface consists of *tierra blanca joven* (*TBJ*) tephra from the earlier eruption of Ilopango Volcano. It is not known whether or not the clay surface is present to the east of the structure, but the ground surface 1.6 meters east of the structure, past the fallen eastern wall is *TBJ*. Excavations south of Structure 7 have not yet reached the prehistoric ground surface, and therefore its nature in this area remains unknown. The clay surface was presumably built before the construction of the main platform, and may be mounded beneath the structure.

The clay surface abuts or is covered by a finished adobe platform. No details of the construction of this platform are visible, but it appears to have been built from solid, unreinforced adobe. The platform measures 3.33 meters on the northern, 3.15 meters on the eastern, 3.02 meters on the southern, and 3.09 meters on the western side. The upper surface is very nearly level; the southwestern corner is only 2 cm lower than the other three corners. There is a gentle slope down to the center of the platform, which is 5 cm lower than the three higher corners. This subsidence may be due to a prehistoric excavation beneath the central part of the platform. Burials or dedicatory caches are sometimes present beneath the floors of Maya structures (Cliff 1988, Haviland 1988, Tourtellot 1983). The corners are nearly square, with slightly rounded edges. The height of the platform is 64 cm above the clay surface in the northwestern corner, 72 cm above the clay surface at the southwestern corner, and 93 cm above the *TBJ* ground surface in the southeastern corner.

The entire upper surface of the platform, including areas that were beneath walls, is heavily oxidized, indicating that the platform was fired before the construction of walls. Wolfman (personal communication 1990) has stated that the platform was fired. The hot tephra units from the Laguna Caldera eruption have also oxidized some portions of the platform. Vertical surfaces that were in direct contact with hot tephra units were more deeply oxidized than other areas, but the upper surface appears to have been protected from hot airfall tephra by the cooler base surge deposits. The oxidation is relatively thin, varying between 2 and 5 mm.

A porch is present north of the main platform. It is attached to the main platform and is approximately 13-14 cm lower. The porch is irregular in plan (Figure 2), and measures 2.35 m east-west along its connection with the platform, and extends 1.5 meters to the north. The porch is nearly flat. The northern edge is approximately two centimeters higher than the southern edge, giving a slight slope towards the main platform. The porch surface is 43-54 cm above the surrounding clay surface.

Some details of the construction of the porch are visible due to erosion that occurred before the Laguna Caldera eruption. A 5 cm thick clay layer was placed on top of the lowest clay surface throughout the porch area. The main portion of the porch, which measures 1.45 m north-south by 1.65 m east-west was built on top of this layer, as was a 10 cm thick extension on the west side that measured 1.25 m north-south by 70 cm east-west. The southwestern portion of the porch was then added, followed by the northwestern portion, which consists of an adobe block measuring 50 x 32 x 30 cm. The entire porch was then surfaced with a 1-2 cm thick layer of clay, which later crumbled away at the junctions between the elements (Figure 2). It is not known if the elements described above represent phases of remodeling, or simply the sequence of events in a single construction episode.

SUPERSTRUCTURE

The superstructure of Structure 7 consists of four *bajareque* walls with poles that extend into the platform, and solid adobe columns in the corners. The structure was covered by a grass thatch roof. All structural elements above the platform were knocked down by base surges from Laguna Caldera volcano. A discussion of the integration of the structure will follow the description of the elements.

Columns

Columns are present at all four corners of Structure 7. The northeastern column fell to the east. The lowest 24 cm of the column is still standing on the platform, and the upper portion was broken into two segments. The total height of the column was 1.53 meters, and it measures 32 x 32 cm in cross-section. The column was inset eight cm from the northern edge and 10-11 cm from the eastern edge of

the platform. Two shallow depressions on the southern side of the column do not correspond to pole locations in the eastern wall. They may have anchored a previous *bajareque* wall, but there is no evidence for this.

The northwestern column fell to the west. The lowest 25-27 cm of the column remained attached to the platform, but the upper portion fell and broke into two pieces. The total height of the column was 1.48 meters, and the column measures 32 cm north-south x 30 cm east-west in cross-section. Although a lip of clay is present on the southern and eastern sides of the column, indicating the location of the attached walls, there are no indications of holes where poles from these walls entered the column. The column was inset 8 cm from the north edge and 10 cm from the west edge of the platform.

The southwestern column fell to the south. This column separated from the platform near its base, and only 3-4 cm remained standing above the platform. The upper portion was apparently unbroken, but was not completely excavated due to the presence of a support post for the roofing over Operation 2. The exposed portion measures 1.15 m long. The column is 34 cm wide east-west, but the north-south dimensions are not known due to the partial burial of the column. The column is inset 6 cm from the western edge, and 8 cm from the southern edge of the platform. There are two shallow grooves on the northern (upper) surface of the column that are perpendicular to the long axis of the column. They are 2-3 cm deep and 6-7 cm wide, and are located 54 and 70 cm above the bottom of the column. Their function is unknown.

The southeastern column also fell to the south. Only 1-6 cm of remain standing above the platform. The upper portion broke into two pieces when it fell. The total height of the column was approximately 156 cm. In cross-section, the column measures 35 cm wide north-south and 37-40 cm east-west. The column is inset 9 cm from the south wall, and 8-10 cm from the east wall. There is no evidence of poles extending into the column.

The columns measured between 1.48 and 1.56 meters high. These lengths are approximations, as the breaks are uneven. Cavities where horizontal beams rested on top of columns were present at Structure 4 (Gerstle this volume), and probably played a role in roof support. The columns of Structure 7 may have played a similar role, but there is no evidence of beams on their tops. All four columns of Structure 2 measure 42 x 36 cm, and those of Structure 4 measure 35 x 35 or 35 x 36 cm. This regularity led to speculation that they may have been prefabricated elsewhere before their installation in the structure (McKee 1989). The columns of Structure 7 are far less regular; they vary between 30 and 35 cm in the short dimension and 32 and 40 cm in the longer dimension in cross section. This may indicate less care expended in the construction of this building or different techniques used in construction.

Two of the columns had approximately 25 cm remaining standing on the platform. This may be due to zones of weakness in the columns. Sheets (personal communication 1991) believes that the columns may have been constructed by stacking thin segments on top of one another, and that the regularity in breakage is due zones of weakness between the segments.

Walls

All four walls of Structure 7 were constructed of *bajareque*. All were knocked down by the force of the Laguna Caldera eruption.

The northern wall consisted of two segments with a doorway between them. There is no evidence of connection of the tops of the segments, which were presumably connected by poles above the top of the clay. The eastern segment fell to the north and was the best preserved wall of Structure 7. It extended 72 cm from east to west, and was 1.67 m tall and 10-11 cm thick. Three holes are present in the platform corresponding to the vertical poles of this wall. The holes were spaced 23 cm apart from center to center. They were 4-5 cm in diameter and extended 3 cm into the platform. There is a row of holes corresponding to horizontal poles that were present on each side of the vertical poles. The inside row had at least 12 holes, and the outside at least 7. These holes were much smaller than the vertical ones, averaging 1.5-2 cm in diameter. Spacing of the horizontal poles is irregular, varying between 7 and 18 cm. A triangular clay extension measuring 13 x 13 cm protrudes from the upper eastern corner of the wall, and overhung the northeastern column. It may have served as structural reinforcement. Two handles from broken storage jars were embedded into the wall near the doorway, probably to hold the door closed. The upper handle is 2.5 cm thick and a length of 9.5 cm is exposed. The long axis is

vertical, and the handle is centered 13 cm from the top and 32 cm from the western edge of the wall. The lower handle is also 2.5 cm thick, and 6.5 cm of length is exposed. The center of this handle is located 34 cm from the base of the wall, and 24 cm from the western edge of the wall.

The wall segment on the western side of the doorway was damaged by the impact of a large volcanic bomb. The bomb fell after the collapse of the wall, during the emplacement of Unit 4, and fragmented the upper portion of the wall. The intact lower portion of the wall measures 80 cm wide from east to west, and is approximately 40 cm high. The wall is 16 cm thick. Holes for three 3-5 cm diameter vertical poles are preserved in the wall, and are spaced approximately 25 cm apart. Three horizontal holes were preserved on alternating sides of the vertical holes. The platform had a total of five holes in the area under this wall. It is not known whether the additional two holes indicate remodeling or had a function other than supporting the wall. All the holes penetrated 3-3.5 cm into the platform. One vertically oriented ceramic handle was embedded in the intact lower portion of the wall. The center of the handle was 26 cm above the base of the wall and inset 35 cm from the doorway. The handle was 4 cm thick and an 11 cm length was exposed. It probably helped to support the door. The broken fragments of the wall covered a 40 x 70 cm area to the north of the unbroken portion of the wall. No handle was found associated with the upper portion of the wall.

The eastern wall fell eastward. It was fairly well preserved and complete. It measured 2.31 m long and 1.55 m high, and was 14-15 cm thick. Nine holes that corresponded to the vertical poles from the wall were present in the platform beneath the wall. They were separated by 20 to 26 cm. Eight holes that did not correspond to hole locations in the platform were present in the wall, which may indicate that some vertical poles did not penetrate the platform. Two rows of horizontal poles were present. Spacing was irregular, and at least 16 poles were present. The horizontal poles were smaller than the vertical poles, which ranged from 3.5 to 5 cm in diameter. No handles or other features were visible in this wall.

The southern wall collapsed to the south, between two columns. The wall broke during the eruption, and the upper portion was not exposed during the 1990 field season. It probably lies beyond the southern limit of the excavations. The wall measures 2.21 m long from east to west, and the maximum exposed height is 1.22 m. The upper portion of the wall is still buried, and therefore its total height is unknown. It was 15 to 16 cm thick. Eleven holes that corresponded to vertical poles in the wall were present in the platform along the base. The holes measure 3-4 cm in diameter, and spacing averaged approximately 20 cm. The holes penetrate 2-3 cm into the platform. Only the inner side of the wall is exposed, as most is hidden by the fallen columns to the east and west. Rows of horizontal poles were present on both sides of the vertical poles, based on limited exposure of the base of the wall.

The western wall fell to the east, on top of the platform. It was heavily damaged during its fall, especially its upper and middle portions, but some details of construction are visible. The wall is 2.33 m long and approximately 1.60 m high. Eleven vertical holes are present with an average spacing of 20-22 cm. Horizontal poles were present on both sides of the vertical poles. The wall was only 11-12 cm thick. The platform was covered by the fallen wall, and we could not see the juncture between the wall and the platform. The *bajareque* poles probably penetrated into the wall as did those from other walls.

All four walls utilized similar construction techniques. All were of *bajareque*, and the poles probably penetrated into the platform for all the walls. The walls varied between 10 and 15 cm in thickness. This variation could have been intentional, or some walls may have been more compacted by the weight of the overburden. The former is more likely, although there is no apparent reason for the differences. All walls had a 3-5 cm diameter vertical poles in the interior surrounded by smaller horizontal poles, which were then covered with clay. The height of the walls was similar, but the northern wall was slightly taller than the others. It measured 1.67 meters, while the eastern wall measured 1.55 m, and the western wall measured 1.60 m. The height of the southern wall is unknown. The northern wall was the only one that had a doorway, ceramic handles, or a triangular extension that hung over the top of a column.

Roofing

Structure 7 was covered by a grass thatch roof. It is difficult to reconstruct the details of this roof because of the complete collapse of the structure, but evidence allows for a partial reconstruction. Two fragments of carbonized beams, approximately 7 cm in diameter, were found in the southwestern corner

of the structure, along with the carbonized remnants of a rope. The rope was unraveled, and at least four smaller pieces of twisted fiber had been twisted together to form the larger rope, which probably measured between 1 and 1.5 cm in diameter. It was impossible to see the relationship between the rope and the beams, but it was probably tied around these beams to secure the corner. A number of other carbonized wood fragments that were probably roofing beams were found on the main platform and the porch. No patterning was visible in their placement, however. One posthole was found centered in front of the doorway on the lower platform, approximately 1.2 m from its junction with the main platform, and another posthole was found 50 cm north of this one on the lower finished clay surface.

Remains of the roofing thatch were preserved over the structure and on the north, east and west sides of Structure 7. Thatch was not uncovered to the south because of support posts for the roof over Operation 2 limited the excavations.

The main platform and the porch were covered by a 5-10 cm thick layer of thatch. To the east, the thatch was present to a distance of two meters from the edge of the platform, that is, approximately 40 cm past the fallen eastern wall. The thatch here was approximately 5 cm thick. The thatch extended approximately 1.3 m west of the western edge of the platform, and was 5 cm thick. Roofing extended ca. 1.4 m to the northwest of the main platform, and extended 20-30 cm past the northern edge of the porch, that is, about 1.7 m north of the main platform.

The area covered by the roof of Structure 7 can be approximated by the horizontal extent of the thatch excavated. It is unlikely that the roof fell directly downward, given the lateral forces of base surges. However, the extent of the thatch gives an idea of the roofed area. The extent of the main platform was approximately 10 m², and that of the porch 3.3 m². Assuming that the thatch extended 1.5 m to the south of the main platform, which is similar to the extension on other sides, the total roofed area was approximately 37 m². If only the main platform is considered interior space, as the porch was unwallled except to the south, then there was approximately 2.5 times as much roofed area outside of the structure as inside. If the porch is considered interior space, then there was slightly less than twice as much exterior roofed area as interior. Using either estimate, this indicates, as have previous excavations, that large roofed areas were present outside of structures that were potentially useful for the inhabitants of the site.

The roof served an integral function in holding the structure together. The vertical *bajareque* poles only penetrated a few centimeters into the platform, and the horizontal poles did not penetrate the columns. The poles provided minimal structural support as they penetrated the platform. The main structural strength came from above, as the vertical *bajareque* poles were lashed to the horizontal poles of the roof. Reconstructed profiles of Structure 7 are shown in Figures 3 and 4. It should be noted that many details of the construction are hidden by fallen walls, and that these reconstructions are very approximate.

EFFECTS OF THE ERUPTION ON STRUCTURE 7

Structure 7 was more heavily impacted by the Laguna Caldera eruption than were other *bajareque* structures excavated to date. All architectural elements above the platform were knocked down by the force of the blasts (Miller, this volume).

Tephra Unit 1, the initial base-surge deposit of the eruption had limited effects on Structure 7. Few deposits from Unit 1 entered the structure, and the roof held through this phase of the eruption. Unit 2, the first air-fall deposit, fell very hot and ignited the roof and some structural supports. Some roofing thatch fell with Unit 2, but the majority remained in place. Little tephra from Unit 2 fell inside the structure, although several large volcanic bombs passed through the roof during this stage of the eruption.

The roof collapsed during the early part of the Unit 3 base surges. This unit fell wet and heavy, and collapsed roofing weakened by its ignition during the fall of Unit 2. All the walls and columns collapsed shortly after the fall of the roofing. Once the structural integration provided by the roof was removed, the walls and columns were unable to support themselves against the lateral forces of the Unit 3 base surges. The phases of the eruption following Unit 3 had no discernable effects on the structure other than to bury it more deeply and to aid in its preservation; all elements were completely buried by the time that the deposition of Unit 3 was completed.

Figure 3. East-West Profile of Structure 7. The walls collapsed during the Laguna Caldera eruption, but are drawn in their original positions. Dashed lines indicate reconstructed or inferred locations.

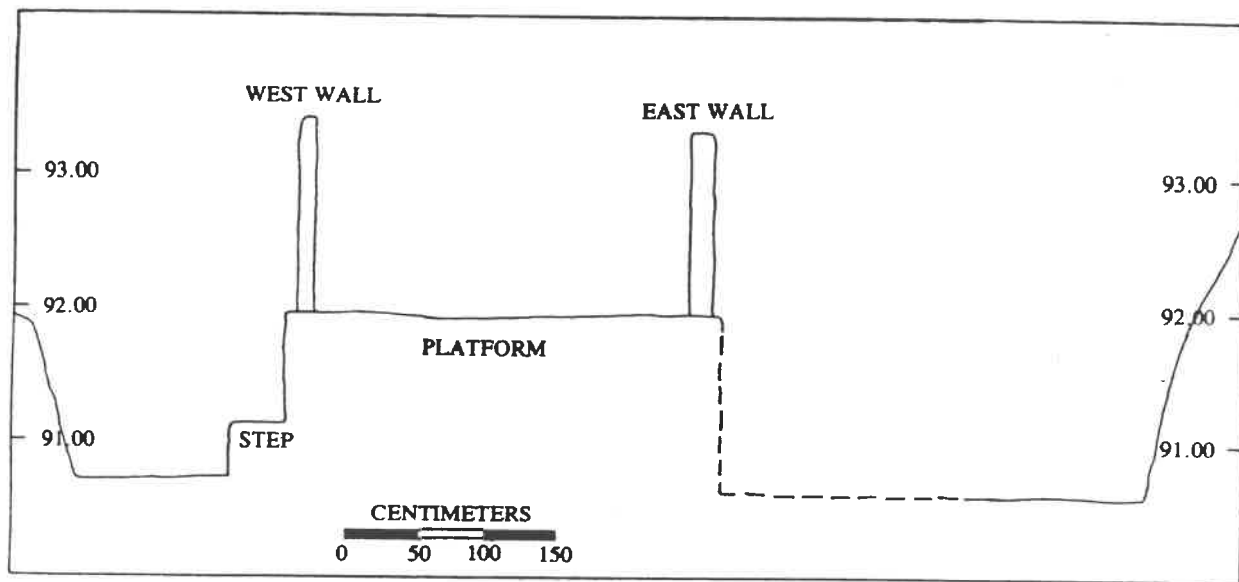
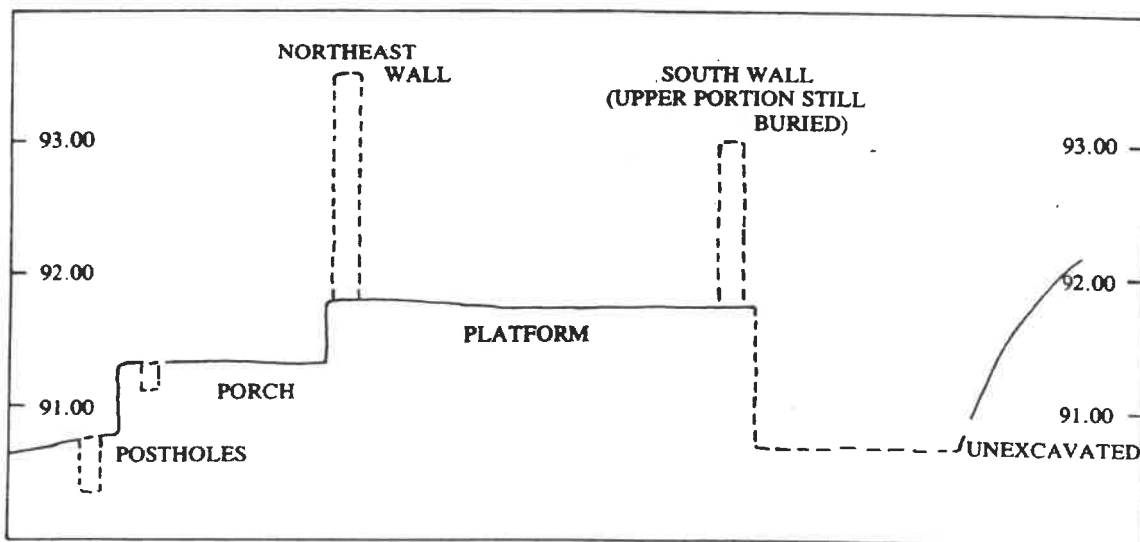


Figure 4. North-South Profile of Structure 7. The walls collapsed during the Laguna Caldera eruption, but are drawn in their original positions. Dashed lines indicate reconstructed or inferred locations. Scale is the same as Figure 3.



PERMANENT OR FIXED FEATURES

DOOR

The first indications of the door of Structure 7 were noted in 1989, when a line of 18 small holes approximately 1.5 cm in diameter was found near the juncture of the platform and porch (McKee 1989). The holes were filled with dental plaster and left unexcavated until the 1990 field season. Several holes located farther to the west were filled in 1990, and the entire feature was excavated. The door was collected as three FS numbers, 295-2-203, -207, and -320. It consisted of a series of poles, approximately 1.5 cm in diameter, connected by string. The door was preserved to a height of approximately 40 cm above the porch and 25-30 cm above the upper platform. Its total height is unknown, because the molds were not preserved in the coarse-grained units above Unit 3. The poles were made of a light cane referred to by the workers as "*vara bofa*." Two small postholes, measuring approximately 1.5 x 2 cm, were found at the juncture of the porch and the main platform, and were apparently used to secure the door. Poles could have extended from the door into these holes to help hold the door in place. The total width of the doorway was 90 cm. Handles embedded in the interior of the walls at each side of the doorway probably were also used to secure the door.

BENCH

An adobe bench or step was attached to the central portion of the western wall of Structure 7. This bench measured 87 cm long and 44 cm wide and was 34 cm tall. One small hole measuring 1 x 2 cm was present at the juncture between the bench and the wall, 12 cm from the southern side of the bench. The corresponding area on the northern side of the feature is still buried by tephra, and it is uncertain whether or not a similar hole is present. The function of the hole(s) is unknown, although they may have helped to hold a door, as those found on the north side of the structure. The function of the feature is also uncertain. The structure may have been remodeled, and previously had an entrance on the west side, with a step similar to that on the north side of Structure 2 (McKee 1989). The small hole(s) in the bench are similar to those between the platform and the porch. If there was a doorway on this side, then it was probably much narrower than that on the north side, based on the width of the step and the distance between holes. It also may have served as a bench in the sheltered area beneath the eaves west of the structure.

SHELF OR TABLE

A raised wooden shelf or table was present in the west-central portion of the main platform. The evidence for this table or shelf includes four postholes measuring 8 and 10 cm in diameter extending into the floor, and several parallel slats of carbonized wood lying on top of a thin layer of base-surge deposits. The postholes are separated by 1.0 meters, north to south, and 65 cm east to west. The slats extended at least 20 cm to the south of the southern post, but their extent to the north is uncertain, as preservation is worse in that area. The table probably continued to the western wall, but we do not know this for certain because its western portion is buried under the collapsed wall. If it did extend to the wall, then there was at least 1 m² of raised shelf area available in the western portion of the structure. The northern portion of the shelf was covered by a mat (FS-360), which may have originally covered the entire feature. A large storage jar (FS-275) was present underneath the southeastern corner of the feature. It was at least 26 cm high, although it has not yet been completely reconstructed. The bottom of the shelf was higher than the top of the pot, but its total height is unknown.

ARTIFACTS AND ORGANIC REMAINS

Structure 7 contained many artifacts and organic remains. The number of artifacts found at Structure 7 far exceeded that found in Structures 2 and 9, leading to its identification as a *bodega* or storehouse. Many of the artifacts were in direct contact with the floor at the time of the eruption (Figure 2), but more were stored above the floor and fell during the eruption. These artifacts were separated from the floor by volcanic ash. They were stored in the roofing, on or suspended from the rafters, and on the shelf.

In the following discussion, Structure 7 is divided into several areas. These areas do not necessarily correspond to activity areas, but allow for preliminary analysis of the use of space. Future

studies will attempt to more rigorously define activity areas that were present at the time of the eruption. The areas are based on internal divisions within the structure and on external areas relative to the structure location. Area 1 consists of the main platform and Area 2 is the porch. Area 3 is the area north of the main platform and west of the porch. Area 4 is west of the main platform, and Area 5 is east of the platform. Area 6 is southeast of the platform, and Area 7 is south of the platform.

Materials that were studied include ceramic, chipped stone, and ground stone artifacts, a variety of other artifacts, and unmodified organic remains. Detailed analyses are presented in chapters by Sheets, Beaudry, Mobley-Tanaka, and Beubien (this volume). Some ceramic vessels contained other artifacts and organic remains. These items are listed with the vessels, but complete descriptions are included in the sections that follow.

AREA 1 (MAIN PLATFORM)

Floor-contact Items

Ceramics

The most notable items found in contact with the floor in Area 1 were five large storage jars in a line just inside of the south wall of the structure. The easternmost of these *tinajas* is FS-253. It is a Guazapa scraped-slip jar 50 cm in diameter and 45 cm high. Its contents were collected as FS-254.

Another Guazapa scraped-slip jar (FS-278) was located approximately 20 cm west of FS-253. It measured 41 cm in diameter and 40-45 cm high. Its contents included FS-279, -280, and -281. The lower portion of the vessel was covered with cloth, which was consolidated to two sherds and collected as FS-282.

A large Cashal Cream-slipped jar that measured 42 cm in diameter was collected as FS-283. The height is not yet available. Contents included FS-284.

Another large storage jar was located about 10 cm to the west of FS-283. It was designated FS-285, and is a Guazapa scraped-slip jar 45 cm in diameter and 45-50 cm high. This vessel was heavily impacted by a small volcanic bomb, which fell into the vessel, damaged the neck, and pressed several of the lowermost sherds into the floor beneath it. Vessel contents included FS-286, FS-298, FS-299, FS-300, FS-301, FS-302, FS-303, FS-304, and FS-305.

The northernmost vessel of the line was designated FS-361. It is a scraped-slip jar that measures 36 cm in diameter and 35-40 cm high. This vessel was left under the western wall for display purposes, and its contents are unknown.

Another large storage jar (FS-107) was located near the northeastern column. No contents were recovered from this vessel.

A large storage jar was found in floor contact about 20 cm north of FS-283, and was labeled FS-275. It is a Guazapa scraped-slip jar 40 cm in diameter and 26 cm high. Its contents were collected as FS-277.

A medium-sized Guazapa scraped-slip jar 36 cm in diameter and 27 cm high was collected as FS-318. It was in floor contact south of the western edge of the doorway. FS-328 and 329 were recovered from within FS-318.

A large basin-shaped vessel was found under the northern portion of the fallen western wall. It was left *in-situ* for display purposes, and was labeled FS-332. It is apparently undecorated and has a slightly constricted neck. Its maximum diameter is 36 cm, the mouth diameter is 20 cm, and it is approximately 28 cm high. Three unstable sherds were removed from the vessel. FS-333 was recovered from inside the vessel. Other contents are not known, as the interior was not completely excavated.

Other Artifacts

Fragments of a painted item similar to the "Cerén Folio" (McKee 1989, Beaubien 1990) were recovered on the porch of Structure 7. The item consisted of red paint on a white ground layer. It was highly fragmented, and was damp due to moisture in the tephra. It disintegrated while being lifted, and therefore, the only part recovered was a small sample for chemical analyses of composition. This sample was collected as FS-263.

A lump of specular hematite was recovered from within FS-318, and was designated FS-329. The hematite had organic material wrapped around it, which had the impressions of a number of small seeds resembling those collected as FS-331.

Organic Remains

Carbonized seeds were found within the large storage jar, FS-278, and were labeled as FS-281. Identification is pending.

Two seeds that resemble beans were recovered from inside the large storage jar FS-283. They were labeled as FS-284, and identification is pending.

The fill from FS-285 was collected as FS-286. Fine screening and/or flotation are planned.

Three types of seeds that were recovered from within FS-285 were labeled as FS-305. Identification is pending.

An organic item was recovered from within FS-318. It was a cylindrical item with a slightly different color than the surrounding tephra. It measured ca. 4 cm in diameter x 5 cm high. The remains were fibrous. It was labeled as FS-328. The object has not been identified.

A large number of small carbonized seeds were recovered from FS-318, and were labeled as FS-331. Identification is pending.

Fallen Items

Ceramics

A cache consisting of five miniature vessels (Figure 5), seven jade beads, two other beads, and six fragments of shells was found in the southwestern corner of Structure 7, immediately south of FS-361 and FS-285. The artifacts were located in a space measuring approximately 20 x 20 cm, with a depth of 15 cm. The entire cache was found in Unit 3. These items were apparently stored in an organic container which rested on or was suspended from the rafters. The cache fell at about the same time as the roof and walls.

The vessels all contained cinnabar (HgS) (Beaubien this volume). One pot (FS-213) was an effigy, with a face on one side and a coiled tail on the other. It measured 4.5 cm high and 3.5 cm in diameter. Two other pots (FS-214 and 215) had raised clay protrusions on their sides. FS-214 measured 3.5 cm in diameter and 3.8 cm high, and FS-215 was 4 cm tall and 3.8 cm in diameter. The fourth pot (FS-222) was 3.6 cm in diameter and 3.5 cm high. It had patterns created by incision and appliqué. The final pot (FS-230) also had incised decoration and was 3.1 cm in diameter and 2.9 cm high.

A large polychrome dish (FS-264) fell at the same time as the roofing, early in Unit 3. It measured 24 cm in diameter and 10 cm high.

Two sherds (FS-267 and 268) fell early in Unit 3, and were located below the roofing thatch. Their association with other artifacts is uncertain.

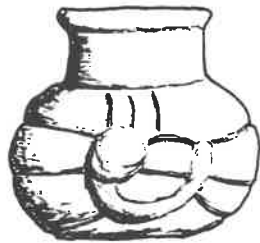
A small jug or jar (FS-271) was recovered from Unit 3. It was probably sitting on the table or shelf in the northwestern portion of Structure 7. This vessel was capped with a lid (FS-273), that was made from a sherd that was ground to a rounded shape. The lid broke and fell inside of FS-271.

An unclassified polychrome dish (FS-274) was resting on top of the fallen shelf or table in the northwestern portion of Structure 7. It measures 16.5 cm in diameter and 4.5 cm high. The vessel had Unit 3 ash with mat impressions (FS-360) both beneath and on top of it. The impressions were similar for all fragments found in the area. The force of the blast, may have folded part of the mat around this vessel, or there may have been more than one mat in the area.

A polychrome bowl (FS-280) was recovered from inside of FS-278. It fell during the early part of Unit 3 and landed inside of the vessel. It is a Copador bowl 20 cm in diameter and 12 cm high. The figures of three monkeys encircled the vessel.

A polychrome sherd (FS-304) fell into the large storage jar, FS-285, during the collapse of the roof. It does not appear to fit any other vessels or sherds recovered. A sherd lot (FS-310) was recovered from this area, in the lower portion of Unit 3, below the roof.

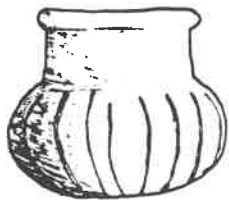
A medium sized, scraped-slip jar (FS-311) fell during Unit 3. Detailed analysis of this vessel is not available.



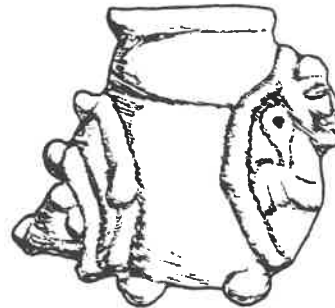
295-2-222



295-2-214



295-2-230



295-2-213

Figure 5. Miniature Paint Pots from Structure 7. Drawn by David Tucker.

0 1 2 3
CENTIMETERS

The upper portion of a Guazapa scraped-slip jar (FS-317) was recovered from the lower part of Unit 3. Most of the lower portion was missing. The incomplete vessel may have had a storage function.

A Campana fine-line tripod plate (FS-339) fell from the roofing during deposition of Unit 3. It fell on FS-285, the large *tinaja*. It measures 22 cm in diameter and 5.5 cm high.

Chipped Stone

Three unused prismatic blades were collected as FS-272. All were found in Unit 3 tephra above the storage jar FS-285, and were apparently stored in the roofing thatch. One was a complete blade, and the other two were medial segments. None showed evidence of use-wear. The blades had apparently been inserted into the roofing thatch for storage prior to use. Similar storage was noted in 1989 (McKee 1989, Beaudry and Tucker 1989).

Two prismatic blade segments (FS-300) were found in FS-285. They probably fell during the eruption, as there was a considerable quantity of Unit 3 between the blade and the contents of the vessel. The segments match and were from a single blade that broke as it fell. It probably was stored with or close to FS-272 in the roofing.

Another prismatic blade segment (FS-304) was found inside FS-285. It was 9 cm below FS-300 in the stratigraphic sequence. It probably also fell from the roofing during the early stages of Unit 3. No use-wear was visible. All five of the blades found in the structure probably were stored together in the thatch near the south wall.

Ground Stone

Seven jadeite beads were recovered from the cache. Two were drilled from both sides using a cylindrical drill or biconically using a drill with nearly parallel sides. One was designated FS-216. It is slightly oblate, and measures 1.6 x 1.4 x 1.2 cm thick. The diameter of the hole is .15 cm. The other bead with this type of hole is FS-223. It is 1.4 cm in diameter and .9 cm thick, and the hole is .15 cm in diameter.

The other five jadeite beads were biconically drilled. One was labeled FS-217. It is 1.5 cm in diameter and .9 cm thick and has a .5 cm diameter hole. Another bead (FS-218) is 1.5 cm in diameter and 0.9 cm thick, with a hole that measures .5 cm in diameter at its maximum width. One bead (FS-224) measures 1.8 cm in diameter and 1.7 cm thick. Its hole was .15 cm in diameter. A fourth biconically-drilled bead was designated FS-225. It is 1.5 cm in diameter and 1.7 cm thick. The hole measures .15 cm in diameter. One other bead (FS-358) measures 1.5 cm in diameter and 1.1 cm thick and has a .5 cm diameter hole.

One bead made from an unidentified dark gray stone (FS-227) was found in the cache. It is cylindrical, 1.6 cm in diameter and .4 cm thick, and has a conical hole .2 cm in diameter.

A greenstone celt (FS-299) was found inside of the large storage jar, FS-285. It was resting in Unit 3 tephra inside of the vessel, indicating that it fell after the beginning of Unit 3. It was well made, and highly polished at the bit end.

Other Artifacts

Two fragments of shell pendants (FS-220 and FS-229) were recovered from the cache. They were apparently from different pendants, as they did not match, and their designs were different. The former is incised with fine lines and was drilled in two locations. It measures 4.9 cm long by 2.5 cm wide.

Several fragments of oxidized iron minerals were found in the cache and collected as FS-221. The minerals may include limonite and hematite.

A disk-shaped shell bead (FS-228) was recovered from the cache. It was incised with a five pointed star.

A sample of red pigment from the cache was collected as FS-234. It is probably hematite.

The sediment from in and around the cache was fine-screened and collected as FS-235.

Recovered materials included paint and shell fragments and a small mammal bone.

An anthropomorphic figurine carved from a medium to large mammal longbone (FS-298; Figure 6) fell into FS-285 early in the eruption. The figurine was well executed, and much fine detail was preserved.

Figure 6. Carved Bone Anthropomorphic Figure from Structure 7. Drawn by David Tucker.



A diffuse scatter of specular hematite (FS-301) was found at about the same level in FS-285. It fell during Unit 3, and may have been in an organic container prior to its fall.

An item made from a nut shell that was probably a spindle Whorl was collected as FS-333. It was recovered from inside of FS-332, where it fell in the early part of Unit 3. It was incised with fine decoration and had a wooden spindle that passed through its center.

A mat that was on the shelf was preserved as impressions in the fine-grained tephra of Unit 3. A block-lifted portion of the mat was collected as FS-360.

Organic Remains

A complete cowry shell was recovered from the cache and designated FS-219. It is 6.5 cm long, 3.0 cm wide, and 2.1 cm thick, and was not modified. A small shell fragment, measuring 8 x 6 x 5 mm (FS-231) was also recovered from the cache, as were two partial snail shells designated FS-232.

The skeletons of several small mammals that fell from the roofing were recovered in Structure 7. They were presumably rodents that lived on stored grains. A single longbone (FS-233) 2.2 cm long was found while fine-screening sediments from around the cache. A relatively complete skeleton (FS-226) fell near the large storage jar, FS-253. It was found in roofing thatch. Several bones from another small mammal (FS-302) were recovered from inside of FS-285. Four longbones, one innominate, one mandible and several ribs were present. It was probably from a small rodent. The animal was probably eating grains stored inside of the vessel when it was killed by the eruption. Bones from two other small animals (FS-315 and - 335) were found in thatch lying on the platform. One innominate, 4 longbones, and 6 vertebrae were recovered as FS-315, and FS-335 was an articulated skeleton found near the shelf.

A single hemisphere of wood ash (FS-330) was found in the east-central portion of the structure. It may have had the form of a ball before its fall from the roof.

AREA 2 (PORCH)

No floor-contact items were recovered from the porch.

Fallen Items

Ceramics

Several sherd lots and two complete vessels were recovered from the porch. Sherd lots collected included FS-106, -109, -110, -111, -112, -113, -114, -115, -116, -237, -243, -307, -308, and -356. Ten of the eleven sherds in FS-308 fit together to form a large sherd that was probably used for storage in the rafters. The use of large sherds for storage at Cerén was noted in 1989 (Beaudry and Tucker 1989, McKee 1989, Beaudry 1989)

A Gualpopa polychrome bowl (FS-309) 23 cm in diameter and 9 cm high was found on the porch. It was located in Unit 3 below the roofing thatch. A Copador melon-striped bowl (FS-338) was recovered from Unit 3 underneath the collapsed northeastern wall. It was 17.5 cm in diameter and 6 cm high.

Chipped Stone

A medial segment of a prismatic blade (FS-313) was found in Unit 3 on the porch. It was immediately below the roofing thatch, and probably was stored in the thatch. It was found near the juncture of the main platform and the porch, and exhibited light use-wear.

The proximal portion of a macroblade (FS-337) was found on the lower platform beneath the collapsed northeastern wall. It exhibits heavy use wear. This blade was found immediately below the thatch, and was probably stored in the roofing.

Other Artifacts

The plaster casts of the door of Structure 7 are discussed above. Three FS numbers were assigned, 295-2-203, -207, and -320.

Four fragments of painted organic items (FS-204, 205, 211, and 212) were block-lifted from the porch. Exposed portions were solid red. They are probably from the same item, and may be fragments of a painted gourd similar to those excavated in Structure 11 (Mobley-Tanaka this volume).

Another painted organic item (FS-248) was block-lifted from an area about 1 meter away from the other three fragments. It is probably from another painted gourd. This item was located stratigraphically below the other fragments, in the upper portion of Unit 1. One side was solid red, but the other had red and gray-green paint similar to two of the painted gourds recovered from Structure 11. There is a continuous painted area of approximately 3 x 4 cm on a white ground layer.

Organic Remains

The tibia and fibula of a medium to large mammal, probably a deer (FS-244), were found on the porch. The bones were found in Unit 3, below the level of the thatch. No modification is visible. One wood ash hemisphere (FS-247) was found in the upper portion of Unit 1. It measured 14 cm in diameter.

A small mammal skeleton (FS-117) was also recovered from the porch. It was resting in Unit 1, near the floor.

One wood ash ball was recovered from the porch in 1989. It was labeled as FS-119.

Rounded seeds were scattered throughout the northern part of the main platform and the southern part of the porch. They occupied a 15 cm thickness of Unit 3. They probably were stored high in an organic container or in one of the ceramic vessels found in this area and fell during Unit 3. The seeds were tentatively identified as *uhushte* (*ramon*) in 1989, but better preserved specimens more closely resemble beans. Final identification is pending.

AREA 3 (NORTHWEST OF STRUCTURE 7)

Floor-contact Items

Ceramics

Several sherd lots (FS-257, -258, -259, -260, -261, -345, -346, and -347) were collected from the ground surface northwest of Structure 9. All were discarded before the eruption, and were associated with other trash found on the prepared clay surface in this area. This trash included corn cobs and obsidian blades.

Chipped Stone

Three medial segments of prismatic blades were recovered from the prepared clay surface to the northwest of Structure 7. One was designated FS-256. It exhibited moderate use-wear. Two other medial segments of prismatic blades (FS-340 and 341) fit together and were found on the prepared clay surface northwest of Structure 7. They appear to have been discarded, even though use-wear is fairly light. An unmodified piece of *laja* (exfoliated andesite) (FS-344) was found in contact with the ground surface northwest of Structure 7.

Other Artifacts

The tip of a bone needle (FS-276) was recovered while screening volcanic ash northwest of Structure 7. It is not known whether it was resting on the ground surface or in the lowest few cm of Unit 1.

Organic Remains

Several voids in the Unit 1 volcanic ash were found northwest of Structure 7. They were filled with dental plaster to preserve the form of the void, as described by Murphy (1989), and the ash was then excavated from around the plaster. The voids were molds of corn cobs. The moist, fine-grained ash packed around the cobs that later decayed. After excavation, the plaster casts of corn cobs with the kernels removed were visible. They were discarded before the Laguna Caldera eruption.

Fallen Items

Ceramics

Ten sherd lots and a single vessel fell into this area. Two sherds (FS-236) were found immediately above the roofing thatch. They may have been stored on top of the roof, or their stratigraphic position may be due to turbulence from the eruption and the falling roof. Four sherd lots (FS-124, -125, -126, and -127) were recovered from Unit 3 deposits in 1989. Two sherd lots (FS-245 and FS-342) were found in Unit 3 below the thatch, and three sherd lots (FS-255, FS-262, and FS-343) were recovered from the upper portion of Unit 1.

A recurved bowl (FS-246) 18 cm in diameter and 12 cm deep was found in Area 3. It was located in the upper portion of Unit 1, below the roofing thatch.

Chipped Stone

Two obsidian blade fragments were recovered from roofing in Area 3 in 1989. They were designated FS-133 and -134, and are described by Sheets (1989).

Other Artifacts

A piece of string or twine (FS-249) was recovered from inside of FS-246. The bowl apparently fell upside down on top of part of the burned grass roofing thatch and string that was used for its attachment. The string is very well preserved, as is the thach, which was collected as FS-250.

Several small fragments of red paint on a white ground layer were collected as FS-252. The fragments were jumbled at the time of excavation, and no block lift was attempted. They were scattered over an area of approximately 10 x 10 cm.

Organic Items

Six wood ash hemispheres were collected from Area 3, and were designated FS-201, -238, -239, -240, -241, and -242. All were found in Unit 3. They varied between 14 and 18 cm in diameter, and averaged about 10 cm thick.

AREA 4 (WEST OF STRUCTURE)

Floor-contact Items

Ceramics

Sherd lots collected from the ground surface west of Structure 7 included FS-323, -324, -325, -326, and -327. All were discarded before the Laguna Caldera eruption. No other floor-contact items were found in this area.

Fallen Items

Ceramics

Two sherd lots and three vessels were recovered from the volcanic ash west of the structure. The sherd lots were FS-295 and -296, both of which fell early in Unit 3. The vessels included FS-289, a Gualpopa polychrome bowl 24 cm in diameter and 10 cm tall. It fell in the lower portion of Unit 3, before the fall of the roofing. A Tazula Polished black bowl (FS-297) 7 cm high and 14 cm in diameter fell during Unit 3, immediately before the roof collapse. An unclassified vessel missing its rim (FS-321) fell early in Unit 3, before the collapse of the roof.

Chipped stone

The proximal portion of a macroblade (FS-288) was found in roofing thatch west of Structure 7, indicating that it was probably stored in the thatch. It exhibited heavy use-wear, and was thermally fractured during the eruption.

Ground Stone

Two manos were found in this area, and were the only grinding implements found in Structure 7. One (FS-290) was a 2-hand mano made of vesicular andesite. It was immediately below the roofing thatch, in the lower portion of Unit 3. It was probably stored in the rafters or on top of the west wall.

A 1-hand mano (FS-291) was located near FS-290. It was also found beneath the roofing thatch and fell during the early stages of Unit 3. Its primary use was as a hammerstone, but it had some light grinding use-wear.

Other Artifacts

A small cylinder of hematite (FS-322) was found in Unit 3 west of Structure 7.

Organic Remains

Two hemispheres of wood ash, FS-292 and FS-293, fell from the roofing early in the deposition of Unit 3, before the collapse of the roof. One (FS-292) was 20 cm in diameter and the other (FS-293) was 14 cm in diameter.

AREA 5 (EAST OF STRUCTURE 7)

Floor-contact Items

Ceramics

Three sherds (FS-348, -349, and -351) were recovered from the ground surface east of the eastern wall of Structure 7. All had been discarded before the eruption.

Organic Remains

A hole was present in the *TBJ* ground surface east of Structure 7. It was cast in plaster and was apparently a void left when a seed decomposed (FS-350). Analysis is pending.

Fallen Items

Ceramics

Three sherds (FS-319, -348, and -349) were found in Unit 3 in Area 5. All were lying above the eastern wall.

Organic Remains

Several tree branches fell to the east of Structure 7 during the eruption. Several leaf impressions (FS-334), and the plaster molds of voids left from tree branches (FS-357) were also recovered from Unit 3 in this area.

AREA 6 (SOUTHEAST OF STRUCTURE)

Floor-contact Items

Ceramics

A 40 x 40 cm hole was excavated approximately 20 cm into the *TBJ* in this area for the placement of a roof support post. A sherd lot designated FS-206 was collected from this area. The sherds were located 10 cm below the surface of the *TBJ*.

Two other sherd lots (FS-352 and -355) were on the ground surface southeast of Structure 7 at the time of the eruption. Both were discarded before the eruption.

Organic Remains

Two voids where seeds had been located prior to the Laguna Caldera eruption (FS-353 and -354) were cast in plaster. Identification is pending.

AREA 7 (SOUTH OF STRUCTURE 7)

Excavations did not reach the pre-Laguna Caldera ground surface in this area. No floor-contact items were recovered from Area 7.

Fallen Items

Ceramics

The only two items recovered from Area 7 were two sherds that fell on top of the fallen southern wall during Unit 3. They were numbered FS-265 and 266.

SUMMARY OF ARTIFACTS

The artifact inventory of Structure 7 was notable in several respects. First, all artifacts were in positions of storage rather than use. The majority of the artifacts at all the structures excavated in 1989 were in storage positions (McKee 1990), a general trend at sedentary sites. People tend to put tools and materials away after a task is completed in order to avoid cluttering work spaces. This tendency was very clear at Structure 7. All obsidian blades were stored in roofing thatch, and grinding implements were stored on a wall top or in the rafters. Many of the vessels of Structure 7 were large storage vessels that were relatively immobile. Some contained grains, and others may have been in storage themselves.

It was also notable that the majority of the artifacts were stored above the level of the floor. The only artifacts that were stored on the floor were the eight large storage jars, the large basin left in place under the western wall, and their contents. Eleven complete ceramic vessels were stored in the roofing in Area 1, and at least two large sherds also fell from the roofing. The use of large sherds for storage was first noted at Cerén during the 1989 field season (Beaudry 1989).

The shelf in the western part of the structure increased the available storage area, but most of the area beneath this shelf was not in use at the time of the eruption. Only one vessel was located beneath the shelf. Raising artifacts off of the floor can have other purposes, however. Artifacts on the shelf would be easily accessible without danger of being kicked or trodden on. The raised shelf also (slightly) reduces access for rodents and other pests.

Six prismatic obsidian blades were stored in the roofing over Area 1, adding support to the hypothesis that the edges of these blades were always carefully protected while they were still usable (Sheets 1989, this volume). All usable blades found to date have been stored in roofing or in other "guarded" areas.

The cache was also of interest. These valuable items were apparently guarded in an organic container and stored in the roofing. All the items in the cache had decorative rather than utilitarian functions. The total inventory included the five miniature vessels that contained cinnabar, seven greenstone (probably jadeite) beads, two other beads, fragments of 2 shell pendants, portions of three other shells, and some fragments of an iron oxide mineral. Many of the items were perforated, and may have been from a necklace. The necklace could have broken and been placed in a bag or other organic container until the beads could be restrung. It is also possible that the necklace was in storage while not in use. The contents of the paint pots have been identified as cinnabar (HgS; Beaubien, this volume). This pigment has been used at the site to paint gourds after they were covered with a kaolinite ground layer (Beaubien 1990, Mobley-Tanaka this volume). Cinnabar is highly toxic, and would be dangerous to use to paint food storage or serving vessels. It would be even more dangerous if used as makeup.

The inhabitants of the site were plagued by some of the same problems that exist in contemporary El Salvador. Skeletons from four small mammals, probably rats or mice were recovered from Area 1 this year, in addition to the one that was found in 1989.

Several hemispheres of wood ash were found in Areas 1, 2, 3, and 4. Their function is uncertain, but wood ash can be used to make *tamales de ceniza*, or in the preparation of corn, as a substitute for lime. Ash also can be spread over the ground to provide a dry area to starting a fire during the rainy season (Murcia, personal communication 1990).

The floor of the porch, Area 2, was kept clear of artifacts, probably to provide access to the interior of the structure. It also may have been used as a work space or an area to eat or converse. The roofing was heavily utilized for storage, however. A complete bowl and the remains of several large storage sherds were recovered from the volcanic ash below the roofing in this area. A prismatic blade

and a scraper made on the proximal portion of a macroblade were also recovered from the thatch in Area 2. At least two painted gourds were present in this area, but only isolated fragments of paint were found. Both were stored above the floor. The tibia and fibula of a medium sized mammal, probably a deer, were also stored above the floor in this area.

Area 3 was utilized for trash disposal by the inhabitants of Cerén. Once corn kernels had been removed from the cobs, they were thrown into this area, as were broken pots that were no longer usable and dulled obsidian prismatic blades. The area was apparently cleaned periodically, however, as the total quantity of trash is low. It may have been hauled away to a larger midden. A probable midden was found to the west of Structure 9 (McKee, Chapter 8 this volume).

The roofing over Area 3 was utilized for storage. One bowl and the remains of several large sherds were found in this area. Fragments of paint probably from painted gourds were also found in this area.

The only floor-contact items in Area 4 were discarded sherds, but two bowls and at least one large sherd were stored in the roofing. The proximal portion of a macroblade was stored in roofing thatch, and 2 manos were located on the wall top or in the rafters.

Areas 5, 6, and 7 were largely free of artifacts, with only a few discarded sherds and seeds on the ground surface and a total of five small sherds found on the fallen east and south walls. There may be many artifacts beneath these walls, however. These areas were roofed, and would have provided well-ventilated but still sheltered areas for work. The areas under the eaves were heavily utilized in many other structures excavated at Cerén (Zier 1983; Beaudry and Tucker 1989; McKee 1989, 1990; Mobley Tanaka this volume, Tucker this volume).

Several general trends in the locations of artifacts are clear from the excavation of Structure 7. The first is that the majority of artifacts were found in locations that indicate that they were stored above the floor. The only area in which items that were not garbage were found in contact with the floor was Area 1, the main platform. Area 2, the porch, was completely clear of artifacts, and only a few discarded sherds and organic materials were found in floor contact in Areas 3, 4, 5, and 6.

The interior of the structure was kept relatively clear of artifacts when compared with Structures 4 and 6, the other two *bodegas*. The large jars in Structure 7 were all easily accessible, mostly in the western and southern parts of the building. Floor-contact artifacts were kept to the edges of the structure, and a large, clear walkway was present in the northern and eastern portions of the structure. Future studies will examine the volume available for storage in vessels stored on the floor, vs. those stored on the shelf, rafters, wall tops and roofing.

The overall picture of artifact distribution at Structure 7 is one of usable storage space. All storage localities were readily accessible. The use of storage space above the floor, including rafters, shelves, and suspended objects is well documented ethnographically (Smyth 1991, Wauchope 1938, Wisdom 1940), and the use of the roofing itself to store cutting edges has been seen repeatedly during excavations at Cerén (Sheets 1989, this volume).

SUMMARY AND CONCLUSIONS

Excavations in Structure 7 have helped to improve the understanding of the occupation of a Classic Period household. The identification of this structure as a *bodega* (storehouse) has helped to establish a pattern of *bodegas* located south of habitation structures, as observed at Operation 1. The hypothesis that each family had multiple specialized structures was also supported by Structure 7 excavations.

Many of the architectural elements utilized at Structure 7, notably the raised clay platform, *bajareque* walls, and solid adobe columns are present at other structures at Cerén, including Structures 1, 2, and 4. The fall of all elements of the superstructure of Structure 7 has allowed us to better understand the techniques utilized in construction of these structures. We now know that the vertical posts used for *bajareque* walls extended into the platform for several centimeters in at least some cases, but not into the columns. We also know that the support system for the thatched roofs tightly integrated the walls, and provided crucial support for holding these walls together. Once the roofing fell, the walls were much less able to withstand the force of lateral base surges from Laguna Caldera Volcano.

The artifactual evidence from Structure 7 indicates that the roof was heavily utilized as storage space. If all of the artifacts present in Structure 7 had been stored on the floor, then passage across the

floor and access to the large storage vessels would have been impossible. The small and valuable items found in the cache at the southwestern corner of Structure 7 indicated that even if the inhabitants of Cerén had time to leave the site during a lull in the eruption, they did not have time to carry these portable and valuable items with them.

Future research in Operation 2 should attempt to excavate the rest of the structures utilized by this household group in order to more completely understand the household dynamics of production, distribution, transmission and reproduction (Wilk and Rathje 1982). Areas between structures should also be excavated in order to understand transportation and communication between the structures, as well as the use of this space for household activities.

ACKNOWLEDGEMENTS

This year's excavations at Operation 2 benefitted by the aid of many individuals and institutions. The majority of funding for the research was provided by the National Science Foundation, with Payson D. Sheets as principal investigator. Payson's aid and support was instrumental to success throughout the season. Funding for a brief preliminary visit to the site in March and April was provided by the Graduate School of the University of Colorado. The staff of USIS at the US embassy of El Salvador provided moral and financial support. I would especially like to thank Pamela Corey-Archer, Bob Dance, Beatrice de Cortez, and Mercedes. Alicia de LandaVerde graciously provided rooms for project members for our first few days in the country. The Patronato Pro-Patrimonio Cultural also helped financially and with logistical problems. Ricardo Recinos, Mario Cristiani, Ana Vilma de Choussy, Juan Carlos Choussy, Ernesto Raubusch, and Jose Luis were especially helpful. Jose Cuenca of Proconsa helped resolve some early season equipment problems. Rafael Cobos took valuable time from his excavations at San Andres to provide appreciated advice from time to time. Zulma Ricord de Mendoza of the Patrimonio Nacional was instrumental in speeding operations. Members of the Patrimonio Cultural who have helped us include Maria Isaura Arauz de Rodriguez, Gloria de Gutierrez, Evelyn Guadalupe Sanchez, and Carolina Avalos. The Peruvian conservation team of Carlos del Mar and Omar Benites assisted Victor Manuel Murcia and his conservation crew in providing the best possible protection for the site.

Our field crew, under the able direction of Victor Manuel Murcia, was one of the finest groups that I have worked with. They included Salvador Quintanilla, Salvador Ramirez Rojas, Marco Tulio Chinchilla, Jose Humberto Portillo Padilla, Pedro Ismael Giron, Jose Antonio Menjivar, Antonio Rivera Espinoza, Jose Mario Quintanilla R., Lazaro Amaya Lopez, Hector Armando Guevara, Moises Arturo Guevara Moran, Jaime Arturo Moron Rodriguez, Jose Cesar Cordova, Elias de Jesus Rivera Espinoza, Francisco Alberto Escamilla, Carlos Nelson Leiva Jaime, Rodrigo Bautista Canton, Osmin Elisandro Granados, Pedro Ramirez Galdamez, Reyes Nelson Alvares, Rodrigo Hernandez Leon, Jose Guadalup Funes Canton, Rene Antonio Quintanilla Carabantes, and Salvador Antonio Quintanilla. Gloria Mejia de Gutierrez and especially Evelyn Sanchez of the Patrimonio Cultural spent a great deal of time in the excavation of structures in Operation 2.

Finally, I would like to acknowledge the aid of the Cerén Project staff. Payson, Fran, Gabi, and Kayla Sheets have all helped a great deal in Operation 2. Andrea Gerstle and Jeannie Mobley-Tanaka provided valuable advice and helped to put Operation 2 excavations into the context of the site as a whole. Marilyn Beaudry and Rae Beaubien aided in the analysis and conservation of artifacts, as well as providing much appreciated advice. David Tucker helped in a lot of the details in closing out the field season, as well as providing interesting and insightful suggestions. Dan Miller, Hartmut Spetzler, and Dan Wolfman all provided helpful advice from their respective specialties.

Chapter 8. EXCAVATIONS AT STRUCTURE 9

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INTRODUCTION

Structure 9 was the third building excavated in Operation 2 at Cerén (Figure 7.1). Structure 2 and limited surrounding areas were excavated in June and July of 1989 (McKee 1989). Structure 2 is located in the northeastern corner of Operation 2. It is a two room *bajareque* (wattle and daub) habitation structure (domicile) measuring approximately 4.2 x 3.5 meters that was covered by a thatch roof and had *bajareque* walls and solid adobe columns in the corners. A moderate number of artifacts were recovered from in and around the structure which is described by McKee (1989). It has been interpreted as a residential habitation structure (domicile).

Structure 7 was discovered during the final week of the 1989 field season, and was excavated in September through November of 1990 (Chapter 7, this volume). It is a single room *bajareque* structure that measures approximately 3.05 x 3.2 meters. Solid adobe columns were present at the corners. The high artifact density and the nature of the assemblage led to the identification of this structure as a *bodega* (storehouse).

Structure 9 (Figure 1) is very different from other structures excavated in Operation 2. It measures approximately 3.8 x 3.8 meters, and has walls of solid adobe, rather than *bajareque*. The roof is also different. It is a dome constructed of clay covering a pole framework, which was protected by a thin roof of grass thatch. Wooden beams that supported the thatch roof rest upon four low adobe columns at the corners of the structure. An interesting aspect of Structure 9 is the presence of a firebox constructed of river cobbles at its center. These features led to the tentative identification of Structure 9 as a sweat house.

The first indications of Structure 9 were found in February 1990, when employees of the *Patrimonio Cultural* were excavating the upper layers of volcanic ash in the southern part of Operation 2. They encountered an area where the tephra layers sloped upwards and were disturbed by either an intrusive pit or the collapse of a large structure beneath those layers. The area was left unexcavated until the arrival of archaeologists in the fall of 1990. Structure 9 was excavated between 10 October, 1990 and 18 January, 1991.

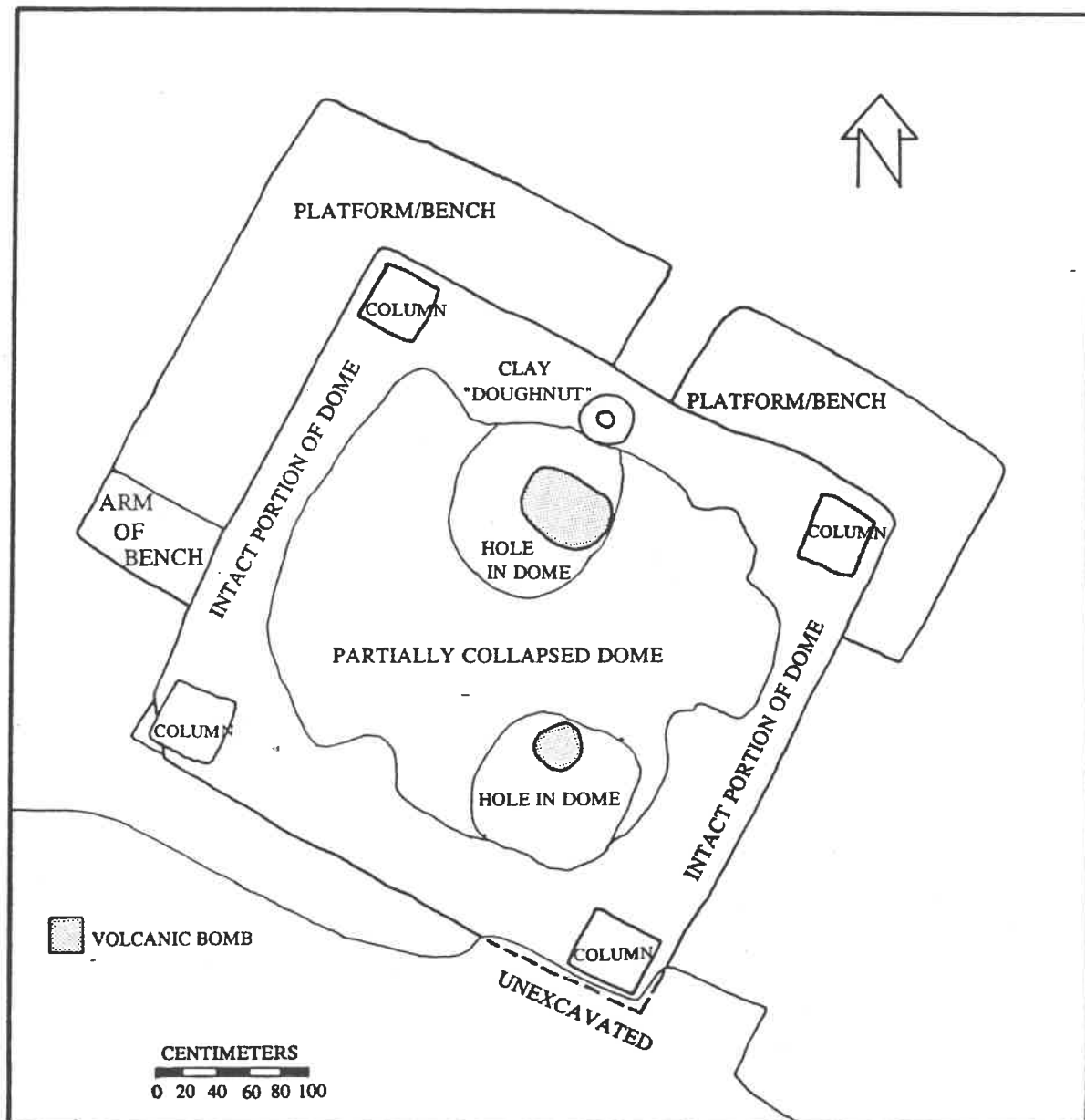
FIELD METHODS

The presence of Structure 9 was first suspected in February, 1990 when steeply sloping and disturbed tephra layers were noted as Operation 2 was being extended to the south. The area was covered with a tarp and left undisturbed until the arrival of the research team. During August and early September, 1990, the permanent roofing above Operation 2 was expanded to cover Structures 7 and 9. In October, during the excavation of Structure 7, the tephra layers above Structure 9 were removed to the Unit 8/9 contact. The first evidence of architecture uncovered was the southeastern column.

Excavations were still underway in Structure 7, and workers were therefore shifted to the extreme southeastern corner of Operation 2, east of Structure 9, and to the area to the west of Structure 9. In both areas, excavations were by stratigraphic levels based on the tephra units described by Miller (1989). Many holes were encountered east of Structure 9 below the top of stratigraphic Unit 3. In cases where these holes did not appear to be from tree branches knocked down by the force of the eruption, they were filled with dental plaster as described by Murphy (1989). Fallen tree branches were not cast, as they are rarely diagnostic of species and very common. Pedestals were left surrounding the casts, which were cleaned up after the pre-Laguna Caldera ground surface was reached in surrounding areas. Excavation was by hand, using finer tools in the lower units. Excavation to the west of the structure proceeded in a similar manner, although few holes were found.

As a result of the excavations on the eastern and western sides, Structure 9 was essentially pedestalled. All work on the structure from this point on utilized trowels, spatulas, and brushes only. In late November, the tephra was removed from the top of the structure, revealing the domed roof. After the dome was fully exposed, the immediately surrounding areas were excavated to the level of the

Figure 1. Plan of Structure 9 Showing Features Visible From Above.



roofing thatch by stratigraphic levels. The extent of the thatch was then mapped, and the final remaining tephra was cleared from the northern, western, and eastern walls of the structure.

The final excavations were inside the structure. The clay roof was damaged by the impact of a large volcanic bomb in the extreme southeastern corner of the building. A pit measuring approximately 1 x 1 meter was excavated in this area (Probe 1). The floor area exposed measured approximately 70 x 70 cm, due to the need to leave a slope to support the unconsolidated tephra. Narrow trenches were excavated to the southern and eastern walls to determine the thickness of these walls.

After the excavations in the southeastern corner were completed, the entrance to the structure was cleared. A probe was excavated in the north-central portion of the roof, where another volcanic bomb had damaged the clay dome (Probe 2). The northern entrance excavation was then connected to the probe through the roof, and a narrow tunnel was cleared to see into the fire-box in the central portion of the structure.

All architecture, features and artifacts of interest were photographed and mapped. At the time of excavation, Victor Manuel Murcia prepared and installed wooden supports for all architectural elements in danger of falling. The location of all architectural elements and artifacts were recorded in three dimensions and the stratigraphic position of all features of interest was recorded.

A concentration of garbage was noted in the southwestern corner of Operation 2. This material was near the edge of a large depression that sloped downward to the west of Structure 9. The surface of the concentration was mapped, and two 1 x 1 meter exploratory pits were excavated to determine the nature of the deposits. Each test pit was excavated in 5 cm levels parallel to the pre-Laguna Caldera ground surface. All material was passed through 1/8 inch mesh hardware cloth, and a one liter sample collected from the southwest corner of the unit was screened through finer-mesh for each level.

ARCHITECTURE

Structure 9 (Figure 1) is different in many respects from other structures excavated at Cerén, but there are some similarities. Like most structures at Cerén, it is oriented 30 degrees to the east of magnetic north. It has solid adobe walls similar to those of Structure 3. It is different in that it has a domed clay roof covered by grass thatch. The firebox is also unique at Cerén, as are the short columns at the corners. During the following discussion, the terms north, south, east, and west refer to directions relative to the orientation of the structure rather than to our cardinal directions, unless otherwise noted.

SUBSTRUCTURE

The lowest construction of Structure 9 is a layer of clay that was present on the west side of the structure. The layer was not present on the north or east side, and the level of this layer has not yet been reached on the south side, so its presence or absence cannot be ascertained. The layer was 3-5 cm thick in places where its depth could be determined. A platform of solid adobe was built upon this layer in western areas and on the *Tierra Blanca Joven (TBJ)* ash from the third Century A.D. eruption of Ilopango Volcano (Hart and Steen-McIntyre 1983). The thickness of the platform varied between 52 and 58 cm on the west side, 46 and 56 cm on the north side, and 42 and 46 cm on the east side of the structure. Excavations have not exposed the level of the platform on the south side of the structure. In the southern parts of the eastern and western sides, the sides of the platform are flush with the edge of a cornice at the top of the walls, but on the north, and west sides, and on the northern portion of the east side, the platform extends out past the edge of the cornice by 45 to 85 cm, forming a long, broad bench. This bench is discussed in detail below. No signs of reinforcement of the platform were visible, and all corners were square.

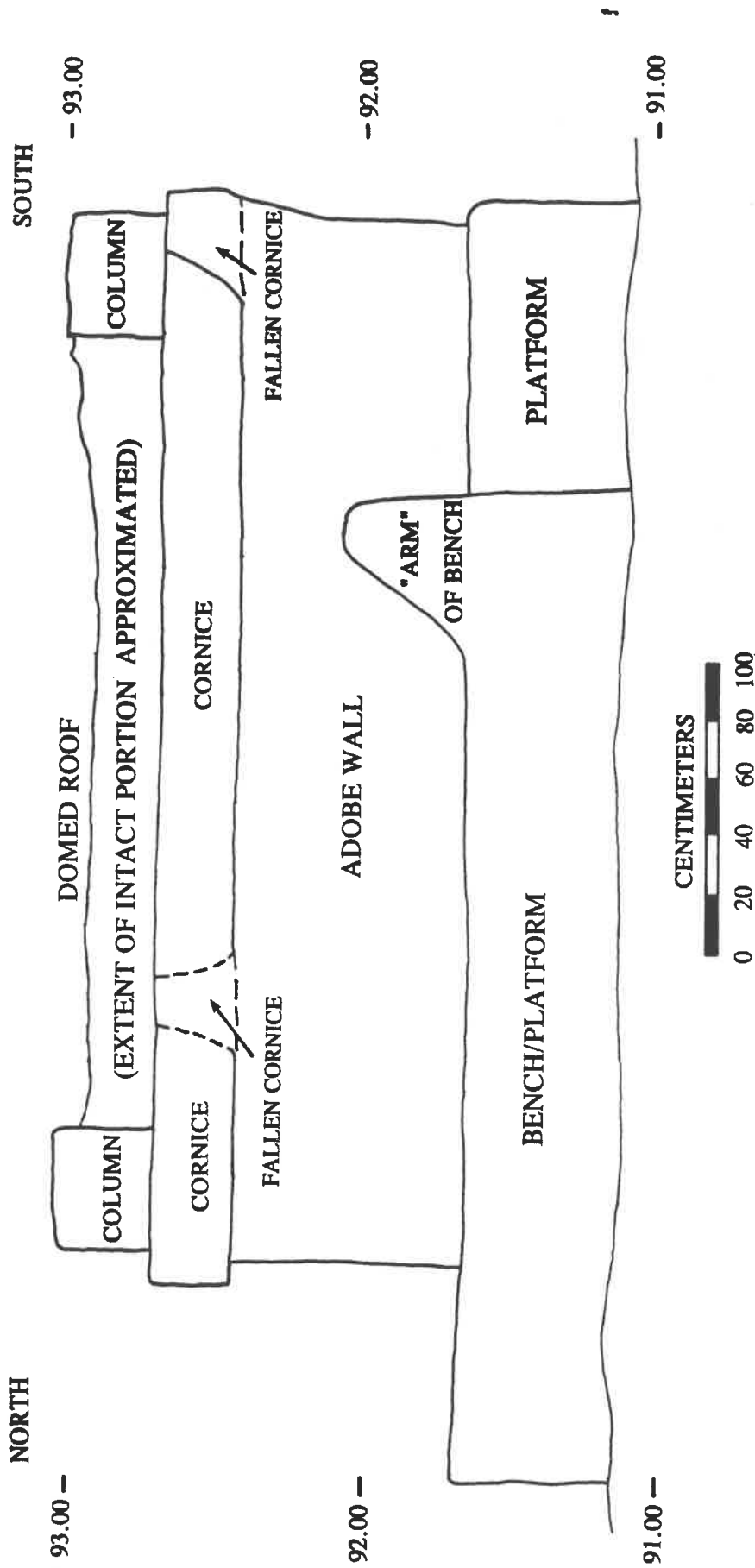
SUPERSTRUCTURE

The superstructure of Structure 9 consists of four solid adobe walls, a cornice, four short adobe columns and the roofing. The roof had two components, a domed clay portion and an overlying roof of grass thatch.

Walls

The western wall (Figure 2) was the first to be excavated. It is 3.65 meters long and extends 1.02-1.05 meters above the platform. The southern portion of this wall was damaged by the fall of a

Figure 4. Elevation of West Wall of Structure 9.



volcanic bomb, and the upper portion of the southern end of the wall bows out to the south. No excavations have exposed the interior of this wall and its thickness is not known. A cornice is present on the upper portion of the wall. This cornice is 27 cm tall, and it extends 7 cm out from the wall. A 20 cm long portion of the cornice near the center of the wall was destroyed by a volcanic bomb, and the southern 30 cm were also damaged by a bomb. The wall is of solid adobe and has no entrances.

The southern wall has not yet been completely excavated. It is 3.83 meters long and 35 cm thick in the SE corner, where a narrow trench was excavated to determine the thickness. There is a cornice along the top of this wall, but the western portion was destroyed by a volcanic bomb. The cornice extends 7 cm out from of the wall, and is 27-28 cm high. The platform has not yet been exposed along the southern wall, but the elevation of the top of this wall is the same as that of the others, indicating that it is probably extended 1-1.05 m above the platform.

The eastern wall was completely excavated except for its extreme southern portion which that buried underneath a support beam for the permanent roof over Operation 2. The wall is 3.70 meters long and 1.02-1.03 meters high above the platform. The thickness of the wall, based upon a narrow trench from the southeastern corner excavations is 38 cm. The cornice extends along the top of this wall and extends outwards 7 cm past the edge of the wall. The height of the cornice is 27-28 cm. The wall is of solid adobe with no entrances.

The northern wall (Figure 3) is similar to the others but it has an entrance. The wall is 3.75 meter long and 89-91 cm high above the platform. It is 34-35 cm thick in the area of the entrance. The cornice continues along the top of this wall. It measures 27-28 cm in height, and extends out 7 cm from the edge of the wall. The central portion of the cornice was damaged during the eruption and fell during excavation. Two other major cracks are present along its length.

Entrance

The entrance to Structure 9 (Figure 3) is 80 cm high and 50 cm wide at its base, and 40-45 cm wide at the upper edge. Two heavy wooden beams served as a lintel over the door. The beams themselves have decomposed, but their forms are preserved as voids in the clay above the doorway. The northern beam was 124 cm long, 13-16 cm wide, and 7.5-8.5 cm thick. All surfaces are nearly flat, indicating that the wood was planed in some fashion. The southern beam was 145 cm long, 12 cm wide, and 7 cm thick. Both beams were apparently covered with clay on all sides, although the clay covering the lower edge had fallen in the area of the doorway. The wall is 34-35 cm thick on the sides of and above the doorway, which is approximately the same as the thickness of walls in other parts of the structure. Although the inner surfaces of walls at the sides of the doorway have not been excavated, the wall thickness indicates that there is probably not a cornice on the inside, above the doorway. The bench around the structure (see below) is interrupted by the entrance, and the gap in the bench continues into the structure to the entrance of the firebox.

Bench

A large bench is present on the north, east, and west sides of the structure (Figure 1). The bench is at the same level as the surface of the platform and is a continuation of the platform. The bench begins 95 cm north of the southwestern corner of the structure and extends 75 cm north of the northwestern corner. On the western side, it varies between 92 and 97 cm wide. On the northern side of the structure, the bench begins 85 cm west of the northwest corner and continues to 1.7 meters east of the northwestern corner. At this point, there is a gap of 45-50 cm in the bench for the entrance. The bench begins again 1.70 m west of the northeastern corner, and continues to 48 cm east of the northeastern corner. It varies between 77 and 87 cm wide along the northern side. It extends from 70 cm north of the northeastern corner to 90 cm south of the northeastern corner on the eastern side of Structure 9. The bench is about 52 cm wide in this area. The southern side of the structure has not yet been completely excavated, but it is not likely that the platform extends out to form another bench on this side.

An interesting aspect of the bench is the presence of an "arm" at the southern extremity of its western side (Figures 1 and 2). This feature looks like the arm of a couch. It is roughly triangular in cross-section, with a vertical southern edge and a northern edge that slopes down to the level of the platform. The top is slightly rounded, and the western side is vertical, as is the bench. The arm is 55

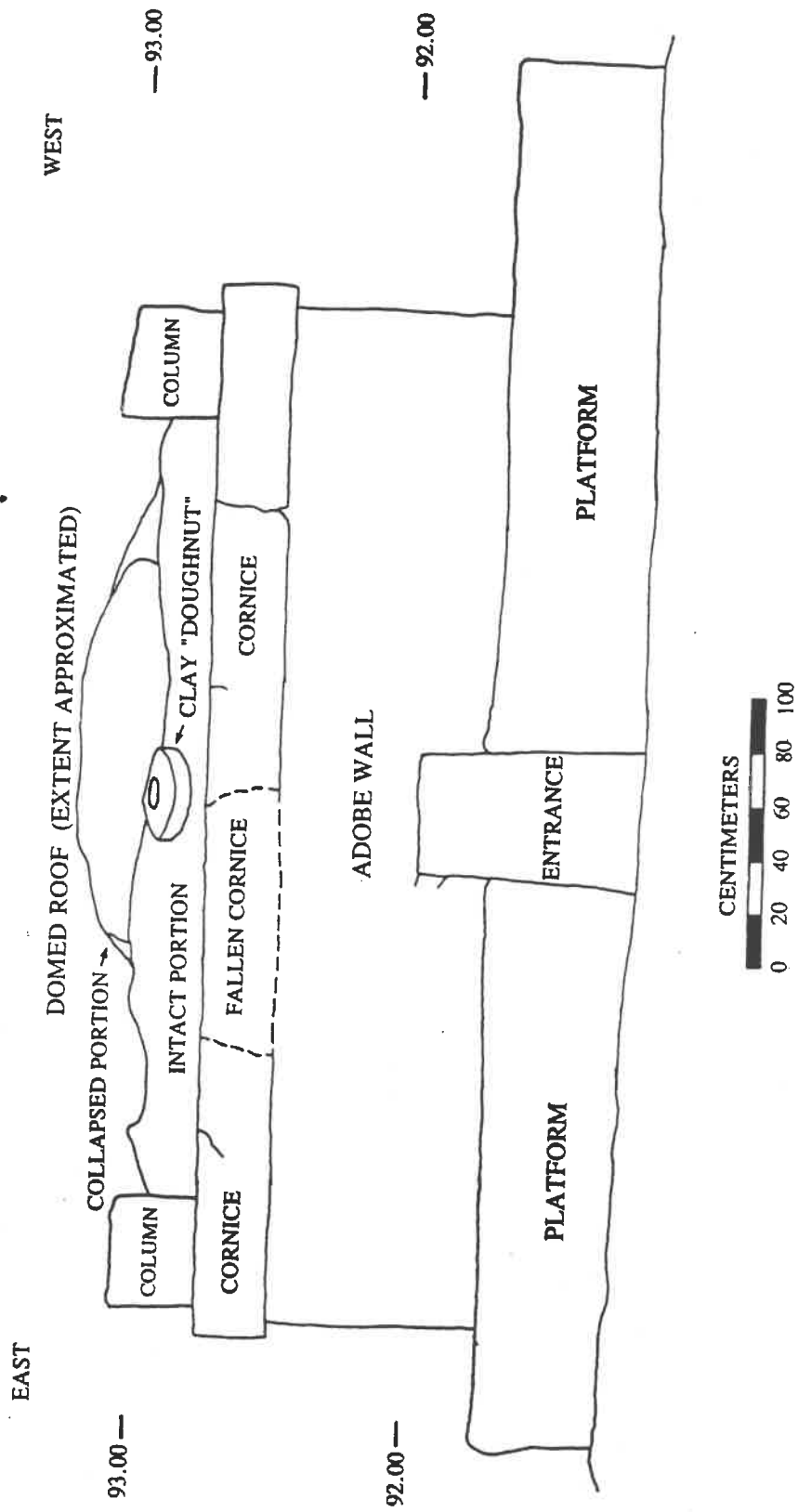


Figure 3. Elevation of North Wall of Structure 9. Note Entrance in the Center of the Structure.

cm wide and 42 cm high above the bench. It is 1.98 m high above the prepared clay ground surface southeast of Structure 9.

Columns

Solid adobe columns are present at each of the four corners of Structure 9. It is not known whether they continue down to the level of the platform or were merely placed on the wall tops. The northwestern column measures 40 cm north-south x 41 cm east-west. It is inset 9 cm from the edge of the cornice on the north wall and 10 cm from the edge of the cornice on the west wall. The column measures 26 cm in height above the top of the cornice. The northeastern column measures 46 cm north-south x 40 cm east-west. It is inset 10 cm from the edge of the cornice on the eastern wall and 12 cm from the edge of the cornice on the northern wall. This column is 32 cm tall. The southeastern column measures 41 cm north-south x 48 cm east-west. It is inset 10 cm from the cornice on the eastern wall, but its distance from the cornice on the southern wall is unknown due to lack of excavation. This column is 34 cm tall. The southwestern column measures approximately 45 cm north-south x 45 cm east-west. It is inset 8 cm from the cornice on the southern wall and 8 cm from the cornice on the western wall. It extends 28 cm above the top of the cornice. The bomb that destroyed the cornice in the southwestern corner of Structure 9 missed this column.

Adorno

A doughnut-shaped piece of clay was centered over the entrance (Figure 1). The clay was attached to the surface of the dome over the entrance, and measured 35 cm in diameter. The "hole" of the doughnut, which was filled with an irregular lump of clay measured 10 cm in diameter. The "doughnut" approximately 6-8 cm thick. It may have functioned as a vent for the escape of smoke (Sheets personal communication 1991), but without further excavations its function remains unknown. It may also have been decorative.

Roof

There were two components to the roof of Structure 9. The lower portion was a *bajareque* dome. This was covered by a thin roof of grass thatch.

The domed clay roof had partially collapsed and was broken at the time of excavation. Details of its construction are incomplete, but we have some idea of its nature. The roof was reinforced by poles, based upon the presence of four holes approximately 1.5-2 cm in diameter exposed during the excavation of Probe 2. The poles were located on the southeastern edge of the probe and were oriented to the south and east, away from the edge of the pit. They were spaced approximately 20 cm apart. No further details of the pole reinforcement of the roof are available.

The poles were encased in a layer of clay approximately 10-15 cm thick that formed a rounded dome. The dome broke into several pieces when it collapsed, and its overall height is not known with certainty. However, a rough approximation of its height above the top of the cornice can be obtained by adding the heights of the collapsed segments. The figure obtained by these calculations is 73 cm. It should be noted that this is a minimum figure for the height of the dome, as some of the segments were probably flattened to some degree as they fell.

The thatch roofing was much thinner than that encountered in Structures 2 and 7 and was not continuous over the dome. It was apparently blown off the structure by the lateral force of the base surges. A continuous layer of thatch was present on the north, east and west side of the structure, but its extent to the south is not known. In most areas the thatch was less than 5 cm thick. The thatch extended approximately 1.8 meters east of the eastern wall and 1.5-1.7 meters west of the western wall of the structure. Excavations extending 1.4 meters north of the northern wall of the structure did not encounter the outer edge of the thatch. The thatch on the eastern side of Structure 9 fell before that on the western side. On the eastern side, it fell at the end of Unit 2 or the beginning of Unit 3 deposits. To the west, it fell somewhat later, just prior to the deposition of the gray portion of the brown-gray-brown layer, relatively early in Unit 3. The 6 cm of stratigraphic separation between the two sides may only represent a few minutes of the eruption.

Some evidence of the support system for the thatched roof is provided by the presence of beams along each side of Structure 9. The southern beam has only been viewed near the southwestern corner of

the structure, and its length is unknown. It is carbonized and is approximately 10 cm in diameter. The beam on the western side was preserved as a cast in the moist Unit 3 deposits that ran nearly the entire length of the structure. It was 3.40 meters long, and varied between 8 and 10 cm in thickness. The beam on the northern side was also preserved as a void in Unit 3, and measured 2.8 meters in length and 14-18 cm in diameter. A carbonized beam was recovered on the eastern side of the structure that measured 85 cm long and 10-12 cm in diameter. It is inferred that these beams rested on top of the columns in the corners of the structure and served to support the thatch roof because of their positions parallel to the walls and their high stratigraphic locations.

The area covered by thatch can be estimated if it is assumed that the thatch extended ca. 1.6 meters from the north and south walls, as it did from the east and west walls. The structure measures 3.8 x 3.8 meters for a total area of 14.4 meters. The thatch extends approximately 1.6 meters on each side of the structure, giving a total roofed area of 7 x 7 meters or 49 square meters, indicating that the roofed area outside of the structure is roughly twice the interior area. It should be noted that the roofing probably spread during its fall, inflating this estimate.

INTERIOR OF STRUCTURE 9

The interior of Structure 9 (Figure 4) is only known from limited excavations in the southeast corner (Probe 1) and the north-central portion (Probe 2). We did not excavate in other areas because of concern for conservation of the structure. In both areas, volcanic bombs from the Laguna Caldera eruption had heavily impacted the domed clay roof.

The extent of Probe 1 at the level of the roof was approximately 1 m². The area of the floor that was exposed measured approximately 70 x 70 cm, or .5 square meters, because of the need to leave a slope to support the overlying clay roof and loose tephra layers. Numerous clay fragments, probably from the roof, were encountered during excavation.

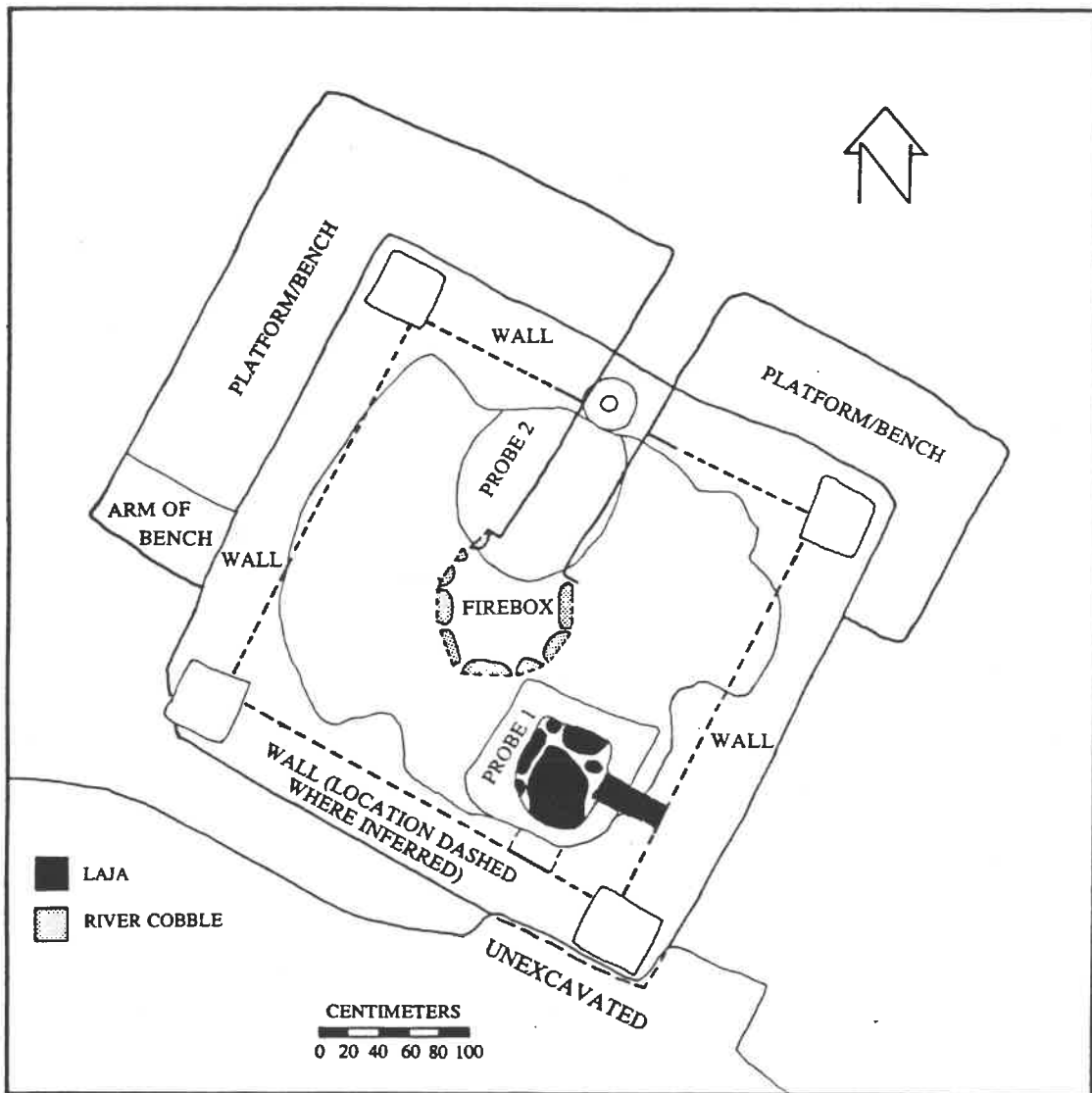
The floor is constructed of *lajas* (exfoliated andesite slabs) with clay in the interstices. The *laja* was covered by a 1-2 cm thick level of *TBJ*. The level of the floor inside of the structure is approximately 10 cm above the level of the platform at the southeastern corner of Structure 9. This level is 1.25 meters below the level of the uncollapsed portion of the dome located to the south of the pit. The *laja* vary greatly in size, with the long dimension ranging from 10 cm to more than 50 cm. A layer of burned clay and rock extending up from the floor for about 30 cm is probably the exterior surface of the firebox.

Excavations in Probe 2, in the north-central portion of the structure, proceeded from two directions: from the north, through the entrance, and from above, through a large hole in the domed clay roof caused by the fall of a large volcanic bomb. The entrance is low, and can only be passed on the hands and knees. The gap between the benches that begins outside the structure continues in the interior. The benches continue 2.25 meters into the structure from their northernmost extension, which is 1.46 meters from the outside of the northern wall. The level of the floor of this passage is approximately 50 cm below the top of the bench. A large volcanic bomb broke through the roof and impacted the area between the benches 75 cm to the south of the entrance. This bomb measures approximately 65 cm x 40 cm x 40 cm, and complicated the process of excavating the interior of the structure.

Fire Box

The stone-lined fire box begins at the ends of the benches, approximately 1.5 meters south of the entrance. This box is round and 80 cm in diameter. The base is about 15-20 cm below the level of the entrance between the benches. The fire box is 75-80 cm high, and is lined by river cobbles. The lower row of cobbles averages 25-35 cm in diameter, and the higher rocks range from 10 to 25 cm in diameter. The upper rocks are not arranged in rows. The majority are vesicular basalt river cobbles. They were not deliberately shaped, and some exhibit thermal fracturing. There is clay in the interstices between the rocks. This clay is heavily oxidized where exposed, but is covered with a heavy layer of carbon in most areas. There is no apparent chimney or exit for smoke. The floor of the firebox is constructed of *lajas* that measure 10-20 cm across. The floor is covered with 2-5 cm of wood ash and some small charcoal fragments.

Figure 2. Plan of Structure 9 Showing Features Hidden by Roof. Dashed Lines Indicate Locations That are Approximated or Inferred.



The interior of Structure 9 remains enigmatic, but some preliminary interpretations can be made. The floor in the southeastern corner of the structure is just a few cm higher than the level of the outside platform or bench. This difference may be solely due to the presence of the *laja* and *TBJ* floor resting on top of the clay platform. This platform is probably at the same level throughout the interior of the dome except in the area of the entrance and the firebox. In these areas, the floor is 50-60 cm lower. At the edges of the structure, there would be about 1.1 - 1.3 meters separating the bottom of the dome from the top of the platform. Towards the center, this distance would increase to about 1.5 - 1.8 meters. If this interpretation is correct, then there is some floor space around the edges of a rounded top chamber for burning wood. Entry was probably through the same passage that is used for feeding the fire, but there may be another entrance on the south side of the structure. The northern entrance is very cramped for an average-sized adult, and is impassable for large or inflexible people.

The outside dimensions of the structure are nearly 4 x 4 meters, but the usable interior space was limited. An area of approximately eight square meters is present between the walls, but the firebox occupies between 2 and 2.5 square meters of that space. The remaining 5.5 to 6 square meters would have had a roof height varying between 1.0 and 1.5 meters. Reconstructed profiles of Structure 9 are shown in Figures 5 and 6.

EXCAVATIONS EAST OF STRUCTURE 9

A 6 x 6 meter area was excavated on the east side of Structure 9 (Figure 7). These excavations revealed that a 2.5 to 3 meter wide strip on the eastern side of the structure was kept clear of artifacts and refuse. The only items lying on the *TBJ* ground surface in this area were nine sherds that had been discarded before the eruption.

A large number of holes were encountered in the Unit 3 tephra in the eastern portion of the excavations. As these holes were encountered, they were filled with dental plaster in the manner described by Murphy (1989). After excavation and cleaning of the plaster molds, it was realized that the holes were the remains of corn plants. The moist, fine-grained Unit 3 tephra had packed around the corn plants that were extant at the time of the eruption. Normal processes of organic decomposition destroyed the plants themselves, but their form was preserved as a hollow in the volcanic ash. When these voids are filled with plaster, a positive mold of the shape of the plant at the time of the eruption is recovered.

The western edge of the *milpa* (cornfield) was 2.6 meters east of the platform of Structure 9, and extended for an unknown distance to the north, south, and east (Figure 6). This indicates that there was about a meter between the edge of the roofed area and the beginning of the field. This area could have been used as a walkway (Sheets, personal communication 1991). The area of the field exposed measured approximately six meters north to south by 3 meters east to west. The cornfield was well organized with raised ridges for the plants and swales between these ridges. The purpose of these ridges was likely for drainage, moisture retention, or both. The ridges were aligned perpendicular to the eastern wall of Structure 9. Spacing averaged approximately 80 cm between ridgetops. The ridges were 10-18 cm high.

On the ridges, there were frequently (but not always) low mounds at the location of the plants. The ridges are also thicker at plant locations. The number of plants at each location varied from one to five, with two to four plants at most locations. The plants were cast to a height of up to 1.0 meters above the *TBJ* ground surface, but heights of molds of 50-80 cm were more common. The plants were mature at the time of the eruption, with many bearing cobs 15-20 cm long. Most plants were doubled over, but it is not known whether they were intentionally bent or this was a result of the eruption. Modern Maya communities often store cobs on plants that have been doubled over (Smyth 1990). The mature plants may indicate that the inhabitants of the site were growing two crops, or they may show that part of the crop from the previous season was being stored in this fashion.

Only nine sherds were found in the 18 square meter *milpa*. Modern *milpas* in the area are frequently littered with all manners of garbage.

EXCAVATIONS WEST OF STRUCTURE 9

An area measuring approximately 4.5 x 6 meters was excavated west of Structure 9 (Figure 8). Unlike the surface to the east of the structure, the ground surface on this side was paved by a 3-5 cm thick layer of clay. This surface was uneven and unfinished. The area was unusual in three respects.

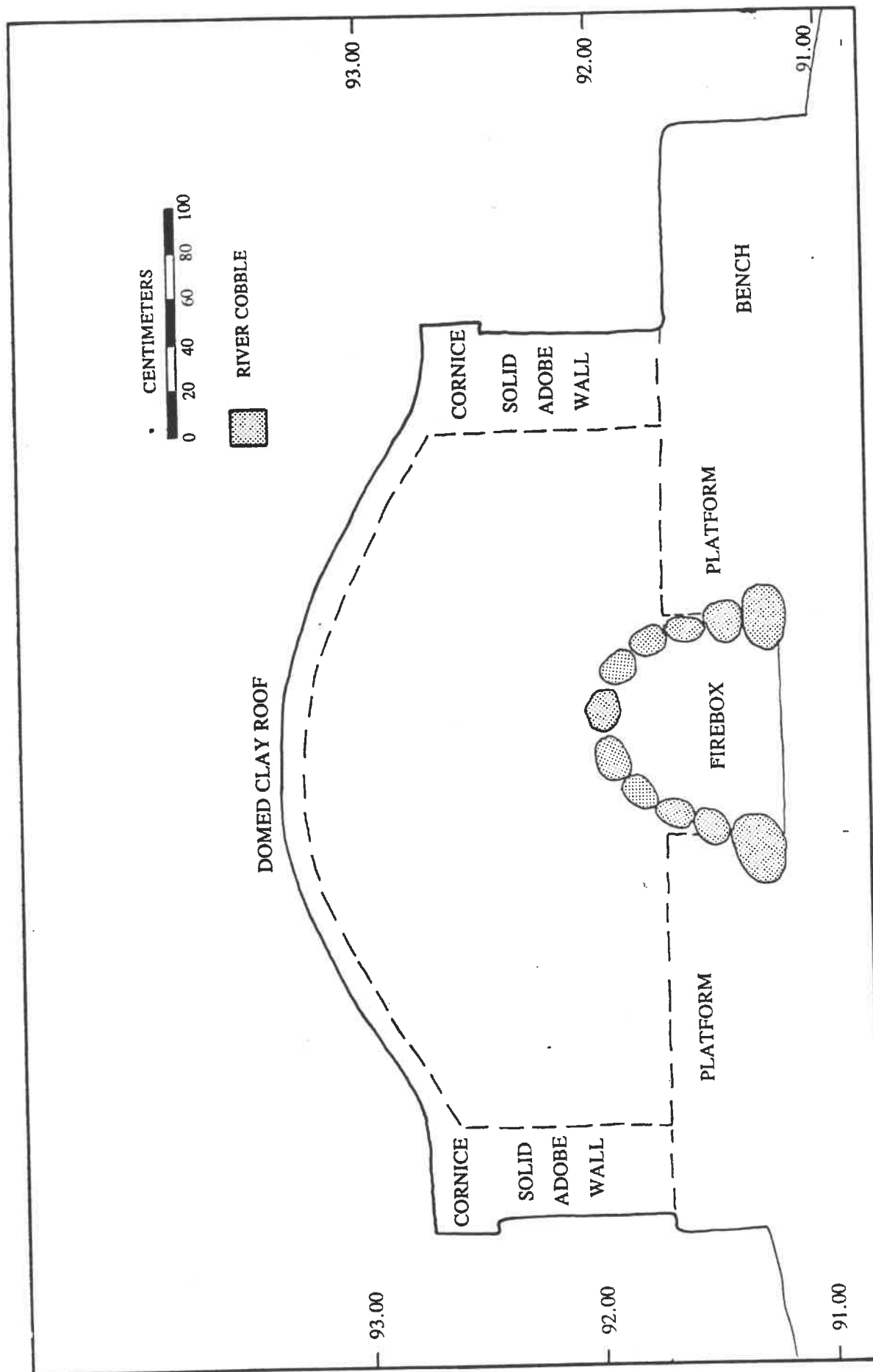


Figure 5. East-West Profile of Structure 9. Dashed Lines Indicate Locations that are Approximated or Inferred.

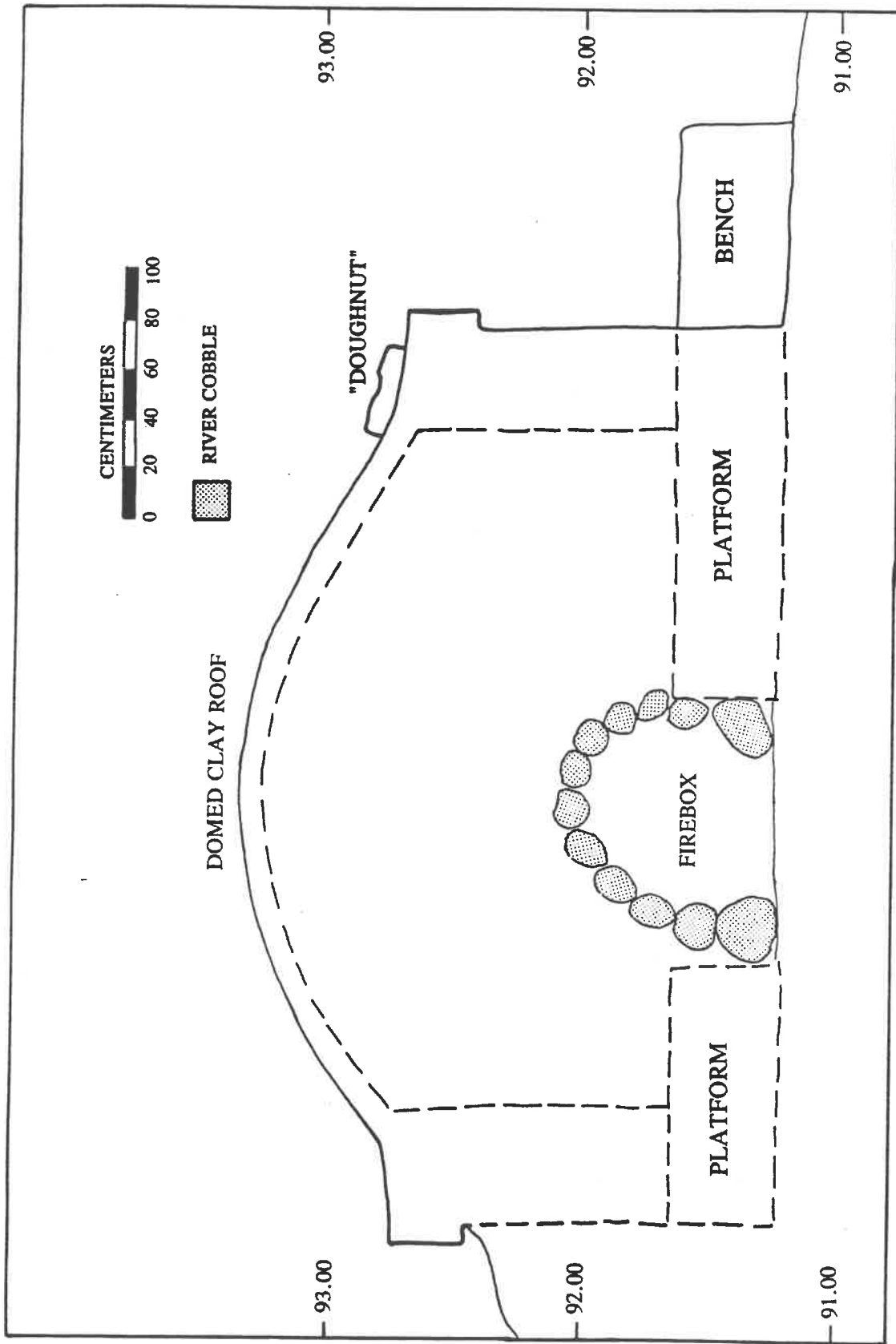


Figure 6. North-South Profile of Structure 9. Dashed Lines Indicate Locations that are Approximated or Inferred.

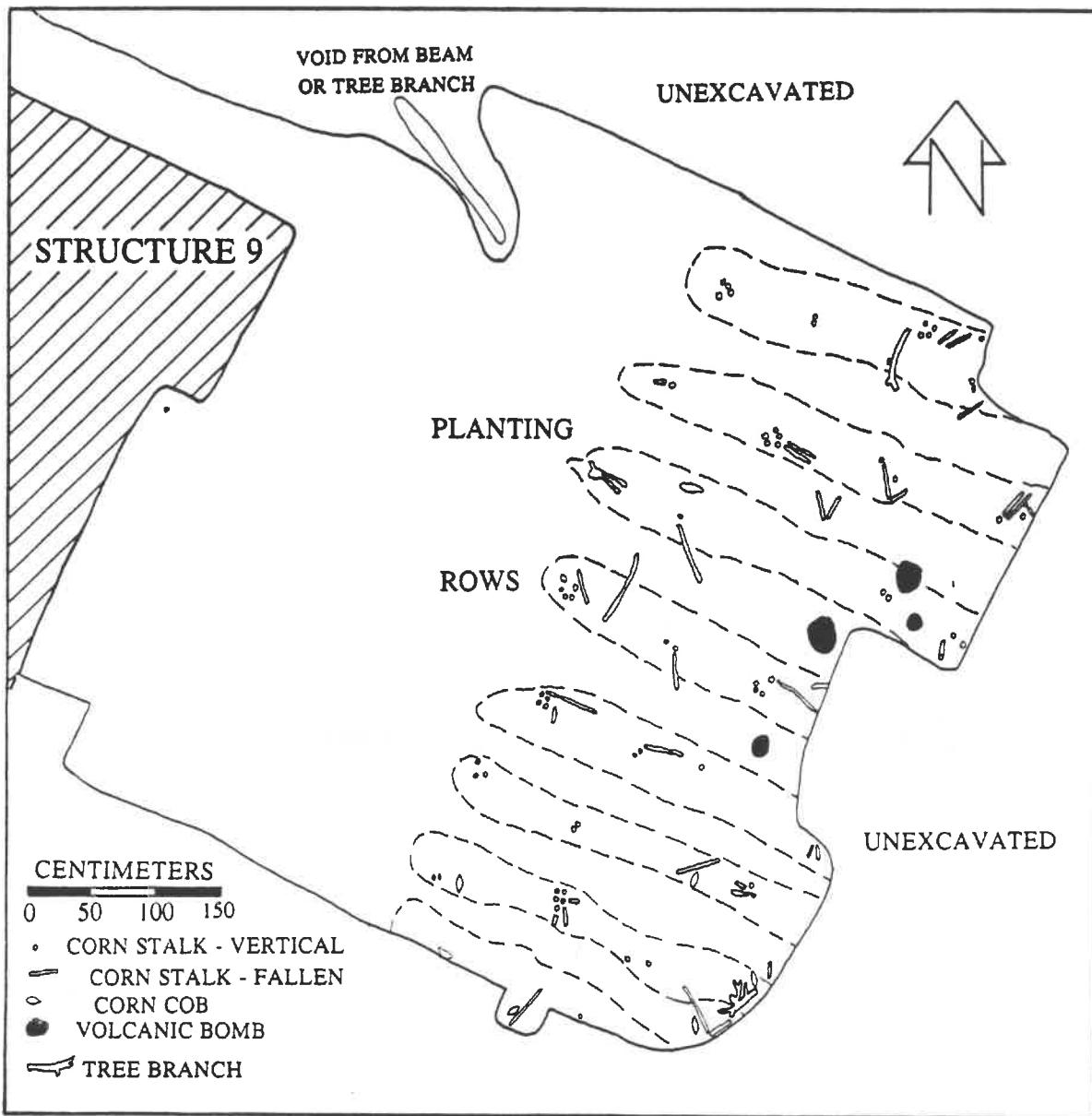
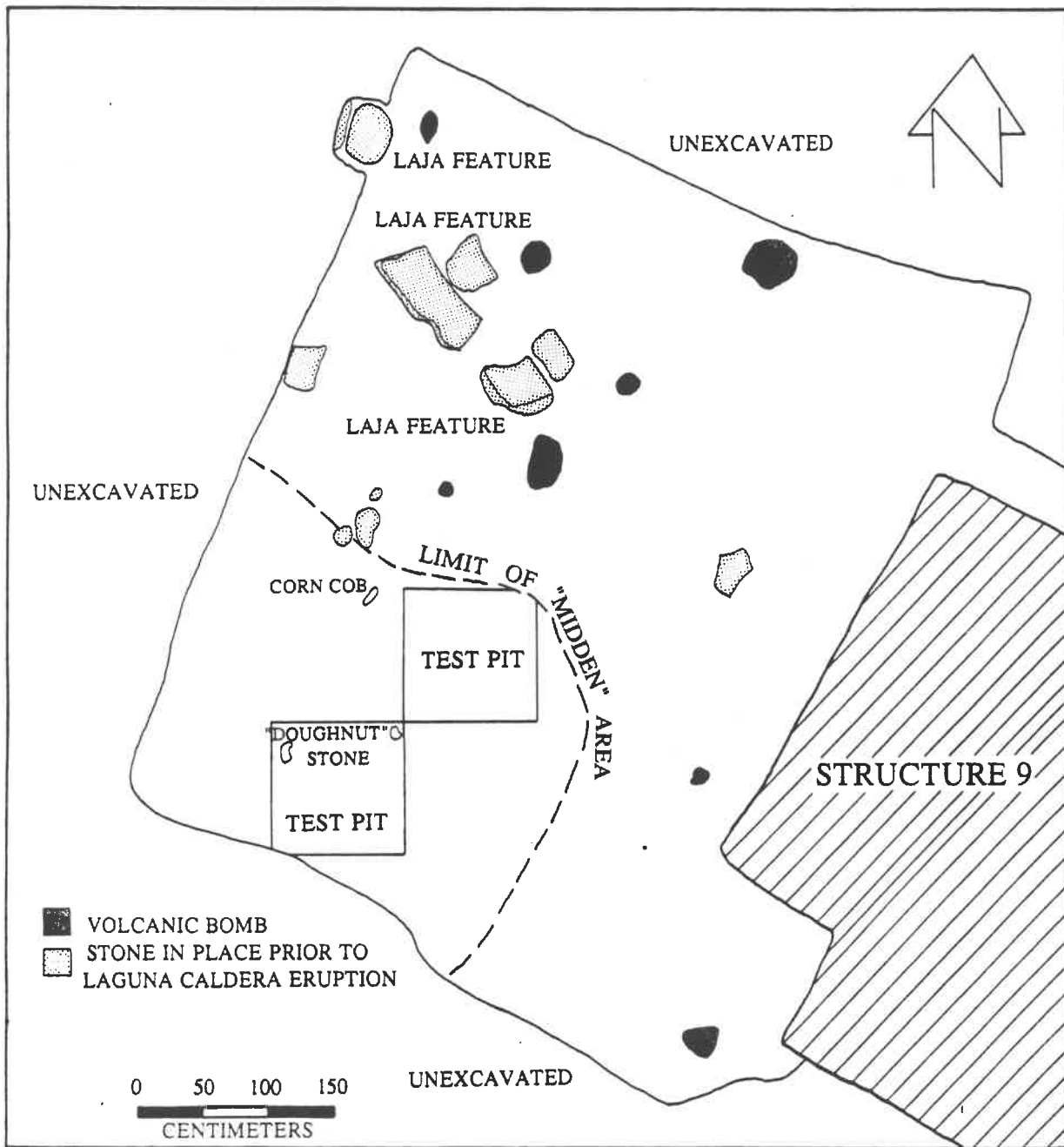


Figure 7. Plan of Excavations East of Structure 9. Note Raised Ridges in Corn Field.

Figure 8. Plan of Excavations West of Structure 9. Note Large Depression Containing Possible Midden and Laja Features.



The first is that the topography was different from previously excavated areas. The extreme southwestern corner of the excavations had a very steep slope to the southwest, away from the structure. The elevation in the southwestern corner of the excavations was about 1.5 meters lower than the elevation near the structure, which was only about four meters away. The origin of this feature is unknown, but the ground surface may have been artificially altered, as the surface in the entire area is covered by the clay layer noted above.

The second interesting aspect of the area is that most of the steeply-sloping area is covered by a deposit of trash. Broken pot sherds, a doughnut stone, a discarded obsidian blade, and large quantities of organic refuse, including corn cobs (with the grains removed), leaves, and tree branches. This may be the corner of a large pit used for refuse disposal.

Test excavations in the possible midden indicated that the cultural deposits at the edge of the pit were at least 20 cm deep, and that those farther down in the pit were at least 35-40 cm thick. Material encountered included sherds, fragments of a ceramic figurine, one obsidian blade, and organic matter including one corn cob, several tree branches, and other, unidentified organic matter. Analysis of the recovered material has not yet occurred, but several hundred sherds were present in each of the 1 x 1 meter units. Analysis of these materials and additional excavations to the south and west will be necessary to determine the nature of this feature.

Another unusual aspect in the excavations to the west of Structure 9 was the presence of three or more *laja* (exfoliated andesite) features in the northwestern corner of the excavations. They consist of a slightly rounded piece of *laja* lying on the ground surface, and a large flat slab inset into the ground behind it at an angle of 50-60 degrees. The stones on the ground vary from 35 x 20 to 45 x 35 cm in size, and those standing were up to 80 cm wide x 60 cm high. Two of the three features face northeast, and the third faces nearly due east. The function of these features remains unknown. There is no evidence of use by pounding or grinding. They may have served as (somewhat uncomfortable) seats, or may have been used for drying various items (grains, pottery, maguey, etc.) in the sun.

ARTIFACTS

The only artifacts that were encountered in Structure 9 excavations were discarded materials in the midden to the west of the structure and the few sherds found in the *milpa* excavations. There is no evidence that these artifacts are related to the structure. Analysis of these artifacts has not yet occurred, and will be described in the future.

DISCUSSION

Structure 9 has been described, but its function remains something of a puzzle. It does not closely resemble structures that have been described ethnographically for the region (Waucope 1938; Hayden 1988; Blake and Blake 1988). It also does not closely resemble structures excavated by archaeological projects in Mesoamerica. It is clear that the structure was used to heat something, based on the domed clay roof and the firebox, but the nature the heated item is unknown. There are several possible functions, including an oven, a kiln, some sort of drying structure, and a steambath or sweat house.

Structure 9 does not appear to have been a kiln. It is far larger than most kilns documented in the ethnographic and archaeological record. It does not have a ventilation system that would be sufficient for a kiln of this size (Healan 1989). The portion of the interior that has been exposed has not been baked to the "brick-hard" consistency of kiln interiors (Healan 1989). It also lacks the highly vitrified sherds inside, and pieces of unfired vessels outside that are commonly present in kilns (Fuller 1984).

It could conceivably be an oven for cooking food. The problem here is what sort of food? The structure is extremely large for an oven, and would be inappropriate for the preparation of most known traditional foods of the region.

The interpretation of Structure 9 as a drying structure runs into similar problems. Most smoke or drying houses are larger with higher ceilings, and have permeable walls and ceilings for moisture to escape. The clay walls and roof of Structure 9 would not be appropriate for this type of structure.

Another possible interpretation is a sweathouse. A sweathouse would presumably have few artifacts inside, and the impermeability of the walls would be an advantage.

ETHNOGRAPHIC EXAMPLES OF SWEAT HOUSES.

The use of sweat houses by Maya and Mexican groups has been reported by ethnographers working in highland Mexico and Guatemala. Peck et al. (1966) describe the use of sweat houses by the Mam in Guatemala, near the Mexican border. The sweat house may be integrated into one of the walls of the domicile, or stand apart. Sweat houses are often about three feet high with an entrance that is two feet high. A cobblestone oven is located in the corner opposite the door. A low bed or bench is made of boards resting on rocks.

Wagley (1941) provided more detail on the use of sweathouses among the Mam. He studied Mam speakers in Santiago Chimaltenango, at an elevation of 7400 ft. Most houses had their own sweatbath. They were "formed like a miniature house" and measured ca. 5 ft. x 5 ft. and stood shoulder high. The sweatbaths were used for general cleanliness, as well as for medicinal purposes. The inhabitants of Santiago Chimaltenango bathed 4-5 times per week. Wagley (1949) provided a detailed account of the use of sweathouses following birth. After birth, both mother and infant were placed in the sweatbath, where they were both cleaned, and the mother was massaged. The mother needed to go to the sweathouse twice a day for the first 15 days after birth. The afterbirth of the infant was buried in the floor of the sweathouse. Adults should return to their family sweathouse periodically to pray. Rosales (1949) also described the sweathouses at Santiago Chimaltenango. "Sweat baths have walls of rock and mud and roofs of sticks covered with mud. In several of them, we noticed that the fireplace was in the corner nearest the door. In the other corner there were several planks, held up by rocks or sticks, which served as a seat big enough to hold more than two people. The owner of one of the houses told us that the Indians here did not take baths in the cold water of the nearby streams, but only in the sweat bath." Rosales noted that two ceramic pots were present in the sweat bath, one filled with warm water, and the other with cold. The bath was heated by throwing water on the hot stones. He also noted that the steambath was very comfortable on cold days in the highlands.

Several ethnographers have also described the use of sweatbaths by Tzeltal speakers. Blom and LaFarge (1925) described sweatbaths as wattle cubes thickly plastered with mud that measured 1.5 meters in all dimensions. Some had a thatched roof supported by poles outside the structure. Redfield (1930) noted that every fourth household at Tepoztlán had a steambath. They were constructed of stone set in mortar. They were rectangular and five feet high. The sweatbaths had one low entrance that was barely low enough to permit the entrance of a kneeling man. Redfield noted that birthing rituals were associated with sweathouses. The mother must bathe once a week for the first month after birth, and the baby sometimes also bathes. Redfield also mentions that the baths are used for hygiene as well as for ritual purposes. Nash (1970) noted that sweatbaths were semi-subterranean, and were made by excavating an area of about 5 m² and then raising an oval of stones that was plastered with mud. During her study, only about half of the households of *Tzo'untahal* had sweatbaths, and use was declining.

Wauchope (1938) described sweat baths at Santiago Atitlán as constructed of wattle-and-daub, with some rubble. Firewood was stacked outside single entrance, and sometimes the structure was covered by a thatch roof. Ovens were of rock slabs with mortar.

A thorough treatment of sweat houses is provided by Cresson (1938). In an attempt to interpret the use of enigmatic structures excavated at Piedras Negras, he examined modern sweat houses in Mexican villages, paying particular attention to features that might be visible in the archaeological record. The first was examined at the village of San Francisco, near Mexico City. It was built of irregular stones laid in mud, and was rectangular in plan and cross-section. The fire box was rounded and built onto the periphery of the structure. The structure had a ventilator. Cresson (ibid.) also studied two sweat houses at the village of Milpa Alta, also near Mexico City. The first structure was rectangular in plan with a domed roof and a fire box added to the outside. The structure had no ventilator. A wooden roof covered the entire building. The second sweat house reported from Milpa Alta was round in plan and had a domed roof. The fire box was built onto the outside. This structure was built of stone and mud. A fourth sweat house was observed at Tepoztlán. It had a square main room and a fire box built onto the outside of the structure.

Cresson (1938) noted several features that were present in all of the sweat houses that he studied. All had both fire boxes and steam chambers. The steam chamber is the location where bathers cleaned themselves and sat in the steam. The fire box was built onto the steam chamber in all cases, but there

was a passage between the two rooms. All had drainage passages where water from bathing can exit the structure. Sweat houses are not only used like saunas, but regular bathing with soap and water also occurs. A passage where water can pass from the interior of the structure during bathing is a necessity. He also noted that all structures had a single low entrance to the steam room. Some structures had ventilator holes and others did not.

Wauchope (1938) mentions that he saw no sweatbaths in Yucatan. This is supported by the lack of discussion of sweatbaths in Yucatan in the HRAF files. Wisdom (1940) also does not mention the use of sweatbaths by the Chorti Maya. Cresson (1938) notes that sweat houses are present near Mexico City, near Vera Cruz, and in Oaxaca and Mitla. They are also present in Chiapas and neighboring Guatemala. At the time of his study, they were lacking in other areas, including northern Guatemala and Belize and Yucatan. Cresson (1938) did note that the Maya dictionary of Motul includes the word *zumpulche*, which means "bath made thus, in which enter the recently delivered women and other sick persons in order to cast out the cold which they have in their bodies." (Translated by Cresson 1938:101-102). This would appear to indicate that sweat houses formerly had a wider distribution than they have at present.

SWEATHOUSES EXCAVATED IN ARCHAEOLOGICAL SITES

Several structures that have been identified as sweathouses have been excavated in archaeological sites. One was found at Zacualpa in Guatemala, one at Tikal, two at Chichen Itza, in Yucatan, Mexico, and eight at Piedras Negras in Guatemala.

Wauchope (1938) reported that a tomb found at Zacualpa had similar dimensions and construction to sweatbaths used today (Wauchope 1936). The structure had been modified before its use as a tomb, but a charcoal-filled oven on the original paved floor of the structure adds support to his interpretation.

Detailed plans and analyses of the sweatbath at Tikal (Structure 5E-22) are not available, but Coe (1967) briefly describes the structure in his guide to the site. The structure has a low doorway on its east side, and a narrow channel between two broad benches. There is a round fireplace at the center of the rear wall. The structure is built of stone. Its dimensions are not reported.

Two sweathouses have been reported at Chichen Itza. One, Structure 3E3, was excavated by Fontaine and Ruppert in 1936, and is reported in Ruppert (1951). It consists of three rooms, interpreted as a gallery, a steam chamber, and a fire chamber. The total dimensions are approximately 17 x 9 meters. The gallery is 17 m long by ca. 4 meters wide. The interior was heavily plastered and painted, and a stone-lined drain was present. Several benches and an altar were present in the outer chamber. The steam chamber is ca. 7 m long by 4 m deep, and also contained benches. Ventilators were present in the north and south walls. The fire chamber measures ca. 4 m x 2 m. The fire box is at the west side, and the interior is 44 cm wide, 88 cm deep, and 55 cm high. The box is made of rounded cobbles in "red-earth" mortar. There is some lime plaster on the floor of the fire box, which is covered by ashes. They report that the fire chamber had no outlet for smoke, other than the front opening of the firebox.

The second probable sweat house excavated at Chichen Itza is Structure 3C15. It was excavated by Ruppert in 1929, and is reported in Ruppert (1951). The description is similar to that of Structure 3E3, but no plan is provided. The gallery is 11 m long, and 2.38 m wide inside. A cornice is present outside the gallery. The floor is of hard-packed plaster, and a raised sill around the edge may have been to prevent water from entering the gallery. The steam chamber has two benches, and is paved with flagstones. There is a single doorway 80 cm wide and 84 cm high. The fire chamber is not described in detail.

Cresson (1938) mentions eight possible sweathouses excavated at Piedras Negras in northwestern Guatemala. They are similar to those described at Chichen Itza. All had three nested chambers. The outer room was a large, non-vaulted gallery, with a roof of perishable materials. Masonry benches have been found in the outer rooms of some of the structures. The inner rooms varied from 3.3-4.8 m long and 2.15-3.2 m wide. They tended to be low, with doorways .9-1.13 m high and .7-.89 m wide. All were constructed of stone. Each structure had a small, rectangular, interior fire box. They had entrances about the same size as the entrance to inner rooms, and were roughly 1 meter across inside. No exit for smoke was present, other than the entrance from the inner room.

The environment of Cerén is also different from that where most modern sweatbaths are found. Most areas in which sweatbaths are used today, or were documented in ethnohistoric records, are in temperate climates. Blake and Blake (1988) found that the distribution of sweatbaths in modern Maya communities was highly correlated with the environment. No sweatbaths were found in communities with altitudes lower than 1000 m. They were relatively common between 1000 and 2000 m, and most households had sweatbaths in communities above 2000 m. They give two possible reasons for this correlation. The first is that higher communities are cooler and have higher rainfall. In these communities, sweatbaths would be adaptive in a practical as well as spiritual sense. It could be very comfortable and healthy to crawl into the sweatbath after being caught out in a cold downpour. The second possible reason for this correlation is that communities at higher altitudes tend to be more isolated, and thus more traditional. If this interpretation is correct, then a widespread distribution of sweatbaths in highland and lowland settings is implied for precontact periods, and this distribution has been impacted by European contact. Blake and Blake (1988) favor the environmental interpretation. Cerén, at 450 m, falls into the area in which the environmental model would not predict sweatbaths.

Although there are several problems with this interpretation, I believe that it is more likely that Structure 9 is a sweatbath than it is any of the alternatives that have been presented. The artifactual evidence points away from the possibility that it is a kiln, and the interpretation as an oven or smoke house is also unlikely. Structure 9 has a number of features that support its interpretation as a sweat house. The clay roof would not have been affected by smoke or heat. The passage way is low enough to allow the escape of water from bathing. The *laja* and ash on the floor would provide a secure surface that would not become muddy and slippery while someone was bathing. Further excavations in the interior may provide data that will help to resolve the question of the function of this structure.

SUMMARY AND CONCLUSIONS

Excavations in and around Structure 9 have uncovered an architecturally unique structure and the extensive extramural areas. The structure, which measures 3.8 x 3.8 meters, was constructed of solid adobe walls resting on a solid adobe platform. These walls had cornices along the top and adobe columns at each of the four corners. The structure had a domed *bajareque* roof which was protected in turn by a very thin roof of grass thatch. The interior of the structure was not completely excavated, but appears to consist of a raised floor of *laja* covered with *TBJ* ash in most areas, except for a domed firebox made of river cobbles in the center of the structure. The only entrance excavated to date leads directly to this firebox. No artifacts have yet been recovered from the interior of the structure.

No clear evidence has resolved the question of the function of this structure, but evidence to date supports an interpretation as a sweatbath or sauna. Further archaeological research is necessary to help to resolve this question in the future.

Excavations outside of Structure 9 also provided us with much valuable information. The eastern excavations may have revealed a *milpa* nearly at the time of harvest. It is also possible that plants were doubled over on the stalks for storage (Smythe 1990). The latter is more likely, as young corn plants were growing in Operation 1 at the time of the eruption (Zier 1983, Beaudry and Tucker 1989, Tucker this volume). The plants and the method in which they were planted remain well preserved for our observation. The dental plaster used to fill the voids showed us cobs growing on the stalks in some cases. The western excavations were also useful in that they uncovered the first large concentration of trash excavated to date at Cerén. Analysis of the frequency of various items in the midden and comparisons of these frequencies with the frequencies of items still in use at the time of the eruption should provide us with valuable information regarding discard processes.

Excavation of Structure 9 and its surrounding areas has amplified our knowledge of the inhabitants of Operation 2. Future excavations that will connect the various structures within this operation together should help us to better understand the relationships between the structures, and thus enhance our understanding of household adaptation in the southeastern periphery of Mesoamerica during the Middle Classic.

Chapter 9. 1990 OPERATION 4 PRELIMINARY REPORT

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INTRODUCTION

Operation 4 consists of excavations in the area of a geophysical anomaly located approximately 15 meters west of Str 3 (Figure 1). The anomaly was a strong one, but relatively limited in areal extent (ca 10 m square; see Loker 1983, Spetzler and Tucker 1989). It was not tested by drilling.

Excavations were initiated on July 12, 1990 and lasted until August 17 with five students from Western Michigan University, up to seven skilled Salvadoran excavators, and myself as director. This portion of the excavations was conducted as a field class for the students, and was supported by various sources: the Patrimonio Cultural and Ministry of Education of El Salvador, Western Michigan University, and the Patronato pro-Patrimonio Cultural of El Salvador. After August 17, excavations continued without the student contingent until December 15. The Salvadoran work force was increased and included experienced excavators and novices in training. This segment of the investigations was supported financially by a Summer Stipend from the National Endowment for the Humanities and with continued support from the Patrimonio Cultural, Ministry of Education, and Patronato pro-Patrimonio Cultural of El Salvador, and the National Science Foundation. Payson D. Sheets was principal investigator. Throughout, Victor Manuel Múrcia was the site foreman and architectural conservator.

EXCAVATION PROCEDURES

Initially, vegetation was cleared and a 10 x 14 m square area over the anomaly was gridded with 2 x 2 meter squares. Because all previously excavated structures (Str 1,2, and 3) were oriented 30 degrees east of magnetic north, this orientation was chosen for the Operation 4 grid on the supposition that a new structure would have the same orientation. The grid units were labelled alphabetically along the NE-SW axis and numerically along the SE-NW axis, with "W" as a prefix to indicate its position to the west of Str 3. In this report, the terms north, south, east, and west are used with respect to this grid orientation unless otherwise noted (Figure 1).

An arbitrary elevation was established above the modern ground surface and labelled 100.00 m. In the field, elevations were measured from this arbitrary datum. It corresponds to a site elevation of 96.29 m. In this report, elevations have been converted to conform to the latter site datum.

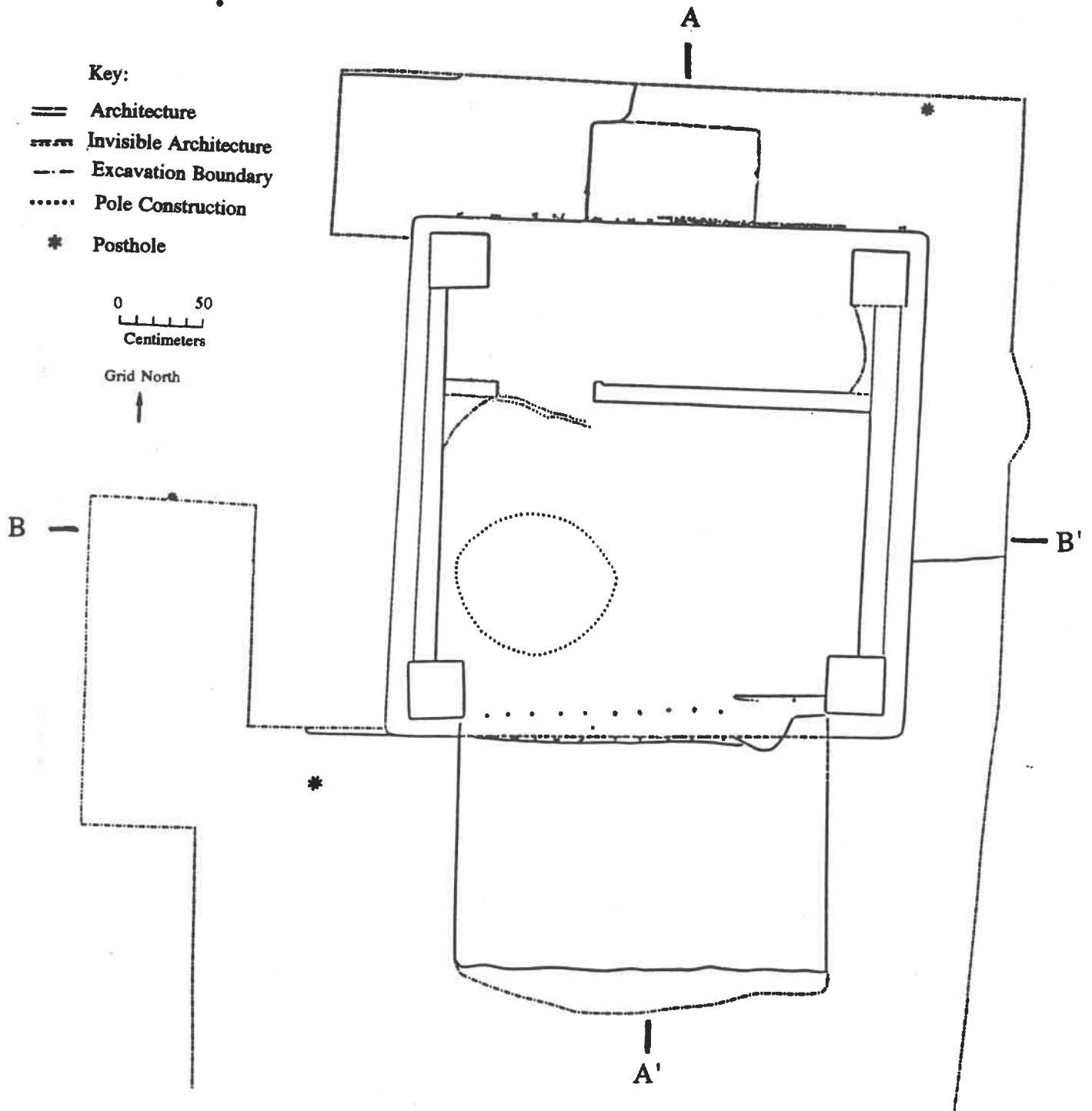
Once the grid was established, excavations were initiated. Excavations in Operation 4 were all done by hand. Picks, hoes, shovels, and wheelbarrows were used to remove the bulk of the volcanic ash. Trowels and other small tools were used to expose and excavate carbonized material, architecture, artifacts, and other cultural materials. The skill level of the excavators was extremely high and quality of the resulting data is excellent.

The first few weeks of excavation were devoted to excavating three 2 x 2 m test pits to locate the structure that presumably was causing the anomaly. These pits were near the center of the anomaly and were spaced to maximize the probability of encountering some part of the structure (Figure 1). The spaced exposure of the volcanic stratigraphy along a N-S and E-W axis also permitted us to observe changes in the slope and thickness of the Laguna Caldera ash layers; these changes are often good guides to the locations of buried structures because of mounding. Mounding of ash layers over the structure was minimal except in Units 3 and 4, immediately over the structure. In all three test units, fragments of branches that were blown in by the Laguna Caldera explosion were found. These were usually carbonized, but in the finer tephra units sometimes were hollow cavities.

The southeastern corner of the structure (Structure 4) was encountered in the southeastern test unit (W-A1). The southwestern test unit (W-A3) revealed part of a clay-paved surface, and the northeastern unit (W-D1) exposed the surface of the white Ilopango ash (*TBJ*). The maximum possible dimensions of the structure were 5.0 m N-S x 3.5 m E-W.

Once the structure had been located and its maximum possible size determined, one of the roof modules provided by the Ministry of Education, covering a 7 x 7 m area, was erected. This was necessary to avoid rain damage during excavations in the rainy season, and provides shelter from the sun as well. It will protect the exposed architecture from the destructive effects of sun and rain in the future as well as moderating the daily and seasonal variation in temperature and humidity.

Figure 1. Plan of Structure 4. Locations of Sections indicated by Letters.



With the roof in place, the excavation area was expanded to a rectangular area measuring 5.5 m N-S x 4.5 m E-W. The original three test pits were partially backfilled, after padding the exposed architecture with cloth and other materials. The larger area was then excavated by stratigraphic units.

A Postclassic midden including many sherds, a partial vessel, some ground stone, and remnants of an obsidian workshop was exposed in the upper excavation levels, within 20-50 cm of the modern ground surface. These materials were contained in and above the volcanic ash from the Boquerón volcanic eruption around A.D. 1000. Unfortunately, the Boquerón ash is difficult to identify as an intact stratum (Hart 1983, Miller 1989 and personal communication); it is heavily mixed with ash from the later 17th century eruption of Playón volcano. This was apparent in excavation profiles where large intrusive holes approximately 1 m in diameter from historic or recent orchard cultivation were evident. In some of the Operation 4 excavations, however, intact areas up to 1 m across were found of the light-colored fine consolidated ash; this may be the tuff described by Hart (1983) and ascribed to the Boquerón eruption. Generally, the cultural materials were in a compact layer in the contact zone where the Boquerón and Playón ashes are mixed. Therefore, they probably post-date the Boquerón eruption and predate the Playón eruption.

By August 17, the tops of four adobe columns and three *bajareque* (wattle and daub) walls had been exposed approximately 3.5 m below the ground surface, and the shape of Structure 4 was apparent. However, there was limited room in which to expose the structure, as the sidewalls of the excavation pit were less than a meter from the structure walls. In addition, the vertical sidewalls of the pit presented a grave risk of collapse. Therefore, the next five weeks were spent modifying the existing roof supports to enlarge the excavation area directly over the structure, adding a second roof module on the south side to double the size of the excavation area, and constructing sloping pit sidewalls. By mid-October, excavation of Structure 4 was resumed and by mid-December the excavation of the structure and an area approximately 5.5 x 3.0 m to its south was complete.

The *bajareque* walls of the structure were in good condition. All walls except for one were still standing and the hollow cavities of the vertical wattles were preserved up to 10 cm above the wall tops. The excellent preservation of the walls was clear as soon as the alignments of vertical pole cavities became apparent. The tops of the walls had been pushed outward slightly, so were no longer vertical. The fallen south wall was also in good condition, although it was horizontal rather than vertical.

Rather than waiting until the entire structure was exposed and vulnerable, we decided to begin consolidation and reinforcement procedures before the walls were exposed. Victor Manuel Murcia and his team began by inserting treated replacement poles into the vertical cavities and solidifying them with a solution of wet clay mixed with the sap of a common weed (*escobilla*). This solution also filled and strengthened cracks in the walls. Once the walls were stabilized, exposure of the wall faces except for balks to support tilted walls could proceed with minimal risk of cracking or collapse during or after excavation.

In October and early November, volcanologist C. Dan Miller examined the volcanic deposits in and around Str 4 to determine the relationship between eruptive events and their effects on the structure (Miller, this volume). The thatched roof of the structure remained in place throughout the Units 1 and 2 phases of the Laguna Caldera eruption, although it was probably charred or ignited during Unit 2 and was damaged by scoria bombs that broke through the roof. The roof collapsed early in the Unit 3 phase of the eruption, followed by the collapse of the south wall.

Miller noted that the Unit 1 ash in the north room is overlain by a layer that is "dark colored and contains charcoal and burned thatch throughout, and may be related to Unit 2.... The origin of this unit is unknown at present." (Miller, this volume). The excavation of this deposit was completed after Miller's departure. It seems likely that this layer is actually a collapsed architectural feature: a pole and daub shelf that burned and fell during Unit 2 or early Unit 3 volcanic activity.

The volcanological evidence also suggested to Miller that the north room had been open on the north side, thus accounting for "very well represented" Units 1 and 3 surge cloud deposits in that room (Miller, this volume). Later excavation revealed that the north side of the room had been closed off with a pole wall of unknown height. This wall was not solidified with daub and even if it had been full-height, probably would not have presented a major barrier for the fine surge clouds and the fine Unit 1 ash would have been able to accumulate in the room. The absence of Unit 2 ash inside suggests that the wall was not destroyed until the Unit 3 phase of the eruption.

Most of this chapter is devoted to a description of the architecture, artifacts, and other features in and around Structure 4. After last season's eye-opening discoveries, we anticipated good preservation in Str 4. But this structure surpassed even our high expectations; it is remarkable for the excellent preservation of both architecture and organic materials. The chapter concludes with a brief discussion of the function of the structure, a comparison with other residential structures, and the relation of Str 4 to the household and community.

ARCHITECTURE

Structure 4 (Figure 2) is a small building about 3.25 m square and with a maximum preserved height of about 2.25 m above the surrounding ground surface. It is a two-room thatch-roofed structure erected on a platform. The structure is oriented approximately 30 degrees east of magnetic north. To facilitate description, the building is considered in four parts: the platform or substructure, the superstructure rooms, the roof, and surrounding areas. Observations on non-portable features, construction techniques, construction history, and the preservative and destructive effects of the volcanic eruption are included here; artifacts are described in the following section.

SUBSTRUCTURE

The substructure is an elevated platform measuring about 3.25 m N-S x 3.20 m E-W. Although almost perfectly square, it is slightly longer on its N-S axis. In addition, the west side is approximately 8 cm (3.28 m) longer than the east side.

The height of the platform above surrounding clay-paved ground surfaces is variable. On the northwest corner, it rises 69 cm. On the northeast, the surrounding floor is higher and the platform is 48 cm high. On the southwest corner, the platform is 78 cm above the surrounding clay-paved floor, and on the southeast corner, it is 76 cm high. Clearly, these variable heights are partially due to modification of the surrounding ground level by paving and raising floor areas, especially on the north side. Where the original ground surface is visible on the south side of the structure, there is a slight slope down toward the south and west as in most of the area of the known site.

The surface of the platform appears level but actually is not. The northeast corner of the platform is 9 to 14 cm higher than the other corners. The higher elevation of the northeast corner extends into the east side of the north room, which is 8-9 cm higher than the floor elsewhere in the structure. The surface in the west side of the north room and the entire south room is within 1 cm of horizontal.

Platform construction techniques and materials are unknown, as no exposure of its core was possible. It is clear, however, that at least some of its exterior surfaces were finished by smoothing on an additional layer of clay. This finishing is most apparent on the north side near the northeast corner and on the east side, where the layer adhered poorly and is cracking and flaking off of the original surface. The heat of the Unit 2 volcanic ash and burning roof thatch that landed adjacent to the structure probably caused this deterioration. In most areas, the added layer is approximately 0.5 cm thick. However, approximately 30 cm below the platform surface on the east side, near the northeast corner, it is up to 2.0 cm thick. It is unknown if the top surface of the platform was also re-finished; the higher elevation of the northeast portion suggests that it was, but the surface is so well-preserved that we can't tell. The platform probably was fired upon completion (Wolfman, this volume).

SUPERSTRUCTURE

The Str 4 superstructure has two main elements: columns and walls. These were erected on top of the platform, leaving 11-13 cm of the platform exposed as ledges on the west, south, and east sides. The columns and walls were erected as separate units and are not structurally unified.

Columns

Four columns are located symmetrically at the corners of the platform, inset 11-13 cm from the platform edges. Their dimensions are very consistent: either 35 x 35 cm or 35 x 36 cm. All vertical surfaces are smooth and well-preserved.

The height of the columns is variable and hard to measure exactly because the tops of the columns were modified to retain horizontal roof beams. Clay that was packed around the beams obscures the original top surface of the columns. Measured from the adjacent floor (platform surface) to the base of

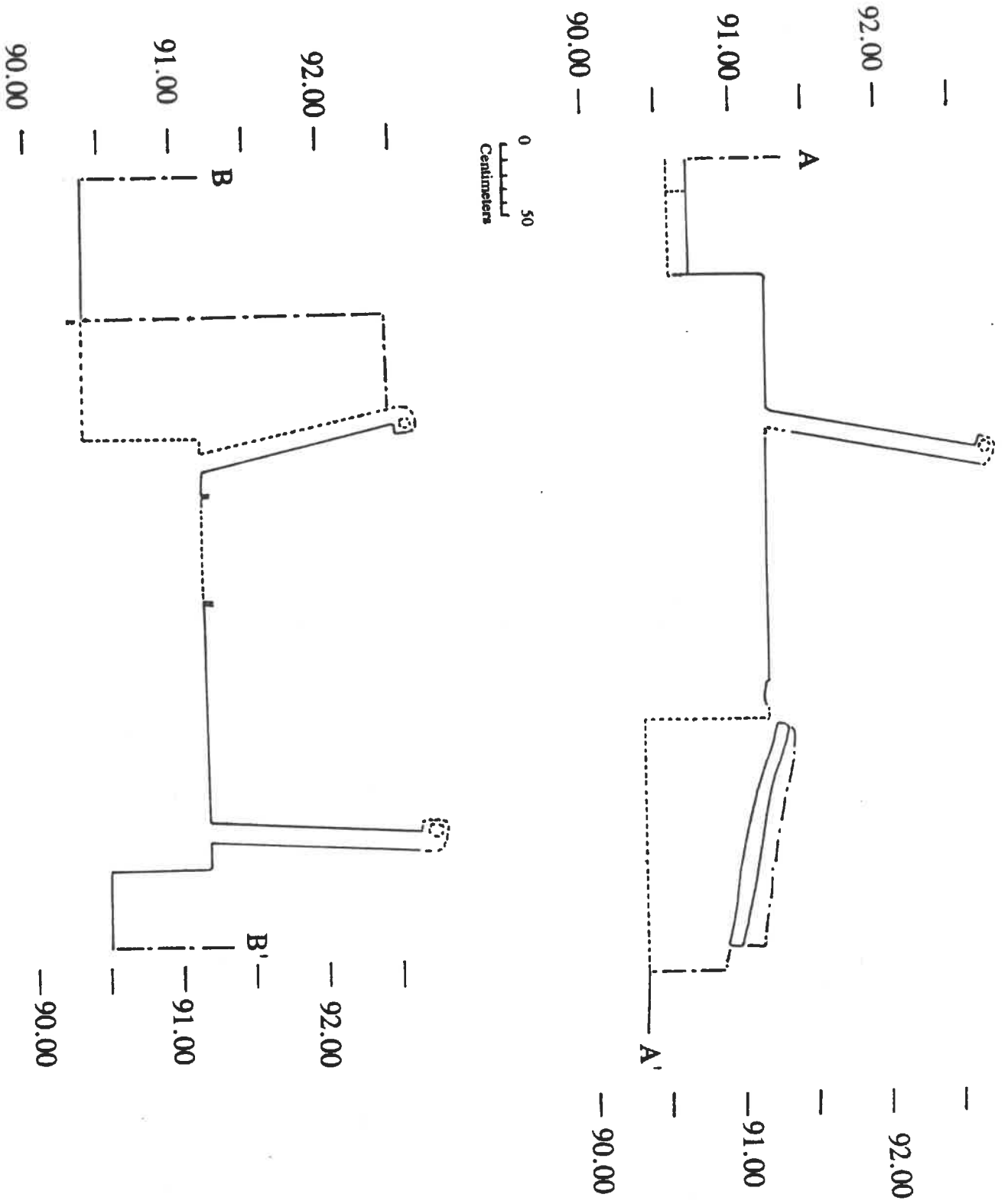


Figure 2. Sections of Structure 4. Section A-A' is N-S, and Section B-B' is E-W.

the beam cavity, the northeast column is about 1.40 m high; the other three columns are about 1.45 m high. These variable heights compensate for the variation in floor level to some extent; the roof beams were closer to horizontal than the floor.

Walls

Four *bajareque* walls define the two rooms of the superstructure. Three are located on the east, west, and south sides of the structure; the fourth wall divides the interior space into a north room and a south room. A pole wall forms the north structure wall.

The walls have an internal framework of vertical and horizontal poles, each about 2 cm in diameter. The vertical poles were set into holes in the platform, some over 30 cm deep. Where these holes are exposed along the south side of the platform, they are 3 to 4 cm in diameter. It is unclear whether they were formed when the platform was built or afterwards.

The walls were covered with a clay mixture including abundant chopped grass and the surfaces were smoothed. The vertical poles extended at least 10 cm above the tops of the walls. Wall thickness is about 10 to 13 cm. There is no structural bond where walls and columns abut, although the clay of the walls was smoothed to cover the abutment. The walls were aligned with the exterior sides of the columns. Thus, the columns were indistinguishable on the outside the structure, but formed projecting corners inside the rooms. Likewise, there is no structural bond where one wall abuts another.

East and West Walls

The east and west walls are still standing, although the upper portions were pushed outward by the force of the volcanic explosion. There are 15 vertical poles in each wall forming a single straight line and spaced 15 to 20 cm apart. The upper part of the west wall was pushed out enough to expose the cavities of some of the higher horizontal poles of the framework; these alternate between the interior and exterior sides of the vertical poles and probably were woven into the vertical framework.

Horizontal beams 7 to 13 cm in diameter connected the columns on the east and west sides of the structure. These rested on the columns and were encased in the wall tops and covered with clay to form cornices. The cornices were on the interior of the walls. The base of these cornices is 1.37 to 1.40 m above the room floors. None are well enough preserved to determine their depth, but the beams project from the walls about 8 to 10 cm; if only a thin layer of clay covered the beams, the cornices probably projected about that much as well. The vertical poles of the *bajareque* walls projected up on the exterior side of the beams.

South Wall

The south wall was knocked down early in the Unit 3 phase of the volcanic eruption; it is intact but lying almost flat outside the structure. Although somewhat crumbled along its top edge, it was at least 1.55 m high. This wall had 13 vertical poles; the holes in the platform are visible and match the cavities in the adjacent fallen wall. The depth of these holes is still unknown. Spacing of the vertical poles varies from 14 to 20 cm and is usually 16 or 17 cm. There were at least 31 horizontal poles. In the lower 50 cm of the wall, each horizontal pole alternates between interior and exterior sides of the verticals but in the upper portion, two adjacent horizontal poles may be on the same side of the verticals.

Because of the damage caused by the explosion and collapse, it is unclear if there was a horizontal beam embedded in the top of the wall. There is no evidence of a cornice or embedded beam along the top of this wall. However, one may have rested on top of the east and west beams.

Dividing Wall

The wall that divides the interior space into two rooms is 1.03 m south of the northern platform edge and parallel to it. It abuts the east and west walls and contains a doorway connecting the north and south rooms (the only access to the south room). West of the doorway, the wall is 28 cm long. The east segment, from the doorway to the east room wall, is 1.78 m long. The doorway itself is 60 cm wide.

The west segment of the wall contains at least two vertical poles. The east wall segment contains 8 vertical poles spaced 18 to 22 cm apart except for the two poles nearest the east door jamb which are 14 cm apart. At the west and east ends of the wall, vertical posts about 5 cm in diameter were also encased by the wall. These extended above the wall and probably were part of the roof support system.

The two segments of the dividing wall were connected by a beam that forms the lintel over the doorway. This beam, 9 cm in diameter, was placed on top of the east and west beams and was covered with clay. The vertical poles in the walls projected up on the south side of the beam. The wall was about 1.58 m high to the top of the beam.

The clay-covered beam forms a cornice along the top of the north face of the wall. The cornice projected 6 cm, was about 14 cm high, and was roughly squared. Most of it was knocked down by the volcanic explosion and it is unclear whether the portion over the doorway was also encased in clay. The height of the doorway was a maximum of 1.45 m, the distance between the floor and the beam cavity.

A vertical cornice or pilaster frames the east edge of the doorway. It projects about 3 cm from the north wall face and is about 9 cm wide. It is rounded rather than squared, and somewhat sinuous. It may have been a later addition rather than part of the original design as it is very uneven and roughly finished and there is no matching pilaster on the west door jamb.

North Pole Wall

The north wall is unlike any of the other structure walls. It is made of poles that were placed vertically against the north side of the platform. The lower parts of these poles were preserved as hollow cavities that were cast in plaster, exposed, and left in place. Some of the pole cavities were not preserved, and some of the preserved sections of wall were slightly twisted and displaced by the force of the volcanic explosion. However, all of them retain their vertical position.

The poles are generally about 1.5 to 2.5 cm in diameter. In surface texture they resemble *vara de castilla* or *vara bofa*. The original height of the poles is unknown as none were preserved above the level of the platform surface, but they probably reached to some substantial height above the platform surface.

Some of the poles were set into the clay-paved floor adjacent to the platform. With one exception, these were in the western one-third of the wall, where the floor is at a lower level. The exception is the single pole closest to the east edge of the platform which was set into the paving of a higher-level floor. This pole, located 15 cm from the northeast platform corner, also has an unusually large diameter of about 3 cm. The depth to which these poles were set is unknown. They indicate that at least the western 1/3 of the wall and the east end of the wall were anchored into permanent positions.

The central portion of the wall was not anchored. These poles are resting on the higher-level paving. In one section 22 cm long, the poles were bound together pairwise with 2-ply twisted string about 4 cm above the floor. A similar bound pair is located 27 cm to the east; this binding is 8 cm above the floor. Very likely, the segment between these preserved parts was also tied; the preservation in this area was poor at the level of the binding. It was also impossible to determine the east and west limits of the binding, although it does not seem to have extended west into the zone of anchored poles.

The door in this wall must have been located in the eastern 2/3 of the wall, where the poles are not anchored. The lengths of the two tied segments plus the poorly preserved segment between them add up to about 55 cm, which approaches the width of most of the doorways in clay walls in other excavations. However, this segment is not centered on the platform, nor is it aligned with the interior doorway. Possibly, all or most of the poles on the higher level floor (except the anchored pole at the extreme east end) were movable and formed a wide door that could be opened and closed. Apparently, it was closed when the volcano exploded; despite the uneven preservation of pole cavities, there is no gap large enough to consider an entrance.

Rooms and Room Features

The walls form a north room and a south room. The entrance to the structure was on the north, and the only access to the south room was from the north room, through the doorway in the dividing wall.

North Room

The north room is the smaller of the two rooms and measures ca 2.7 m east-west x 1.03 m north-south. The columns at the north wall ends project into the room, forming nooks in the east and west ends of the room. The total floor area is about 2.78 square meters.

As described above, the doorway from the north room to the south room is offset to the west of center. The west jamb wall is only 28 cm long, the doorway is 60 cm wide, and the east jamb wall is

1.78 m long. The doorway was about 1.45 m high and was framed along its west edge with a rounded pilaster. The lintel beam may have been clay-covered and continuous with the cornice running along the top of the wall. The east and west walls (only 65 cm long in the north room) also had cornices along their top edges. The columns are undecorated.

Elevated Shelf (*Tabanco*).

The north room probably had a high *tabanco* or shelf installed across its entire east-west length. None of this feature was found *in situ*, but its general form and construction can be inferred from the collapsed remains.

The collapsed *tabanco* formed a layer of clay fragments with impressions of poles. This layer was resting on Unit 1 ash and was below burned roof thatch. Ceramics and other artifacts that had been resting on the *tabanco* fell with it; these items were above the layer of clay fragments and also were covered by the roof thatch. The layer of impressed clay fragments was restricted to the north room, although a few pieces were found just off the north edge of the platform at the approximate level of the platform surface, and an occasional fragment was found outside the east wall by the north part of the platform.

The *tabanco* was constructed with poles that were laid side-by-side. Usually only 0.5 cm or less separates the pole impressions. The poles themselves are small-diameter (1.5-2.5 cm) and the texture of the pole surfaces in the impressions resembles *vara bofa*. One daub fragment (FS 224) retained bits of two-ply twisted string in the pole impression, indicating that the poles had been tied together. At least the upper surface of the poles was daubed with the clay/grass mixture commonly used in construction.

The original location of the *tabanco* is difficult to reconstruct. The fragments were in a fairly even layer throughout the room, suggesting that they had fallen more or less vertically from their original position. The *tabanco* probably was as long as the room itself. There is no sign of attachment or embedding in the walls, or of posts that might have formed independent supports. The *tabanco* poles probably rested on top of the east and west walls of the rooms, i.e., on the beams that formed the cornices. An original height below the level of the wall tops seems unlikely because it would have blocked the doorway into the south room; the concentration of fallen vessels is highest in the area near the doorway. The rarity of daub fragments outside of the structure suggests that the *tabanco* did not extend outside the room, or at least was not daubed with clay.

It is possible that these fragments represent daub from the north pole wall. However, this seems unlikely for several reasons: 1) no sign of daub was found on the existing wall poles below the level of the platform surface, 2) if the north wall had been daubed, many fragments undoubtedly would have fallen to the north and been found off of the platform itself, and 3) numerous vessels and other items had apparently fallen with and on top of the daub, including large storage jars; it is highly unlikely that these were all hanging from the pole wall, especially on the outside (assuming that the wall would have been blown over to the south).

Door.

The bottom 12 cm of the pole door between the north and south rooms was recovered from Unit 1 ash as a plaster cast (FS 275). It was closed at the time of the eruption. The door appears to be intact, as it is only 1 cm shorter than the width of the doorway. It was just south of the doorway and was probably held in place by some kind of binding to the jar handles embedded in the door jambs on the south side (see below). The height of the door probably matched the height of the doorway.

The door consists of two adjacent rows of poles approximately 1.5 to 2.0 cm in diameter. In each row, the poles were tied together in pairs. This binding was 3 to 5 cm above the bottom end of the poles. Presumably, the poles were also bound at higher intervals. The two rows of poles also were bound together originally. At the east end, the two rows were bound with the same string used to tie the poles. In some places, traces of what may be a smooth flat binding, possibly strips of vine or bark, are apparent, but this binding is broken and the rows have been separated by up to 2 cm. Numerous small fibers branch out from the poles; it is unclear whether these were blown in with the volcanic ash or whether they had been attached to or interwoven with the poles.

South Room

The south room measures 2.6 m east-west x 1.79 m north-south. As in the north room, the columns project into the room at the corners. The total floor area is about 4.58 square meters.

The cornice and pilaster that decorate the north face of the dividing wall are not present on the south face. However, the east and west walls have cornices projecting into the room along their top edges. The interior face of the collapsed south wall has not yet been exposed, but no cornice is apparent in the wall profile. The columns were apparently undecorated.

Embedded Jar Handles.

Numerous jar handles were found embedded in the walls. The orientation of the handles is consistently vertical. The surface layer of clay on the walls was absent around these handles so that the loops were accessible. The following measurements are to the mid-points of the handles.

The west room wall has one handle embedded in it, located 50 cm north of the southwest column and 98 cm above the floor. On the opposite east wall, there is a matching handle located 40 cm from the southeast column and 1.0 m above the floor.

The north room wall has a variety of handles. One pair was located near the east door jamb. One handle, no longer in place, was located near the top of the doorway ca 1.28 m above the floor and ca 18 cm from the jamb. The other is near the bottom of the doorway about 8 cm above the floor and 20 cm from the jamb. A matching set of handles probably is located by the west door jamb, but to prevent collapse we were unable to expose this wall face. These handles probably functioned as door-holders.

Two more handles are located east of the doorway. One, 87 cm from the east door jamb and about 1.06 m above the floor, is broken and partly displaced, but both pieces are still in the wall and the lower half forms a hook. It may have been broken while the structure was still in use. The other is 60 cm farther east and is located 33 cm from the northeast room corner and 1.1 m above the room floor. It is intact.

The interior face of the south wall has not been exposed; it may also have embedded handles in it.

Granary.

A permanent corn bin was built on the floor in the west part of the south room. Although presenting a circular appearance, it measures 1.0 m east-west x 0.78 m north-south. Its west side is only 10 cm from the east room wall; its south side is about 27 cm from the south room wall. It was at least 50 cm high.

The bin was made with poles having a diameter between ca 1.0 and 1.5 cm arranged in a circle. The pole cavities were filled with plaster, but the casts have not been exposed. The exterior surface of the poles was plastered with a thin layer of clay that was smoothed at the base to form an invisible joint with the floor. The maximum preserved height of the clay surfacing was only 18 cm. It is unknown if the poles were tied together pairwise like the poles of the north wall and door, or if they were set into the room floor.

Inside the bin, the floor and lower walls were padded with several layers of fibrous plant material. There are at least two layers, laid perpendicular to each other and in strips about 9 to 14 cm wide. The strips were not woven either internally or with each other. The fibers are pressed flat against the floor and against the interior of the pole walls to a maximum preserved height of 8 cm above the floor. The fiber layer is only about 2 to 3 mm thick currently but is probably partly decayed and compacted. It may have been much more loosely installed originally to provide a moisture barrier, ventilation and padding for the corn on top of it.

There is no doubt that this feature is a corn bin because corn and only corn was found in it. The corn was recovered in the form of carbonized grains and cobs, partially decomposed grains, and cavities that were preserved as plaster molds (FS 106, 108, 109, 129). The casts are of whole ears of corn with the grains still on the cob. There was no sign of husks. Most likely, the corn had been dried and shucked, and then placed in the bin for immediate use, i.e., within a few weeks. The fiber padding would have protected it from the dampness of the clay floor and the clay surfacing on the bin walls may have helped prevent infestation. However, the latter was apparently insufficient protection, as the skeleton of what may be a rat (FS 134) was found among the corn. A sticky brown residue (FS 190) was

present on the padding fiber in the center of the bin; it has not been analyzed yet so its origin is unknown.

It is possible to make a rough estimate of the volume of corn in the bin at the time of the eruption. The area of the bin is approximately 0.61 square meters. The pole walls were preserved up to 50 cm high. Although the highest corn remains were recovered about 42 cm above the floor, there was a cavity under one of the hard ash layers in the upper part of Unit 3 that was up to 80 cm above the floor. This suggests that the corn had been piled about that high but settled during decomposition. Assuming that the corn was piled 80 cm high and that the padding was only a few cm thick, the bin may have held about 0.5 cubic meter of corn.

ROOF

The roof of Str 4 collapsed late during the Unit 2 phase of eruption, but there is good evidence with which to reconstruct its appearance and support framework. In addition to partially carbonized thatch, a variety of other roof components were preserved. These include the ridge pole, several horizontal beams and rafters, and vertical support posts. In general, they were recovered in the form of hollow cavities, but some parts had been carbonized.

Roof Elements

The grass thatch was up to 10 cm or more thick. The ridge pole was oriented north-south along the center of the building and the roof sloped down to the east and west. The eaves of the roof extended beyond the walls, creating sheltered areas adjacent to the structure.

The ridge pole had fallen onto the building and cracked when it landed on the dividing wall, but its original north-south orientation was shifted only slightly. It was found with a NNW-SSE orientation. The preserved portion of the pole is 3.47 m long and has a diameter of 6 to 9 cm.

The east and west horizontal beams were embedded in the tops of the columns and the east and west structure walls. Beam diameters were 10 to 13 cm. The preserved cavities of these beams extended at least 30 cm and up to 45 cm to the north and south of the columns. The maximum preserved beam length was 3.84 m on the west side.

An excellent candidate for a north horizontal beam was found just north of the platform. Its cavity, oriented WSW-ENE, was located 25 to 85 cm from the north side of the platform in the lower part of the Unit 3 ash. Presumably it fell after the thatch itself burned and collapsed. The preserved cavity was 2.6 m long and had a diameter of about 13 cm. The length corresponds almost exactly to the distance between the two northern columns.

The original location of this north beam is difficult to reconstruct. It seems unlikely that it was placed on the north columns for two reasons: 1) there was no sign of its presence in or on the preserved clay packing of the east and west beams, and 2) because the eruptive force was from the north, it probably fell some small distance to the south of its original location.

The north beam may well have rested on its own set of vertical posts located north of the platform. One possible original location may be about 75 cm north of the platform. A single posthole was found here, only about 45 cm from the east end of the pole. Alternately, its location may have been about 1.6 to 1.8 m north of the platform. Three vertical hollows, two of which are approximately aligned with the structure columns, have been located here, although the occupation surfaces have not been exposed this far from the structure.

The first possibility seems more likely, as the latter three cavities are not a consistent distance from the platform and may pertain to the unexcavated Structure E north of Str 4 (see below). The layer of fallen roof thatch extends at least 30 cm but not more than 50 cm north of the single posthole; an unexcavated balk is located here. This is a reasonable distance for overhanging eaves. The edge of the prepared clay floor is also 30 to 50 cm north of the posthole.

No south horizontal beam has been found, but it may be preserved under the fallen wall. There is no evidence to suggest that it was embedded in the top of the south wall or that it rested across the top of the southern columns. It may have been supported outside of the structure itself. A posthole about 30 cm south and 45 cm west of the southwest platform corner indicates a possible location, although no posthole was found in the corresponding area southeast of the southeast platform corner. The clay-paved floor on the south side of the platform extends more than 1.5 m farther south from the post hole.

However, the fallen thatch extends no more than 1.4 m from the south side of the platform, it is thickest within 1.0 m of the platform.

A vertical post cavity was found about 1.3 m west of the platform, approximately centered between the north and south edges of platform. This post was tilted slightly to the south but otherwise seems to be in its original location. It appears to have been forked at the top. The cavity (FS 29) has been filled with insulating foam at the bottom and plaster at the top but has not been excavated.

Very likely, this west post marks an external support for the west edge of the roof and supported a horizontal beam parallel to the west side of the structure. The area along the west side of the structure has not been excavated. The fallen thatch layer was quite thick between the post and the platform, but quickly thinned and disappeared to the west of the post. This western post may be aligned with the western-most of three posts located to the north of the structure and discussed above with respect to the location of the north beam.

Vertical support posts preserved as cavities also were located where the room dividing wall abuts the east and west structure walls. These were embedded in the dividing wall and projected an unknown distance above the wall. The best preserved example was at the juncture of the east and dividing walls; its diameter at the level of the wall top was about 5 cm.

At this junction, it was possible to see the spatial relationship between the vertical and horizontal members of the roof support system. The east horizontal beam was the largest. The perpendicular horizontal beam in the dividing wall rested directly on top of the east beam and extended beyond it (only about 6 cm of this extension was preserved). The vertical post, located in the interior corner formed by the two horizontal beams and perpendicular to both of them, was touching both of them. Very likely, all three members were bound together with vine or rope before being covered with clay.

At the junction of the room dividing wall and west wall, a possible diagonal rafter was preserved in its approximate original relation to the horizontal beams. This was a short fragment of stick (about 65 cm long and 4 cm in diameter) that joined the cavities formed by the two horizontal beams. Presumably, these three pieces and the vertical post were bound together so strongly and were sufficiently protected from the heat by Unit 1 ash that when the roof burned and fell, the diagonal piece broke farther up its length and not at the joint.

Other parts of the roof were less well preserved. Most of the rafters burned and broke when the roof fell and were lying in pieces under and in the thatching itself. These rafters were usually 2 to 4 cm in diameter. The thatching itself was probably about 10 cm thick. Some possible pieces of carbonized vine or coarse rope were found among the thatch and rafters; these may have been used to bind the thatch to the rafters.

Total Roofed Area

The total roofed area can be estimated by the location of roof support posts, the distribution of burned thatch, and to some extent, paved floor areas. Unfortunately, the excavations did not extend very far from the structure except on the south side, where the fallen south wall prevented excavation adjacent to the structure. On the north side, a strip 90 cm wide was cleared to floor level. On the east side, the exposure was only 60 cm wide. On the west side, a balk 70 cm wide was left against the structure, and only a 1 x 2 meter area was excavated to the original ground surface west of the balk, exposing a short strip ca 0.7 to 1.7 m west of the platform. On the south side, only the floor adjacent to the southwest platform corner and near the southeast corner was exposed. South of the fallen south wall, approximately 13 square meters of the original ground surface was exposed. Therefore, the following reconstruction of exterior roofed areas is somewhat conjectural.

On the west side, the support post and the layer of fallen thatch suggest that the exterior roofed area was about 1.3 m wide. On the south side, the edge of the roofed area is suggested by a post hole and the deterioration of the clay-paved floor 30 cm from the building. On the north side, a posthole ca 75 cm from the platform and boundaries to both the thatch layer and prepared floor 30 to 50 cm north of the posthole suggests a roof overhang approximately 1.0 m wide. No evidence of roof supports was recovered in the narrow excavated strip east of the structure, but the well-paved floor and thick layer of fallen thatch indicate a minimum 60 cm -wide roofed area, and probably more. Assuming symmetry with the west side, it would have been about 1.3 m wide.

A conservative estimate of the total roofed area is about 26.1 square meters (4.5 m north-south by 5.8 m east-west). This is two and one-half times the area of the platform (ca 10.4 square meters) and about three and one-half times the floor area inside the structure (7.36 square meters). The exterior roofed area (ca 15.7 square meters) was more than twice the interior roofed area. This estimate of roof area may be corrected if driplines and walkways are identified when excavations are enlarged.

SURROUNDING AREAS

As described above, only limited areas around the structure itself were exposed. However, these are interesting because they exhibit considerable modification of the ground surface. Clay-paved floors surround the structure, and on three sides these were raised. An agave garden was discovered south of the building, and the edge of another structure was found to the northwest.

North and East Sides

On the front or north side of the structure, a large clay step was located against the platform originally. Subsequently, the floor to the north and east of the step was raised to the level of the step's surface. The outline of the north and east edges of the original step is visible due to compaction of the later floor around it. The west side and northwest corner of the step remained uncovered. The northwest corner of the step is clearly visible because of erosion on the edge of the added floor, probably due to foot traffic and settling between the lower and higher floor levels.

The original step is 1.02 m long east-west and about 60 cm wide north-south. It is 12 cm high on its west side, where the original lower floor level was retained. It is centered between the east and west sides of the platform.

When the floor to the north and east of the step was elevated, the step was coated with a new layer of clay about 2 cm thick which is continuous with the surface of the raised clay floor. The raised floor extends between 1.35 m and 1.85 m north of the platform; this area is still unexcavated.

The raised floor also continues around to the east side of the structure; its eastern boundary is beyond the 60-cm wide excavation on the east side of the structure. On this side, its southern edge is located about 2.1 m south of the northeast platform corner. The edge is well-defined, although somewhat irregular. The irregularity may be due to heavy foot traffic.

The raised floor surface north of the structure is smooth and regular. Around the northeast structure corner and on the east side, the floor surface is more irregular than on the north side.

On the east side of the structure and south of the raised floor, there was an irregular layer of clay lumps. The layer is highest where it abuts the edge of the raised floor (about 5 cm below its surface) and slopes down to the south where it gradually becomes continuous with the paved floor on the south side of the platform. Similar lumps were heaped against the southeast corner of the platform. The origin of these clay lumps is puzzling. If it is fallen wall debris, than it is curious that none were found on the raised floor.

Around the northwest corner of the platform, to the west of the original front step and later raised clay floor, the ground was paved with clay. The thickness of this paving is not known. It is even and well preserved. A *metate* (FS 220) still on its forked support posts was found 30 cm from the northwest corner of the structure. These posts were set into the paving. However, because the post cavities were cast with insulating foam and remain in situ, the depth of the post holes is not known.

Northern Structure (Structure "E")

In the northern sidewall of the excavations, northwest of Str 4, the rounded southeast corner of a raised floor was exposed. The floor's surface is about 12 cm above the floor level near the Str 4 northwest corner and approximately even with the raised floor adjacent to the Str 4 northeast corner. Only 90 cm separates the Str 4 platform and the south edge of this floor. It continues north and west for an unknown distance and suggests the presence of another structure to the northwest of Str 4. This suspected structure is designated "E" until excavations are conducted.

West Side

A raised clay floor abuts the west side of the platform. It was exposed only at its southern end, where it is aligned with the south side of the platform. This floor is ca 8 cm high and about 45 cm wide

east-west. It has a rounded southwest corner. Its length is unknown, but it does not extend as far north as the north platform edge, where about 15 cm of the west side of the platform by the northwest corner was exposed.

Only a small area of the clay-paved floor on the west side of the structure was exposed. This area is 1.0 m wide east-west and 2.0 m long north-south, and is located 0.7-1.7 m west of the platform. In this area, the floor slopes down slightly toward the west. The veins of large palm-like leaves were impressed into it. Toward the west edge of the exposed area, about 1.6 m from the structure and near a post cavity (FS 29), patches of *Tierra Blanca Joven* (*TBJ*) from the original ground surface were visible. It is likely that the clay paving in this area was eroded, possibly from foot traffic and/or water erosion if it was beyond the eaves of the roof (see discussion of roofed area above).

South Side

The paved clay surface extended about 2.0 m south of the structure. Although the fallen south wall prevented exposure of the entire area adjacent to the structure, this paving is quite regular and smooth in the exposed areas near the platform corners. Beyond about 1.5 m from the building, the paved surface tends to undulate more. This contrast probably indicates proximity to the original roof dripline; it is also approximately even with the edge of the thickest fallen roof thatch.

From about 2.0 m to 2.5 m south of the structure, the ground surface was primarily *TBJ* with bits of clay occasionally mixed in. Beyond this, the surface is *TBJ*.

Agave Patch and Other Features

About 2.5 -3.0 m south of the southwest corner of the structure, a dense patch of agave plants was exposed. Reyna de Aguilar (1991) has tentatively identified these as *Agave americana*. These were found in the form of cavities reaching as high as 73 cm in the Unit 3 ash, and were cast in plaster. They were growing in *TBJ*. Eighteen plants were identified in a 1.8 m north-south x 1.0 m east-west area. All have tall central stalks. Several more plants with tall stalks or stems extend the patch another 90 cm to the west; the lower portions have not been exposed but they are presumed to be the same type. The western limit of the patch has not been identified.

The exposed plants are tightly clustered and variable in size. The proximity of the plants to the structure suggests that they were intentionally cultivated. There is no apparent pattern to their distribution within the exposed patch. The *TBJ* is humped up in the center of this patch, although this does not appear to be related to individual plants. One additional agave plant seems to be an out-lier; it is about 1.0 m east of the main patch.

Agave is a good source of fiber, acquired by cutting and processing the leaves. It is difficult to determine if leaves had been cut because most of the leaf casts were incomplete and because the base of most of the plants cannot be exposed without toppling the upper part of the cast. However, some long leaf impressions were visible in the ash and one long leaf was cast. These leaves were up to 38 cm long and were located near the bases of the plants. Evidently, the plants had not been exploited for their leaves for at least one growing season prior to the eruption.

One of the agave plants closest to the structure had two pieces of string draped over one of its leaves. This two-ply twisted string is thicker than the string used in the construction of walls, doors, fences and other features, but looks similar in other respects. It was not tied to the plant; perhaps it was tossed away as trash or blown in by the volcanic explosion. Its cast remains attached to the plant.

Another agave, also relatively close to the structure, had a potsherd stuck between two leaves. It is unclear if it was there before the eruption or if it was blown in during the blast. There were numerous other sherds around and among the plants, resting on or pressed into the *TBJ* and still *in situ*. These are undoubtedly trash sherds. The sherds and the irregular mound of *TBJ* may have resulted from periodic sweeping of the open areas around Str 4.

At least five non-agave plants were growing in the area south of the agave patch. These have not yet been identified. One has a flower bud and resembles a possible cacao plant (Reyna de Aguilar 1991). No patterning in the distribution of these plants can be seen but this may be because of the limited area exposed.

Seven possible seeds, cast in plaster, were found in the Units 2 and 3 ash in the southern area (FS 253, 277 - 280). These are all round, have a diameter of approximately 3 cm, and have rough surfaces.

Some have vague parallel or concentric ridges around their circumferences. These were probably blown in by the volcanic explosion; some had lodged between the agave plant leaves. They have not yet been identified.

The impressions of leaves (FS 276) from other plants or trees were also found among and near the agave plants and casts were made of several branches in the area of the south of the structure. Some of these are located in the Units 2 and 3 volcanic ash and undoubtedly were blown in by the explosion. One branch (FS 252) had landed against the north side of the agave plants. However, one log with several branches, measuring over 1.0 m long and up to 7 cm maximum diameter, may be in its original position. It is over 4 m south of the building and is resting on the *TBJ* ground surface. No secure species identifications have been made.

SUMMARY OF ARCHITECTURE

Str 4 was a small two-room building on a raised platform. The superstructure corners were marked by solid clay columns. *Bajareque* walls formed the east, south, and west sides; the north wall was made of poles. A *bajareque* wall with a doorway and pole door separated the two rooms. The entrance to the structure was on the north side. The south room could only be reached through the north room. The entire structure and surrounding areas were protected by a thatch roof with a north-south oriented central ridge pole.

Embellishments to the basic structure included cornices on the interior sides of the east and west walls and on the north side of the dividing wall. In the north room, one of the door jambs was framed with a crude pilaster. A pole and daub shelf or *tabanco* was built at or above the level of the wall tops. In the south room, jar handles were embedded in the walls; several of these were probably door holders. A permanent corn bin was constructed in the southwest corner.

The structure itself shows little evidence of remodelling or major alteration. Parts of the platform may have been re-surfaced with clay, but this may have been part of the original construction procedure.

By contrast, adjacent clay-paved exterior areas were modified from their original configuration. Initially, a single large step centered against the north platform provided access to the north room. Later, the floor on the north and east sides of the structure was raised to the level of the step surface. A raised floor was appended to the west side of the platform at some time after the platform was completed.

A raised floor unconnected to Str 4 but less than 1 m away suggests that an unexcavated structure (Structure "E") is located only a few meters northwest of Str 4. Str 3 is located about 17 m east of Str 4; the intervening area has not been excavated and may contain additional structures. The area west of Str 4 is completely unknown. No structures were present within 5.5 m south of Str. 4. This area was largely open space, except for a patch of cultivated agave-like plants southwest of the structure. Other unidentified plants were growing south of the agave patch.

ARTIFACTS, PORTABLE FEATURES, AND ORGANIC MATERIALS

Description and discussion of the contents of Str 4 is presented by area (Figures 3 and 4). Inside the structure, the areas include the north room and the south room. Outside the structure, the areas correspond to excavation boundaries, changes in floor level, or other arbitrary or cultural features. They do not necessarily correspond to specific activity areas. The exterior areas include the north raised floor, north low floor, east raised floor, west floor, the floor around the southwest and southeast structure corners, and the unpaved ground south of the structure where the agave plants were found. All items and their locations are listed by number in the field specimen catalog appended to this report.

NORTH ROOM

The items found in the north room can be divided into two groups: *in situ* items, and fallen or displaced items. *In situ* objects were resting directly on the room floor. Most of the displaced items had been on the high *tabanco*, concentrated over the doorway, and fell when the *tabanco* collapsed.

In Situ Items

Most of the *in situ* items in the north room were ceramic vessels, but some perishable items also were recovered. These artifacts were in the west part of the room, near the doorway leading to the south room.

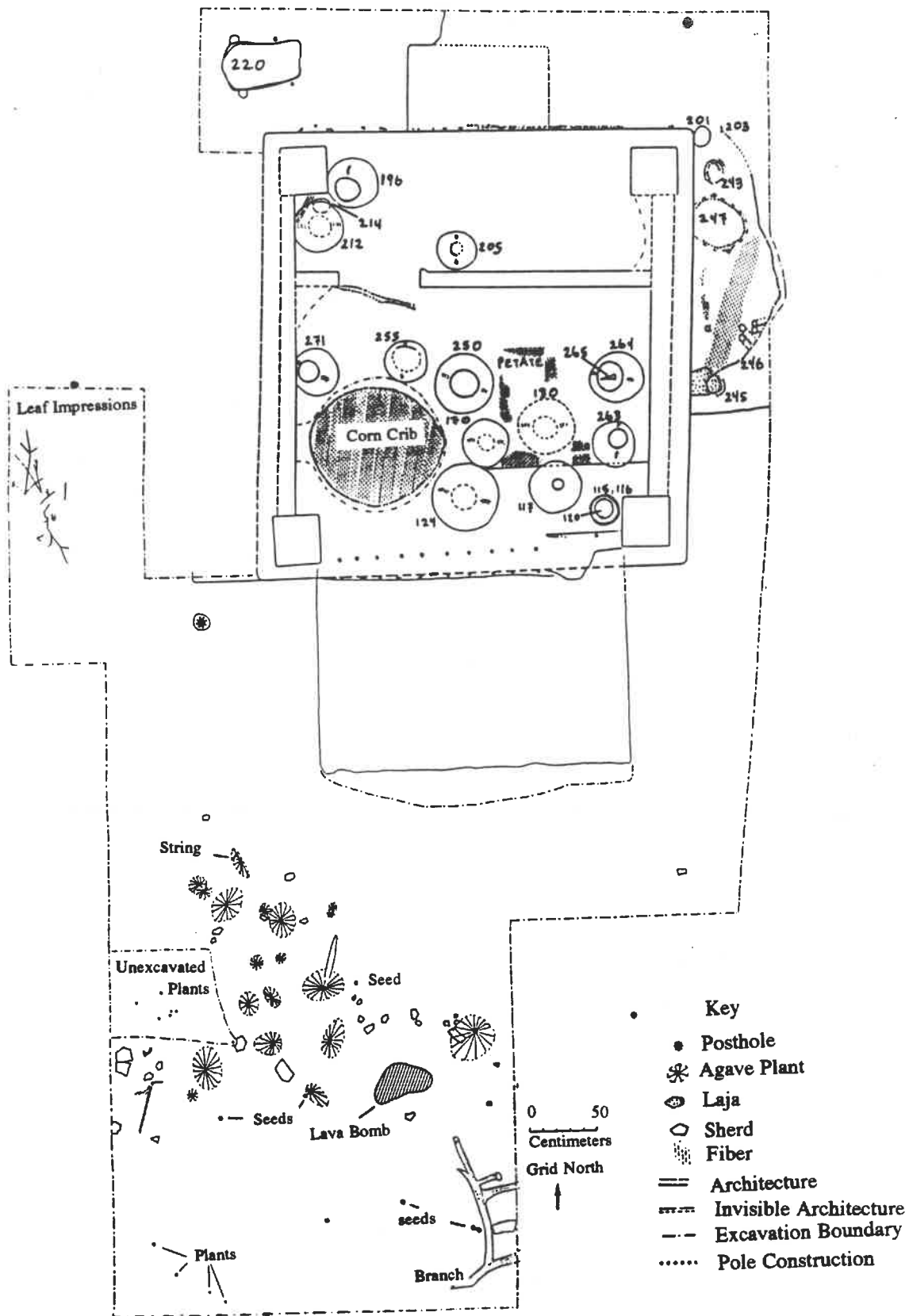
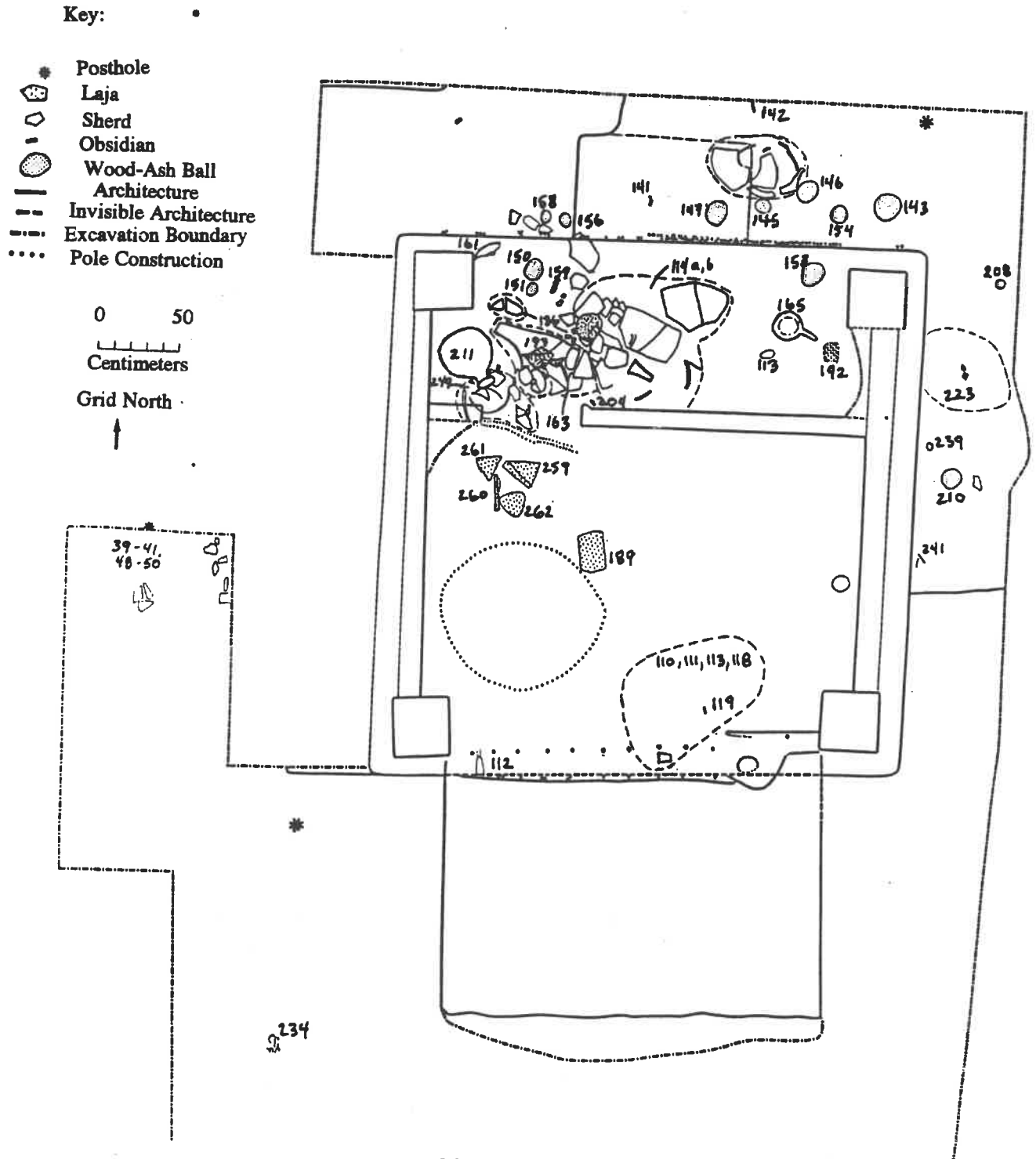


Figure 3. Plan of Structure 4 showing locations of *in situ* artifacts. Numbers refer to Field Specimen designations.

Figure 4. Plan of Structure 4 showing locations of fallen artifacts. Numbers refer to Field Specimen designations.



Three jars were found in the west part of the room. One jar (FS 205) had been placed against the south room wall near the east door jamb; it was apparently empty. Two jars (FS 196, 212) were against the west wall and northwest column. Some unidentified organic contents (FS 217) were collected from the interior base of the FS 212 jar.

In the corner formed by the northwest column and the west wall, there was an irregular lump of red pigment mixed with crushed mica(?) (FS 214) measuring about 9 x 12 x 5 cm. This pigment was not solid but had a convoluted and laminated structure into which Unit 1 ash had inserted itself. It may have been in or on a flexible organic container, perhaps cloth or leather, either painted or containing the pigment. Also in this corner were a pair of parallel adjacent stick cavities (FS 219, not collected) with orange-stained surfaces (the stain is probably from the wood, not from paint). These were each 2.5 cm in diameter and about 20 cm long. Although very like the poles used in construction, it is unlikely that they fell from the *tabanco* or roof because they were in floor contact and were buried by Unit 1 ash. They were not cast and it is unclear what they represent.

The east half of the north room was almost clean. The floor in the east part of the room has a small irregular red stain on it about 5 square cm in area, but there were no lumps of pigment or indications that the entire floor had been painted. The stain suggests a paint spill.

Fallen Items

Most of the artifacts in the north room had fallen from a high original location (Figure 4). The few items in the east one-third of the room were lying in or on Unit 1 volcanic ash and were among or below the *tabanco* daub fragments. Therefore, they either hung below the *tabanco* or fell before the *tabanco* collapsed. In the west two-thirds of the room, the artifacts usually were broken and the pieces were resting on the fragments of *tabanco* daub. They were covered by roof thatch and early Unit 3 ash. The concentration of artifacts was much higher in the western part of the room. Several items that were probably on the *tabanco* or in or on the roof in the northern part of the structure fell onto ash that had accumulated outside of the structure. Balls of wood ash were found in the north room and nearby areas north and east of the platform; these were probably stored high in the north room area.

East Third of Room

One of three items that fell into the east part of the room was a piece of textile with some coarser fibers attached to or adjacent to one surface (FS 192). It was recovered in the form of a plaster cast. Although lying on about 1 cm of Unit 1 volcanic ash, it was touching the floor in one section. Probably it was displaced from its original location by the initial surge, but how far is unclear. The threads are very fine and the weave is very tight. There are approximately 16 threads per centimeter. This may be a piece of cotton cloth.

The coarser fibers associated with the cloth suggest that it may be a piece of unfinished cloth but the association may be accidental. They are similar to the fibers used in a coarser mat (FS 243) on the east side of the building. No sign of spinning or weaving equipment was found anywhere in or near the structure.

A second item was a complete ladle incensario with a modelled effigy animal head at joint of the handle and rim (FS 165). It was found on about 6 cm of Unit 1 ash and touching some fragments of *tabanco* daub. It was upside-down and had carbonized roof thatch inside it. It may have fallen together with the burning roof or landed on top of the burnt thatch. Pressed against the inside wall of the incensario was a fragment of carbonized braided or twisted fiber (FS 167). A similar fragment was found near the incensario in the contact zone between the Unit 1 and Units 2/3 ash strata (FS 187). This may be vine, bark, or manufactured cord used to tie roof elements.

The third item is an ovoid fist-size ball of a waxy organic substance (FS 113). Its surface is irregular but smoothed. The material has not yet been identified. It was among fallen *tabanco* daub fragments and carbonized roof thatch above the floor and was probably on the *tabanco* originally.

West Two-Thirds of Room

Items that fell into the west part of the room include several vessels or partial vessels, sherds, obsidian blades, bone artifacts, and food remains.

At least nine whole or partial ceramic vessels had been resting on or hanging above the *tabanco*. These include two polychrome hemispherical bowls (FS 144, 135), two polychrome tripod dishes (FS 136b, 161 - partial), four jars (FS 211, 163, 114a, 249) and a large piece of an open-mouth bowl (FS 114b). Some of the jars may be partial, but at least two appear to have been complete. Generally, the smaller polychrome vessels had fallen on top of the large jars. However, all were above the layer of *tabanco* daub fragments and were surrounded and covered by carbonized roof thatch.

At least two jars were used as storage vessels. One (FS 114a) had the remains of what is probably cacao seeds inside (FS 177, 181). The second (FS 249) contained a reddish organic crumbly material (FS 251; not yet identified).

One *in situ* jar (FS 196) had no preserved original contents, but the ash in the upper part of the jar had a variety of leaf impressions and seeds of what appear to be cacao, chile, and some bean-like seeds (FS 199, 200). These apparently fell or were blown into the vessel from above.

A bone needle fragment (FS 215) had fallen into an *in situ* jar (FS 212), along with a small sherd (FS 216), and several tiny fragments of red pigment (FS 213). The sherd does not come from any whole or broken vessel that was found. These items probably fell into the vessel from the *tabanco* or roof; they were mixed with fallen thatch, *tabanco* daub fragments, and Unit 2/3 volcanic ash that filled the upper portion of the vessel.

A piece of crudely worked or unworked bone (FS 204; possibly an awl) was recovered in Unit 1 ash. It was about 5 cm from the back room wall, between an *in situ* vessel (FS 205) and the east door jamb.

Carbonized chile seeds were found throughout the western portion of the north room (FS 149, 164, 177, 181). In many areas, the clusters of seeds within pods were distinguishable, and sometimes parts of the pods also were preserved. The chile seeds were especially dense in the areas of two fallen jars (FS 163, 114) and were resting on top of the uncarbonized cacao seeds inside the FS 114 jar. They were also in the carbonized thatch above and below the vessels, and had scattered throughout much of the Unit 2/3 ash layer in the west part of the room. Occasional chile seeds were also found in the south room (FS 125).

The chiles were probably stored in bundles or branches rather than being contained in a vessel. The wide distribution around and inside fallen vessels suggests that they were probably tied to the rafters, but they may also have been placed on the *tabanco*. The consistent and thorough carbonization suggests that they already were dried and ignited easily, in contrast to the cacao and leaves which would have been moisture-laden. However, this may simply be because they were nearer the burning roof thatch and not protected inside vessels.

One of the fallen jars (FS 163) was directly on top of two fragments of andesitic *laja* or tabular rock. These *lajas* (FS 197) were on Unit 1 ash among fallen *tabanco* daub fragments just north of the doorway. A cluster of similar *laja* fragments (FS 259, 260, 261; all refittable) and an unworked cobble (FS 262) were found just to the south of the doorway, also on Unit 1 ash, and another *laja* (FS 139) had landed almost on top of a vessel on the south side of the dividing wall.

The proximity of the *lajas* and cobble suggests that they all were originally in the same location. They may have been resting on the *tabanco*, perhaps being used as pot supports to keep the jars upright or as pot lids. An alternate interpretation is that they were weights on top of the thatched roof. The most likely possibility, however, is that they were resting on top of the wall dividing the two rooms, perhaps even on top of the lintel. This would explain their presence on both sides of the wall and below the fallen vessels in the north room.

Two fragments of an unused obsidian blade (FS 198, 159) were found about 50 cm apart in the Unit 2/3 ash and collapse debris of the north room. They were both in fallen roof thatch in the west half of the room. Very likely, the whole blade had been stored in the thatch.

North Peripheral Area

A number of items were found in the volcanic ash deposits just off the north edge of the platform. These probably were in the north room originally, either on the *tabanco* or in the roof. They include a ceramic vessel and several obsidian blades.

The ceramic vessel (FS 144) is a jar. It was recovered about 45 cm north of the platform and in front of the east half of the room. It was slightly below the level of the platform surface in Unit 2/3 ash.

Roof thatch was found around and above it. From its broken condition and context, it seems likely that it was stored fairly high up in the north room; either on the *tabanco* or hung from the roof. The latter is suggested by the lack of *tabanco* daub fragments associated with it. A few carbonized bean-like seeds (FS 152) were found among the vessel sherds, but it is unclear whether these fell into the sherds or are part of its original contents.

Two unused obsidian blades were found north of the platform (FS 141, 142 [same as FS 162]). One (FS 142) was found about 25 cm north of the fallen jar (FS 144); it was crushed into four refittable fragments. The other (FS 141) was found about 45 cm southwest of the jar. Both were sandwiched between layers of fallen roof thatch, indicating that they were originally in storage in the roof.

Three ceramic sherds also had fallen north of the platform. One (FS 139) was about 70 cm north of the northwest platform corner in fallen roof thatch. The other two (FS 155, 157) were in Unit 3 ash within 10 cm of the west part of platform edge. The original locations of these sherds must have been high in the north room or on the roof.

Wood-Ash Balls

Balls of wood ash were common in the north room, along the north edge of the platform, and around the northeast corner of the platform. A total of 14 wood-ash balls were recovered. They all contain abundant particles of carbon and are soft and porous. They are invariably rounded although not perfectly spherical. Maximum diameters range from 6 to 16 cm; most are 8 to 14 cm in diameter.

The four balls inside the north room (FS 150, 151, 153, 183) all were above the layer of fallen *tabanco* daub fragments. One of these (FS 183) was under the sherds of a fallen jar (FS 114) but on top of the layer of *tabanco* daub fragments. Two others (FS 150, 151) had fallen directly against one *in situ* jar (FS 196) in the northwest room corner. The fourth (FS 153) was near the northeast column.

Seven wood ash balls were recovered north of the platform. Three balls (FS 145, 146, 147) had landed adjacent to a fallen jar (FS 144) beyond the edge of the platform; all of these items probably fell together from the same original location. The others (FS 143, 154, 156, 158) were scattered, but none was more than 25 cm from the north edge of the platform.

Three wood ash balls had fallen to the northeast and east of the structure. Two (FS 210, 239) were found east of the structure within 1.35 m of the northeast platform corner. These were close to each other, resting on Unit 1 ash and directly covered by fallen roof thatch. The other (FS 208) was in Unit 3 ash about 45 cm east of the northeast platform corner.

All of the wood ash balls were found in contexts indicating that they had fallen from high original locations; either the *tabanco* in the north room or the roof itself. Most were in Unit 3 ash between layers of roof thatch but not necessarily touching the thatch. It is possible that these balls had been sitting on the *tabanco* surface. However, it is more likely that they were suspended in some kind of organic container such as a leather or fine-mesh net bag or gourd. This inference is based on several observations: 1) no especially or consistently flat surfaces were noted on the balls, as one would expect if they had been resting on a flat surface, 2) the distribution of balls along the north edge of the platform (over half were within 25 cm of the platform edge) and to the northeast and east outside the structure under roofed areas suggests that they were not originally among the jars and other materials stored on the *tabanco* but were around them, and 3) the size and shape of the balls conforms to the shape of a bag or bowl. Maybe they were hung from the roof or north pole wall, either inside or outside the north room.

SOUTH ROOM

The south room contained a variety of ceramic vessels and other artifacts, organic features, and food remains in addition to the corn bin and corn discussed above. Most of the southwest portion of the room was occupied by the corn bin. The majority of artifacts, both *in situ* and fallen, were in the east half of the room and in the northwest part near the doorway. The following brief description of these will begin with items that were found *in situ*, followed by items that were displaced by the volcanic eruption.

In Situ Items

The majority of *in situ* artifacts in the south room were ceramic vessels. A dozen of these were found throughout the room. All but three are jars; the exceptions comprise a carefully arranged set of

two polychrome bowls and a polychrome cylinder vase. Other items on the room floor include some lumps of raw clay, a seed, and a woven mat.

Of the nine jars in the south room, six (FS 117, 124, 250, 255, 263, 271) had no preserved original contents, although one of these (FS 263) had the bones of a small animal, perhaps a rat (FS 270), that may have found refuge or food in the jar and become trapped.

Three jars did have preserved contents. One jar in the middle of the east half of the room (FS 130) contained large uncarbonized seeds, probably cacao (FS 131, 132). The jar itself was smashed by a lava bomb, but the upper body and rim pieces covered the contents that were still in the base sherds. Some of the seeds had been scattered and were partially under adjacent vessels (FS 128).

An adjacent jar (FS 170) also contained probable cacao seeds in addition to unidentified carbonized small round seeds and round nut shells (FS 172, 174). The seeds in this jar were covered with a layer of cloth (FS 173) resembling gauze or cheese-cloth. The threads are extremely fine but loosely woven, with approximately 8 threads per centimeter. When exposed, the jar was smashed and the cloth was adhering to the interior surfaces of upper body sherds that had fallen onto the seeds in the lower portion of the vessel. It is unclear whether the cloth was originally inside the vessel or covering the mouth of the jar. It presumably was meant to protect the contents from pests while maintaining ventilation. Whether it was successful or not is debatable because a small animal (rat?) had managed to get into the jar but not out again. Its bones (FS 171) were found just below the collapsed upper body sherds.

The third jar with contents (FS 264) was against the east wall of the room. It contained a short pointed antler tool, probably an awl (FS 265). Unit 1 ash covered the tool as well as filling the narrow space between the tool and the curved base of the vessel.

The northeast quadrant of the south room was apparently carpeted with a woven mat resembling modern *petates*. All that remains of this are impressions on the underside of the Unit 1 ash that coated the floor between vessels (FS 133, 179). The southern edge of the mat, located in two areas, is 49 cm north of the south wall. No western border was found but *petate* traces were found up to 1.2 m from the east wall. It may have extended as far as the corn bin, 1.5 m from the east wall. No northern or eastern *petate* edge was located; perhaps it was fitted into the northeast corner of the room. The maximum size of the *petate* was about 2.0 square meters (1.3 m north-south x 1.5 m east-west).

Although up to five jars may have been resting on the *petate*, these are all close to its edges. The center of the mat was apparently left open. The only easy access to the east and south parts of the room would have been across this open area of the *petate*. However, this apparently clear zone is below the embedded handles in the south face of the dividing wall, so some of this space may have been occupied by hanging items that were not preserved or, if they fell, have not been exposed in the unexcavated Unit 1 ash left against the wall.

Several polychrome vessels were found in the southeast corner of the room. The assemblage consists of three vessels: an upright cylinder vase (FS 120) covered by two identical nested inverted bowls (FS 115, 116). This assemblage was touching the west face of the column and was 5 cm from the south room wall. It was tilted just slightly to the west, probably because of currents from the volcanic explosion.

The cylinder vase may originally have held liquid contents. The exterior was coated with clay dust and the interior with a yellowish crust (FS 123), especially toward the base. Of the two inverted bowls, the lower one (FS 116, nested inside FS 115) has dark stains of organic material in the form of two to four parallel stripes from 0.6 to 1.0 cm wide. These cross the bowl and each other at apparently random angles. They are probably the marks of the fingers that wiped food from the bowl (FS 121). The upper bowl had no finger-swipes evident. This assemblage probably represents a set of serving and eating dishes that were not cleaned before being put away in the back corner of the room.

The only other *in situ* items that were found in the south room were several small irregular lumps of raw clay near the south and east sides of the corn crib. These were not collected.

Fallen Items

A variety of items had fallen into the south room (Figure 4). These include items of ceramic, stone, bone, and other organic materials. Although the variety is great, the number of items is less than in the north room.

One polychrome bowl (FS 110, 111, 113, 118) had been shattered and scattered throughout the south room by a volcanic bomb. Pieces were found in and around several jars (FS 124, 130, 170) in the east part of the room. The same bomb also broke several of the *in situ* vessels. The original location of the bowl was probably somewhere to the north or northwest, perhaps on top of the dividing wall.

Several fragments, some refittable, (FS 259, 260, 261) and an unworked cobble (FS 262) had fallen just south of the door between the north and south rooms. Small pieces, probably of the same *laja* (FS 256), fell into a nearby jar (FS 255) about 40 cm south of the east door jamb. These may have fallen from above the lintel (see discussion above). Another sub-rectangular *laja* (FS 189) had fallen onto one side of a jar about 60 cm south of the wall (FS 250); it was in lower Unit 3 ash. This one may have been shaped and used as a grinding stone. It was probably also on top of the dividing wall originally.

Some fragments of red pigment (FS 257) and some carbonized seeds (beans?; FS 258) had fallen into the same jar (FS 255) as the *laja* fragments. All of these items were found in mixed Units 2 and 3 ash in the upper part of the vessel and probably came from the top of the dividing wall or north room *tabanco*. Nothing was preserved in the lower part of the vessel to suggest its original contents.

A small concentration of chile seeds (FS 125) was discovered in the southeast part of the room. These were high in Unit 1 ash above the sherds of a jar (FS 130) that was smashed by a volcanic bomb. These seeds were probably introduced by the bomb from the north room area, where chiles had been stored in the roof or on the *tabanco* (see discussion above).

A complete greenstone celt (FS 112) had fallen onto the broken base of the south wall about 16 cm from the southwest column. It was resting on about 2 cm of Unit 1 ash. Assuming that such a heavy object would not have moved very far laterally, it is possible that the celt was on the south or west wall top above where it fell. Alternately, it may have been hafted and leaning against a wall in the dark corner behind the corn bin. A possible shaft was found in the form of a straight pole cavity projecting from the butt end of the celt and aligned with the celt's long axis. The cavity was only about 14 cm long and had a diameter of about 1.5 cm. However, this latter reconstruction seems unlikely because of the small pole diameter. The pole is more likely from the roof or corn bin and its association with the celt is probably coincidental.

Farther east, a bone needle fragment (FS 119) was recovered near a jar (FS 117). Its original location may have been in the roof, as numerous carbonized rafter fragments were found nearby in the same stratigraphic context (high in Unit 1 ash).

Two organic containers were in the southeast part of the room. One of these (Feature W) was a small round shallow concavity in early fine Unit 3 ash. The concavity was about 11 cm in diameter. The container itself may have been an unpainted gourd or *morro*. The observed diameter may only represent a small portion of the container. It contained some carbonized seeds, possibly beans (FS 107). It may have been in the roof originally, or on top of one of the room walls. Its final resting place was over the broken base of the south wall about 35 cm from the southeast column.

The second organic container (FS 273) was found near the east room wall, about 65 cm north of the southeast column. It had also fallen from a higher location, possibly the top of the east wall. This container, probably also a *morro*, was a small very shallow bowl or plate about 9 cm in diameter and painted red. It was upside-down on about 4 cm of Unit 1 ash. Although the *morro* itself is gone, the paint layers remain. Recovery procedure included cleaning off the upper (exterior) surface, and then encasing the exposed surface and sides with plaster to stabilize the artifact. The plaster cover and collar was then lifted and inverted to clean the lower (interior) surface.

The exterior paint layer, facing up when exposed initially, was almost entirely missing; only flecks of red were still in place. Virtually the entire exposed area was the pinkish back side of the interior paint layer. This surface is now against hard plaster. The interior red-painted surface was almost undamaged. No designs were painted on the interior of the vessel. There is a sizable bump in the center of the *morro*, covered by the interior paint layer, that corresponds to the natural interior topography of the bottom of the *morro*. There was no sign of any contents that might have been in the small plate.

NORTH RAISED FLOOR

The raised floor north of the platform had no *in situ* artifacts on it. However, various items had fallen into the volcanic ash that covered the floor. These probably came from the north room or the roof, and were described in that section above.

There were two primary layers of fallen roof thatch over this area. Both were only partly carbonized. The lower layer was resting on less than 5 cm of Unit 1 volcanic ash. The upper layer was in Unit 2/3 ash up to 30 cm above the lower layer. This layer was heavily carbonized in some areas. The orientation of the thatching was inconsistent, as if sections of the roof had twisted as they fell. However, in many areas, the thatch was oriented to the north or northwest. Most of the fallen artifacts were between these two layers, usually separated from the lower thatch layer by some volcanic ash, but surrounded and covered by the upper layer of thatch.

NORTH LOW FLOOR

The primary in situ artifact found in this area was a *metate* (FS 220) resting on its forked support posts (*horquetas*). It is about 35 cm north of the northwest corner of Str 4 and about 25 cm south of the barely-exposed raised floor to the northwest of Str 4 (see above). Carbonized roof thatch had landed directly on it in a thick layer. Within this thatch was some fibrous-looking mineralized and melted substance (FS 140, 141) that has not been identified. This thatch may have come from the structure northwest of Str 4.

The west end of the *metate* is its high end; this is where the user would have stood. At the high end, the upper surface is about 60 cm above the floor. The surface at the low end is about 18 cm lower. A yellowish fine powdery residue (FS 221) was covering the surface; it was thickest (ca 2 mm) at the low end of the stone. It has not yet been analyzed.

The *horquetas* were preserved in the form of cavities. These were filled with insulating foam and subsequently exposed; they remain in situ. They are single posts that were set into the clay floor. Both fork about 10 cm above the floor. Near the floor, the posts are ca 10 cm in diameter. However, the branches of the east post are thinner than the west ones. None of the branches projected above the level of the *metate* surface. No mano or other artifacts were associated with the *metate*, so it may not have been in use prior to the eruption.

The only other in situ item found in this area was a single tiny sherd that had been pressed into the clay floor near the edge of the platform (still in place).

Items that had fallen into this area and were in the volcanic ash above the floor probably came from the north room or overhanging roof. These were described above in the north room section.

EAST RAISED FLOOR

Both in situ and fallen items were recovered from raised floor on the east side of the structure. No artifacts or features were found south of the raised floor on the east side of the building.

In Situ Items

The only ceramic vessel on the east side of the building was a polychrome cylinder vase (FS 201) on the floor adjacent to the northwest corner of the building. It was badly burned and warped by flaming roof thatch that fell onto it. No contents were preserved.

A pole fence was placed east of the building. Most of the poles had partly or completely decomposed, so several lengths of the fence were recoverable as plaster casts (FS 203, 245, 246). Maximum preserved pole height was 12 cm; the original height of the fence is not known. All of the poles in the fence were slightly tilted to the west, toward the building. The fence was apparently portable, as none of the poles were set into the floor, and the south end of it had been rolled. No evidence was found of any contents. Presumably it was in storage alongside the building.

The poles used in the fence are about 0.75 - 1.5 cm in diameter. They were tied together in pairs using twisted two-ply string. The binding was about 6 to 8 cm from the bottom of the poles. The poles, string, and binding technique are similar to those used in the corn bin, the door, and the north pole wall.

The minimum length of the fence, including the rolled portion, is approximately 2.9 m. About 2.1 m of the fence (FS 246) was extended along the side of the building. The south end of the fence was rolled up and has three layers of fencing (FS 245); it is approximately 80 cm long. The extended portion of the fence veers out up to 65 cm from the platform. The northern-most preserved segment (FS 203) was 20 cm east of the northeast platform corner but it may have extended farther north. The south roll was ca 12 cm from the platform wall and 20 cm north of the south edge of the raised floor.

Two sets of paired sticks were next to the fence within the enclosed area (FS 246). The sticks are straight, parallel, and almost in contact. The two pairs were close together but oriented slightly differently; one set was tilted to the west, the other to the northwest. The upper portions were probably resting against the structure wall. The lower ends of the sticks were resting on the floor and were within 5 cm of the pole fence. They are located about 30 cm and 50 cm north of the rolled portion of the fence.

Another pair of similar sticks was located closer to the structure wall within the area enclosed by the fence (FS 242). Both were resting on the floor at their lower end and were tilted to the west, as if leaning against the structure at their top ends. All six sticks are about 4 cm in diameter.

The uniformity of these sticks, their pairing, and their association with the portable fence invite the notion that they were part of the fence. Perhaps they were the posts for erecting and anchoring the fence when it was in use. When the fence was not in use, apparently the case when the volcano erupted, they may have been stored together with it.

A round basket (FS 247) was located adjacent to the platform and about 70 cm south of its northwest corner (toward the north end of the area enclosed by the fence). The diameter of the basket is 30 to 38 cm (it was slightly compressed in one dimension, probably as a result of disturbance during the eruption). The entire basal section was preserved and the sides were preserved up to about 5 cm high. The basket contained small carbonized bean-like seeds (FS 226, 238). The corners of two *lajas*, or one large one, below the basket were partly exposed, one on the north side and one on the south side. These were presumably on the floor and the basket was resting on the *lajas* rather than directly on the floor.

The basal portion of the basket was made with fiber bundles about 1.0 - 1.5 cm wide arranged in a concentric spiral starting at the center of the base. These bundles were bound with thin cords radiating out from the center. At the edge of the basket, these cords were a centimeter or more apart. The sides of the basket were supported with vertical poles about 1.0 cm diameter. Preservation of the poles was variable and included complete carbonization, partial decomposition, and cavities. They were visible around almost the entire circumference of the basket. These vertical poles may have been bound to flexible sticks (diameter ca 1.0 cm) placed around the exterior circumference; fragments of these were carbonized. Some fragments of possible basketry were found on the exterior of the vertical poles (FS 228). It is unclear how far up the interior of the poles the basketry extended and how it was bound to the poles.

Recovery of the basket required a plaster collar around its perimeter to provide stability. The basket was lifted together with the collar by sliding a rigid piece of sheet metal underneath. The sheet metal was inserted just above the floor and below the *lajas*, so it was impossible to examine the underside of the basket or the *lajas* on which it rested. The clay floor below the basket had a 3 cm diameter strait cavity angled obliquely downward to the west.

A second portable fence (FS 243), also cast in dental plaster, was found about 10 cm north of the basket (also within the area enclosed by the extended portable fence). This is a roll of tied poles resembling the south end of the portable fence; the poles, string, and binding technique are identical, and there are at least three "layers" of fence in the roll. The outside diameter of the roll is about 16 cm; the estimated length of the fence is 1.0 m.

This fence roll is unique in that it was wrapped and tied. The lower end of the roll was resting on a very loosely woven mat of coarse fibers. This mat was folded up over the sides of the fence roll and then tied with twisted two-ply string. The warp and woof of the mat are bundles of coarse fibers. Around the edge of the roll where the mat was folded up, there is up to a centimeter of space between the bundles. The string was tied with a simple knot. This fence was clearly in storage.

The only other *in situ* item in this area was some fibrous material preserved, but not carbonized, on the clay floor (FS 228, 244). There is no indication that it was woven, and it is unclear if it was a permanent feature on the floor or something that was in storage.

This fibrous material was best preserved in a strip about 15 cm wide and about 1.0 m long. The southern end of the strip was under the rolled southern end of the portable fence (FS 245) and was in turn resting on a large *laja* (ca 22 x 20 x 2 cm; not collected) that was on the clay floor. From this point, the strip ran northeast and ended close to the extended portion of the same fence (FS 246). Some small patches of the same material were found elsewhere in the southern part of the fence-enclosed area, notably in the area of the un-paired sticks that may have been part of the fence support structure (about

10-15 cm from the platform). None of the fibrous material was found in the northern part of the fence-enclosed area or outside of the fenced area.

It is unclear whether this fibrous material is in its original use location, perhaps as padding or a moisture barrier for perishables stored there at some earlier time, or whether it was also being stored here together with the fencing for use elsewhere.

Fallen Items

Some items that originally had been hanging from the roof or on the east wall fell to the east of the structure (Figure 4). These include three balls of wood ash (FS 208, 210, 239), discussed above. There were also a few sherds (FS 209, 240) that had landed within 40 cm of the platform wall. Most (FS 209) were in Unit 2/3 ash but one (FS 240) was in Unit 1 ash just above the floor. Some twigs (FS 241; recovered as plaster molds) had also been blown into the area between the south fence roll (FS 245) and the platform wall.

A quantity of carbonized large bean-like seed (FS 222, 232) had fallen onto the basket and its contents. They covered an area larger than the basket itself, and were clearly not the basket contents. Directly under the beans were fragments of a carbonized string bag (FS 223). The bag was made of two-ply twisted string and was tightly woven; less than 3 mm separated the fragments that were still in position.

The fallen beans were covered with and partly mixed with carbonized roof thatch (FS 218). Two heavily burned pieces of *tabanco* daub, one with carbonized string in the pole impressions (FS 224) and one with bean stains, were found under the fallen bag of beans. The bag of beans originally may have been hung from the roof or, more likely given the presence of *tabanco* daub fragments, was on east end of the north room *tabanco*.

Virtually all of the material that fell east of the structure was covered with carbonized roof thatch (FS 229). This thatch was up to 30 cm above the floor adjacent to the platform. In one area near the center of the building, an unidentified mineralized and melted fibrous-looking substance was among the thatch (FS 230). This is similar to material (FS 140) found in the thatch on top of the *metate* near the northwest structure corner.

WEST FLOOR AND SOUTHWEST AND SOUTHEAST CORNERS

Only a small area of the floor west of the structure was exposed (1.0 m east-west x 2.0 m north-south). This was located from 0.7 to 1.7 m west of the south end of the platform. The clay-paved floor had impressions of large leaves in it; the shape and prominence of the veins suggests palm leaves. No in situ artifacts were found on the floor.

Six sherds (FS 39-41, 48-50) with carbonized roof thatch adhering to them were found just above the floor. Associated with them were three seeds (FS 35) resembling squash seeds. There were also abundant fragments of adobe, probably from the west wall. The sherds and seeds probably come from a vessel that was either resting on the west wall or hanging from the roof outside the structure. The rest of the vessel is probably in the unexcavated balk against the west structure wall.

The floor areas exposed around the southwest and southeast platform corners were quite clean. No artifacts were present around the southwest corner. One sherd, still in place, was pressed into the clay surface near the southeast platform corner.

AREA SOUTH OF STRUCTURE

The artifacts found to the south of the structure are discussed in the section on the agave patch above. These are all sherds that were pressed into the surface of the *TBJ*, except for one that was located between the leaves of an agave plant. Two pieces of string were draped over the leaves of another agave.

Between the structure and the agave patch, about 1.6 m south of the southwest corner of the platform, there was an articulated skeleton of a small animal (FS 234), probably a toad or frog (Figure 3). The length of the skeleton is just over 11 cm. Although the bones are poorly preserved, its limbs were flexed and its head was to the north. The skeleton was lying horizontally between the Unit 1 and Unit 2 ash strata. Evidently it was one of the victims of the explosion. It has not been identified.

SUMMARY OF ARTIFACTS

The quantity, quality, distribution, and context of the artifacts, foods, and features in and around Str 4 lead to the inference that the structure was principally for storage rather than serving as a residence or work area. The most obvious of these characteristics are summarized briefly here.

General Distribution and Context of Materials

Numerous ceramics, features, foods, and other items were found in and around Str 4. Most foods and artifacts were concentrated inside the structure.

In the north room, many items were on a high shelf or *tabanco*. These include jars, smaller serving vessels large sherds, and various small tools and supplies. Some of the jars held foods but many were probably empty. Most of these items were concentrated toward the west end of the shelf over the doorway, but an incensario was located toward the east part of the shelf.

Foods such as chiles and possibly beans were also placed high up in the north room, either resting on the shelf or hanging from the roof. Numerous wood-ash balls probably hung from the roof or pole wall along the north side of the room; many of these may have been outside the room under the overhanging eaves. Obsidian blades also were kept in the roof thatch above the north room or in the eaves.

Relatively few items were on the floor of the north room. Three jars, at least one of which had some organic contents, were still in place; these were all in the west end of the room clustered around the doorway to the south room. The center and east end of the room were virtually clean.

The south room had no high shelf and most artifacts and foods were on or near the floor. Ears of corn were stored in a permanent corn bin in the southwest corner of the room. Nine jars were located throughout the rest of the room. Two of these contained cacao and other seeds; the others had no preserved contents (except one with an antler awl inside). A set of unwashed serving vessels had been stowed in the southeast corner of the room. The northeast quarter of the room was carpeted with a mat and left largely open. Relatively few items had fallen into the room; they include small ceramic and organic containers, stone and bone tools, and *laja*. Most of these probably had rested on the tops of the surrounding room walls.

Relatively few goods were recovered outside of Str 4, and most of these were on the east side of the structure. Here, portable fencing was stored, as well as some beans in a basket. A single cylinder vase was placed near the northeast structure corner. A *metate* on its support posts was located near the northwest corner of the structure; this may not have been in active use. The floor area in front of (north of) the structure was very clean. Behind (south of) the structure, the floor area near the structure was also clean. Farther away, numerous discarded sherds were scattered in and around a dense patch of cultivated agave plants.

Vessels

A total of 27 ceramic vessels (mostly whole, but some partial) were found. Almost all of these were originally inside the structure (at least 24; 89%). One or two jars may have been hanging from the roof outside of the rooms and one cylinder vessel was on the floor near the platform. All of the vessels were analyzed by the ceramicist (Beaudry 1990) and many are currently being restored.

Over half of the ceramic vessels are jars (16; 59%); nine were in the south room and seven were in the north room. Most of these jars (13) are classified as medium or medium-large (see Beaudry, this volume). Not surprisingly, many (12) were on room floors but some (4) were on the north room *tabanco*. Seven of these jars (including three on the *tabanco*) had some trace of their original contents: three held cacao-like seeds, one may have held beans, a third had an antler awl, and two others had unidentified residues. Others had contents that have left no trace or were empty.

The remaining ceramic vessels include one utilitarian bowl with incurved walls, nine polychrome serving vessels, and one ladle incensario. All of the polychrome vessels are Copador, and most (5) were apparently kept on the north room *tabanco* or on wall tops, as was the incensario. One cylinder vase was outside the structure; another cylinder vase and two bowls were stacked (unwashed) in a back corner of the south room.

Non-ceramic vessels include rigid organic containers (probably *morro*), a basket, and perishable sacks. Two small *morros*, one painted and one unpainted, fell into the south room, probably from nearby

wall tops. One of these contained bean-like seeds. A single basket outside the structure was full of small bean-like seeds. Perishable sacks hanging from the north roof or wall probably held the many balls of wood ash found in that area. A string bag was used to store large bean-like seeds. Other bags may have held pigment and other materials.

Tools

Other artifacts recovered from Str 4 include chipped stone, ground stone, andesitic *laja*, and bone tools.

Ground stone tools include an *in situ metate* outside the northwest corner of the building, and a *laja* with some grinding wear on one surface. This *laja* had fallen from the top of the dividing wall or *tabanco* along with several other *lajas* and a cobble, all apparently unworked. Other *lajas* were on the east side of the structure, placed directly on the clay floor and supporting the basket and a fence roll. The *laja* under the fence roll (and possibly the ones under the basket) had been covered with a layer of unidentified fibrous material, so were apparently in a permanent position.

The obsidian artifacts, all unused blades, had been stored in roof thatch over or in front of the north room. A single greenstone celt had fallen into the south room, probably from the top of a nearby wall. Bone tools (needles and a possible awl) were found in both the north and south rooms, but all were displaced from high original locations, possibly in the roof or on the *tabanco*. An antler awl had fallen into a jar in the south room.

Other Materials and Features

A variety of apparently raw materials were recovered from Str 4, including a ball of an unidentified waxy substance, red pigment, wood-ash balls, and fibers and cloth. Portable fencing was recovered outside the structure.

The waxy ball, a piece of finely-woven cloth, and a clump of layered and contorted red pigment probably were kept high in the north room. The pigment was on or near the west end of the *tabanco*; the other two items were on or near the relatively empty east end of the shelf together with a ceramic ladle *incensario*.

Wood-ash balls had been hung in bags along the north side of the structure. This may have been a substitute for lime for soaking corn (no nearby lime source has been identified). Today, wood ash is an important ingredient in "*tamal pisque*" and "*tamal de ceniza o ticuco*." These traditional recipes are still used in the Department of Santa Ana, where lime is also abundant (Mejía de Gutierrez 1989).

At least two portable fences, one 3 m or more in length and the other at least 1 m long, were stored along the east side of the structure. The shorter fence was rolled, wrapped, and tied. The longer fence was partially unrolled. Judging from the proximity and angle of tilt toward the structure, it was probably leaning against the structure. A basket with beans was placed between the east platform wall and the fence; this may have been to protect them from scavengers such as birds. A half dozen posts that may have been used to anchor the fence when in formal use were nearby.

Fibers and textiles were found both inside and outside the structure. Except for a finely woven cloth fragment in the north room, these were all still in primary contexts. In the south room, carefully laid fiber bundles were used to line the corn bin and a woven mat or *petate* carpeted part of the adjacent room floor. A very fine but loosely-woven "cheesecloth" covered the contents of one jar in this room. East of the structure, a layer of coarse fibers covered part of the raised clay floor and the *lajas* resting on it. A loosely woven mat of coarse fiber bundles was used to wrap a fence roll, and somewhat finer fibers were used in a basket.

Two-ply twisted string was used in various ways, but is most visible on cast pole features such as the north wall, the door between the two rooms, and the fence features. In all these constructions, the string was used to tie the poles together pairwise. Similar-weight string was also used to make net bags, such as the one that held large bean-like seeds that fell from the *tabanco* or east roof overhang onto the basket. Heavier-weight twine made in the same way was also used, although the only sample is a piece draped over an agave plant.

Other kinds of fiber were also in use. Fragments of what may be vine or bark strips were observed among roof collapse debris. These may have been used to tie thatch to rafters, and to bind the two layers of poles in the door.

The source of these fibers has not been identified, but the coarser fibers may come from the agave plants that were being cultivated south of Str 4. No equipment for processing agave leaves into fiber, such as obsidian scrapers, have been found in or around Str 4. The very fine threads used to make the cloth may be of cotton, but there is no direct evidence of this.

Summary and Discussion

Virtually all of the items in and around Str 4 probably were in storage. In the north room, the bulk of the vessels, tools, and foods were high up on the *tabanco* or in the roof itself. Only three jars and a pair of adjacent sticks were on the floor, but these were placed against walls and were probably also in storage. In the south room, all small items were on wall tops or in the roof; the larger ceramic vessels, mostly jars, are on the floor along with the corn storage bin. Some of the jars were clearly used to store foods; others may have been empty and in storage themselves. The assemblage of three polychrome vessels was clearly stored in the corner after use. Outside, almost all portable items (fences and the basket of beans) were against the east side of the structure; their positions and form indicate storage. The *metate*, in its position of use, is in permanent storage on its support posts. A single cylinder vase near the northeast structure corner is the only item that may not have been in storage, but even this does not suggest any specific activity.

Apart from the *metate*, where corn-grinding must have taken place at some point, no assemblages of associated artifacts suggest specific productive activities that took place in or around the structure. However, there are open areas that might have been used for some activities. Inside the structure, the largely empty north room may have been a work area - a red stain on the floor may have resulted from some painting activity - or it may have been storage space. Likewise, the open *petate*-carpeted area in the south room may have been used for some activity. Maybe this was where the food from the polychrome vessels was eaten. But there is no direct evidence to indicate how these areas were used, and it is very likely that both areas were fairly dark even during the day.

The variable use of space inside Str 4 is interesting. The high density of materials stored on the *tabanco* over the north room and the height of the shelf itself probably reflects the need to keep open access to the south room. However, most of the items seem to have been stored at the west end of the *tabanco* or in the thatch above. This may simply be because it was the easiest part of the *tabanco* to reach while passing through to the south room. The items stored at the west end of the *tabanco* or roof, including serving vessels, jars, obsidian, bone tools, and chiles, could have been used relatively frequently compared to the few items at the east end, which include the waxy ball and ladle *incensario*. The same pattern is evident in the few items on the north room floor; they were all near the doorway at the west end of the room, and were primarily utilitarian jars. Possibly the east part of the room was used to store high-bulk foods such as corn or other goods on a seasonal basis.

In the south room, stored items seem to have a more uniform distribution. The floor area near the doorway was somewhat restricted. The doorway and the corn bin are only 60 cm apart, but at least one jar was placed so that the space was narrowed to only 35 cm. The carpeted open area in the south room was easily accessible from the entrance, as were most of the items in the room. Most of the jars on the room floor were separated by 10 to 20 cm. The corn bin was only accessible directly in front of the doorway; other sections of it were blocked either by jars on the floor or by the west and south room walls. Curiously, the stacked unwashed serving vessels were placed in a relatively inaccessible corner and the doors were closed. The greenstone celt also would have been relatively inaccessible. Other small items, stored mostly on the tops of the east and north room walls, could have been reached easily.

COMPARISONS AND CONCLUSIONS

As hypothesized prior to excavation, the orientation of Str 4 is identical to that of most other excavated structures in the site. In plan and construction, it is very much like Str 1 and 2, both of which are residences. In its storage function, however, it is most like Str 6 and 7 (the storehouses associated with Str 1 and 2 respectively). It is unique in the combination of its formal and functional characteristics.

FORMAL AND FUNCTIONAL COMPARISONS

Structures 1 (Zier 1983, Beaudry and Tucker 1989), 2 (McKee 1989), and 4 are similar in basic construction and room configuration. All are built on low clay platforms. Four columns connected by

bajareque walls comprise the superstructures. A *bajareque* wall divides the interior space into small two rooms. Although size and shape vary slightly, the rooms are arranged in shot-gun fashion: the only access to the back room is through the front room. The front room is always the north room and the doorway from the north room to the south room is always off-center to the west. All have embellishments in the form of cornices and/or pilasters, although these are not all in the same locations or equally well made. At least Str 2 and 4 have jar handles embedded in some of the walls; Str 1 was too poorly preserved to determine if it also did.

Overhanging thatched roofs are characteristic, but the Str 4 roof support structure, which is particularly well preserved, may be different. In Str 4, the east and west beams were placed on the columns and encased in clay. This technique was not used in Str 1 or 2. A pole wall along the front of Str 4 may comprise a further difference with Str 1 and 2, but this may also be a result of differential preservation. A U-shaped pole feature, perhaps a displaced segment of a front wall, was found near the north edge of Str 2, and the north end of Str 1 was destroyed by bulldozer damage.

There is considerable variation among the structures in their interior features: *tabancos*, storage bins, and benches. This furniture relates more directly to the functions of the structures.

Tabancos are storage facilities. The *tabanco* in the north room of Str 4 recalls a similar feature in the south room of Str 2. In Str 2, the clay-daubed portion of the *tabanco* was outside the walls. By contrast, the clay-daubed Str 4 *tabanco* was inside the room. In Str 2, relatively little was stored on the *tabanco* (McKee 1989) but a large quantity and variety of items were stored on the Str 4 *tabanco*.

The corn storage bin in the south room of Str 4 is unique in the site so far. If corn was stored in the latter two structures, it was done without a permanent special facility, or no signs of such a feature have been preserved.

In Str 1 and 2, the south rooms contain benches in the east part of the room and the doorways are offset to the west. These benches are interpreted as combination sleeping platforms, meeting places, and possibly dining or work areas. Although Str 4 lacks a bench, it is possible that the open *petate*-carpeted area in its south room served the same purpose. The off-center doorway and presence of unwashed dishes lends some support to this interpretation.

Structures 1, 2, and 4 are similar in size, plan, and construction, but differ significantly in the details that pertain most directly to function. More and larger storage facilities are present in Str 4 than in the other two, and residential (sleeping, meeting, working) facilities are less well developed or entirely absent in Str 4.

These functional differences are most obvious in the quantities and distributions of artifacts and the activities they reflect. The roofed exterior areas of Str 4 were quite clean and there is no evidence of on-going craft production or food processing, and only minor refuse disposal, outside the structure. In contrast, activity areas have been identified around Str 1 and 2. For example, the area east of Str 1 was probably a daytime work area, including corn-grinding (Zier 1983, Beaudry and Tucker 1989). Numerous used obsidian tools, worked *lajas*, and sherds were found around Str 2, and a small hearth was located against its west wall (McKee 1989).

Activity areas also have been identified inside Str 1 and 2. For example, the north room or north side of Str 2 apparently was used in some activity requiring obsidian tools (McKee 1989). The north room in Str 1 contained a spindle whorl, miniature vessel, some bone fragments, and various sherds. These suggest a variety of activities such as spinning and child's play (Zier 1983). In contrast, the Str 4 north room floor area was walled and empty except for a few storage jars. This space may have been used for seasonal bulk storage.

The south rooms of Str 1 and 2 were kept relatively open, with artifacts clustered into small areas. At least two-thirds of the bench and floor space in these rooms was "empty" space. In the south room of Str 4, by contrast, only about one-third of the floor space was unoccupied.

The items in the south room of Str 4 also contrast in their functional attributes with those found in the south rooms of Str 1 and 2. In the latter structures, many of the artifacts seem to be related to ongoing or frequent activities, although limited food storage also occurred in these rooms. In Str 2 (McKee 1989), dirty dishes, a codex, and shell were in a niche under the bench. A variety of small tools including a bone spatulate tool and hammerstone was found on the bench. The floor area in front of the bench was clean. In Str 1 (Zier 1983, Beaudry and Tucker 1989), pots with beans and a stone maul were on one end of the bench but it was otherwise clean. On the floor, some jars were clustered in one corner;

at least one contained beans. Another contained a specialized toolkit with red pigment and a miniature *metate*; grinding stones (*lajas*) and a hammerstone were nearby. An *incensario* was located in another corner. The south room of Str 4, in contrast, was packed with storage jars and a storage bin. Open space was limited to a small *petate*-carpeted area. The only on-going activity apart from storage that may have occurred here is eating; the assemblage of dirty dishes stowed in a back corner of the room is strongly reminiscent of the dirty dishes in the Str 2 bench niche.

The materials in Str 4 are more like those in Str 6 and 7, both of which are small thatched single-room *bajareque* structures that served as storehouses for the Str 1 and 2 residences respectively. The majority of the artifacts associated with Str 4, 6 and 7 are inside the structures. The density of artifacts is much higher than in the residential structures.

In many respects, the storehouse inventories are quite similar. For example, the absolute quantities of ceramic vessels are comparable (24 to 27 [Beaudry 1990]). The obsidian in Str 4, 6 and 7 is virtually always unused and stored in roof thatch (Sheets 1989). The grinding stones, even if they are mounted on support posts, may not have been in continuous use, as there are no handstones directly associated with them. The vast majority of items in all three storehouses is domestic equipment: storage jars, serving vessels, grinding stones, and other small tools. Foodstuffs including corn, beans, chiles, and other plant foods are also common. Both storehouses and residences have *incensarios*, suggesting that ritual was also important in domestic context.

Although the items stored in Str 4 are generally similar to those stored in Str 6 and 7, there are some interesting differences. For example, miniature vessels were kept in the latter two storehouses, but none was found in Str 4. In Str 7, five miniature jars, some containing red pigment, were kept together with jade beads and shell ornaments. No comparable assemblage was stored in Str 4. These items may relate to differences in household composition, social status, or occupation.

The relative quantities of different foods and other resources being stored also varied (analysis, identification, and quantification of botanical remains have not been completed). Possibly households specialized in cultivated crops and/or had variable access to them.

In Str 4, corn was clearly an important item. Abundant corn was found, and a special bin had been constructed to store it. No corn remains were found in Str 6, and in Str 7, only discarded cobs were found outside of the structure. Both Households 1 and 2 had *milpas* within 5.0 m of the storehouses (Str 6 and 7 respectively) so corn may have been stored in the field. This is a common modern practice. Household 4 used the area behind the storehouse (Str 4) to cultivate agave. Possibly the household *milpa* was so distant that corn was transported periodically and stored.

At least three jars of cacao were stored in Str 4 and a possible cacao tree was growing behind the structure. Cacao was probably a highly valued resource and local environmental conditions are favorable for its cultivation (Reyna de Aguilar, personal communication). Perhaps Household 4 specialized in cacao production, either for local consumption or for export.

Household 4 also may have specialized in agave cultivation; a dense patch of these plants was growing behind Str 4. These would have been a good source of fiber for rope, string, basketry, and cloth, all items that undoubtedly were used in all households.

By contrast, Household 1 may have specialized in the production of a variety of flowers or medicinal plants, as these are found in gardens behind the storehouse (Str 6) of that compound (Reyna de Aguilar 1991).

Str 7 contained plant resources not found in the other structures, including possible *uhushte* (ramon) and tobacco(?) seeds. The possible tobacco seeds were in a jar, suggesting the possibility of specialized tobacco cultivation by this household. The *uhushte* seeds were found scattered near the structure entrance (McKee 1989), so it is unclear if they were actually in storage. The large trees bearing these seeds are common in the region (Reyna de Aguilar 1990, 1991) but are not cultivated today. The seeds are recognized as a starvation food today (Murcia, personal communication 1989). Perhaps Household 2 was supplementing a limited corn supply with these seeds, especially if the new corn crop was still young (Zier 1983).

The contents of the storage structures (Str 4,6,7) are similar in quantity and function. The majority of artifacts are clearly domestic in nature, and include a variety of storage and serving vessels, *incensarios*, obsidian tools, grinding stones, and other tools. A variety of foods were also stored; most storehouses contained corn, beans, chiles, squashes, and other foods. However, these were not always

present in comparable amounts and were not always handled in the same way. These differences, and the unequal distribution of specialized artifact types and crops, indicate that the households varied in terms of access to trade networks and production of crafts and/or crop specialties.

STR 4 IN HOUSEHOLD AND COMMUNITY CONTEXT

Str 4 was clearly a storehouse, although its form and construction are more like other excavated residences. Its contents are essentially domestic in nature. It is probably only one structure in a household compound that contains a residence, a kitchen, and possibly other structures. If Household 4 is arranged like other households, there may be a residence to its northwest (Str E).

These similarities indicate a high degree of homogeneity among community residents, at least in the neighborhood that is currently under investigation. This homogeneity probably reflects to a large degree common domestic traditions ranging from basic diet to structure placement and architectural ornamentation. The repetition among households indicates that many domestic functions were carried out by households independently; not surprisingly, storage of food and utensils was certainly one of these functions.

The differences that do occur, however, also suggest a well-developed community organization in which households were both interdependent and unequal. There may have been specialization in the production of some cultigens, notably agave, and possibly cacao and other crops. It is unclear if this kind of specialization is related to *milpa* location; households that produced specialty items may not have had access to abundant or sufficient near-by *milpa* land. In any case, an outfield system was almost certainly used (McKee 1990). There may also have been specialty craft production by household, e.g., ceramic production and spinning by Household 1 (Zier 1983).

A well-developed community organization is also indicated by the presence of Str 3, a large structure located in the midst of the excavated residential compounds (Gerstle 1989). Although this structure was originally thought to be an upper-class residence, it seems equally likely based on current data that the structure may be a public structure.

The architectural differences between Str 4 and other storehouses also suggest differences in household composition or history. Str 4 may have been a residence originally, suggested by its formal similarity to other residences, but was later converted to a storage function. Certainly the corn bin, and probably the *tabanco* too, could have been installed at any time after the structure was built. Perhaps the founding family built a single structure to begin with, serving both residential and storage functions. As the family grew, a separate residence may have been constructed and the original one converted to a storage facility. Excavation of the complete compound should provide data with which to test this hypothesis. If this hypothetical reconstruction is correct, then the pattern of structural expansion in Household 4 may be different than in other households, where residences were simply remodeled or enlarged, and storage structures apparently were constructed as "new" buildings.

As more structures and households are excavated at Cerén, it becomes increasingly clear that household organization and community dynamics are both complex and discernible. These need to be investigated further, both by continued excavation and by analysis of recovered materials and data.

Chapter 10. EXCAVATIONS OF STRUCTURE 12, CEREN.

Payson Sheets
and Fran Mandel Sheets

INTRODUCTION

Structure 12 is the easternmost structure excavated at the Cerén site to date. It is located along the low ridge that overlooks the Rio Sucio. The closest household is 1, located about 15 meters to the west. Apparently Str. 12 was not related to Household 1, based on its architecture and artifacts. However, the yet-unexcavated Structure 10 is located between Str. 12 and the structures of Household 1. Based on very little information, a column top and two wall tops, it appears that Structure 10 may have been a part of a Str. 12 complex rather than having been a part of Household 1.

Structure 12 is unusual in a number of characteristics, such as having been painted white all over, having a lattice window, having bold red lines painted on an interior wall, for not having a household assemblage of artifacts inside, for having difficult access to the innermost room, for having numerous vertical niches in addition to an unusually-placed horizontal niche, for the nature and placement of artifacts, for being oriented 15 degrees east of north, and for other characteristics.

A structure was first suspected to be in the area, where Structure 12 is located, in late November, 1990. The back hoe-front end loader was removing the top two meters of volcanic ash overburden from the general area south of Operation 1 and east of Operation 2, to create a consistent slope toward the river, for drainage purposes. The first indications that there might be a structure was the bowing upward of the middle tephra layers of the Laguna Caldera eruption. Units 8, 9, and 10 were definitely heaped up over something, so it was decided to remove Units 8 and below by hand to determine if a structure had caused that tephra feature. A column top (now known as column 2) was encountered, and the tephra topography indicated that the majority of the structure was located to the north and west. The excavations by hand began on 19 December 1990, after a Duralite 7 x 7 meter roof had been erected to protect the structure from rain, sun, and the wind. Excavations, by a crew averaging 8 Salvadoran workers, continued until 17 January 1991.

THE ARCHITECTURE

Structure 12 (Fig. 1) is described here in order of construction, from building up the drainage mound to making the platform, mounting the columns, and constructing the walls and roof. The first step was making a mound of clay-laden earth, from the pre-Ilopango eruption soil. Only the extreme peripheries of this mound are visible, and they measure 30 cm long and 10 cm high at the building's southwest corner, and 40 cm long and 16 cm high at the building's southeast corner. If the mound continues to rise under the formal platform it would account for much of the volume of the platform. Only excavations inside the structure and platform can resolve that question.

The platform, with its flat top surface that creates the inside floor of the structure (Fig. 2), is built on top of the adobe mound. It is 70 cm high above the mound at the southwest corner, and 50 cm at the southeast corner. The platform, and the walls and columns built on top of it, are oriented 15 degrees east of magnetic north. Other rectangular structures excavated to date at Cerén are rotated about 30 degrees clockwise, so this structure marks a departure from that orientation. It is unlikely that local topography, being located on a broad ridge overlooking the river, was a determining cause. It is possible that this, as a special use structure, may have been inappropriate for the general rules of orientation.

Only the two southern corners of the platform were exposed, due to the fragility of this structure. The remainder was left covered by intact volcanic ash. The vertical and horizontal corners of the platform are decorated by a rounded cornice that extends 5-6 cm out from the flat side panels, and are 10 cm in diameter. All elements of the platform were finished with a fine surfacing of adobe and then "painted" white. The term "painted" here refers to a thin layer of white material applied, presumably wet, to the adobe walls, columns, and other architectural features. The white paint appears to be primarily fine white tephra from the Ilopango eruption. It probably was applied with a binder that assisted its attachment to the adobe surface, but there is no direct evidence of a binder. It should be noted here that the fragility of the structure necessitated unusual excavation techniques. Generally, at Cerén, when walls are solid, most or all of their surfaces can be excavated. However, this structure has

Figure 1. Map of Structure 12, Operation 5. The Artifacts in the Niche at the South End of the North Room are Shown in the Detail Drawing at Bottom.

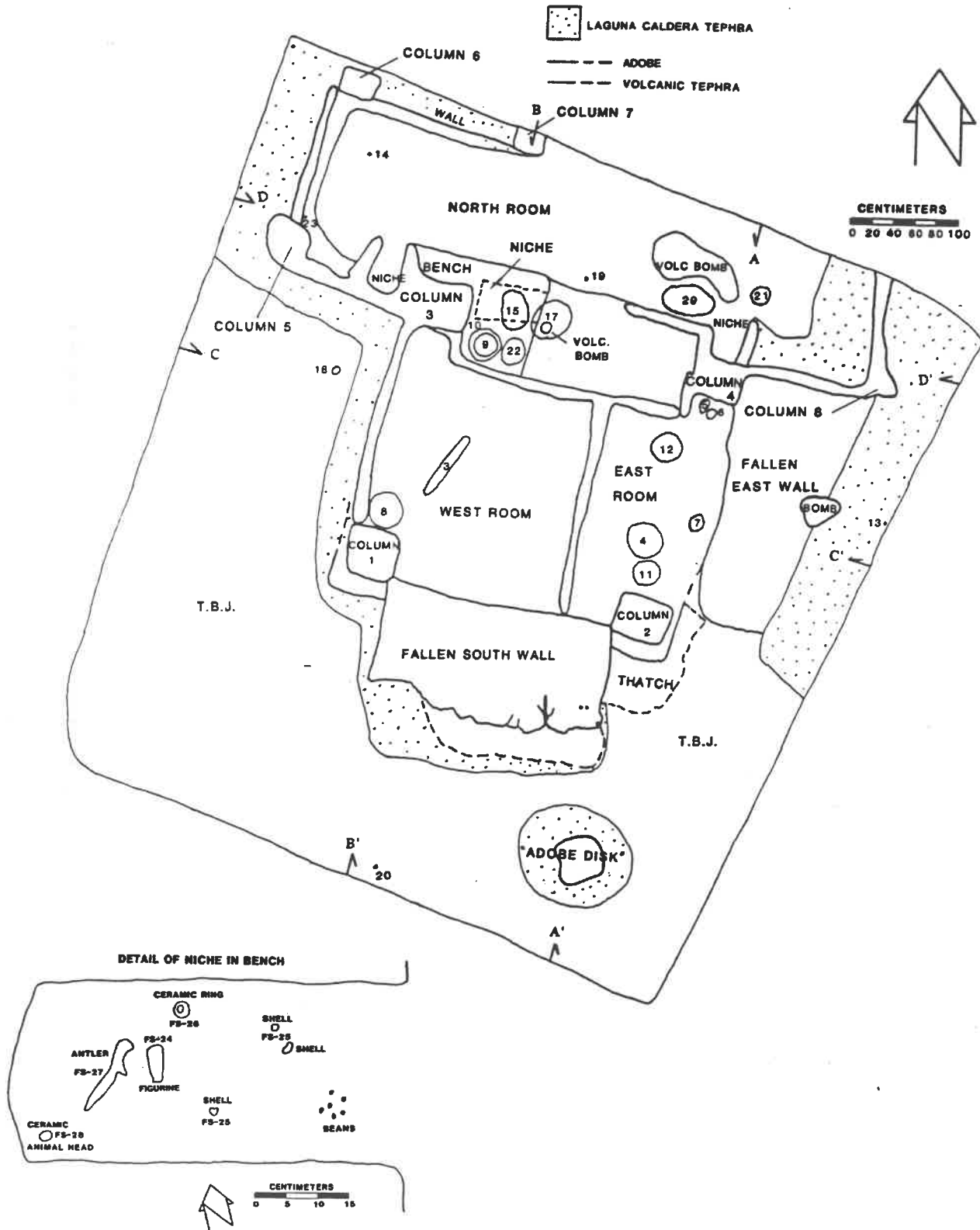
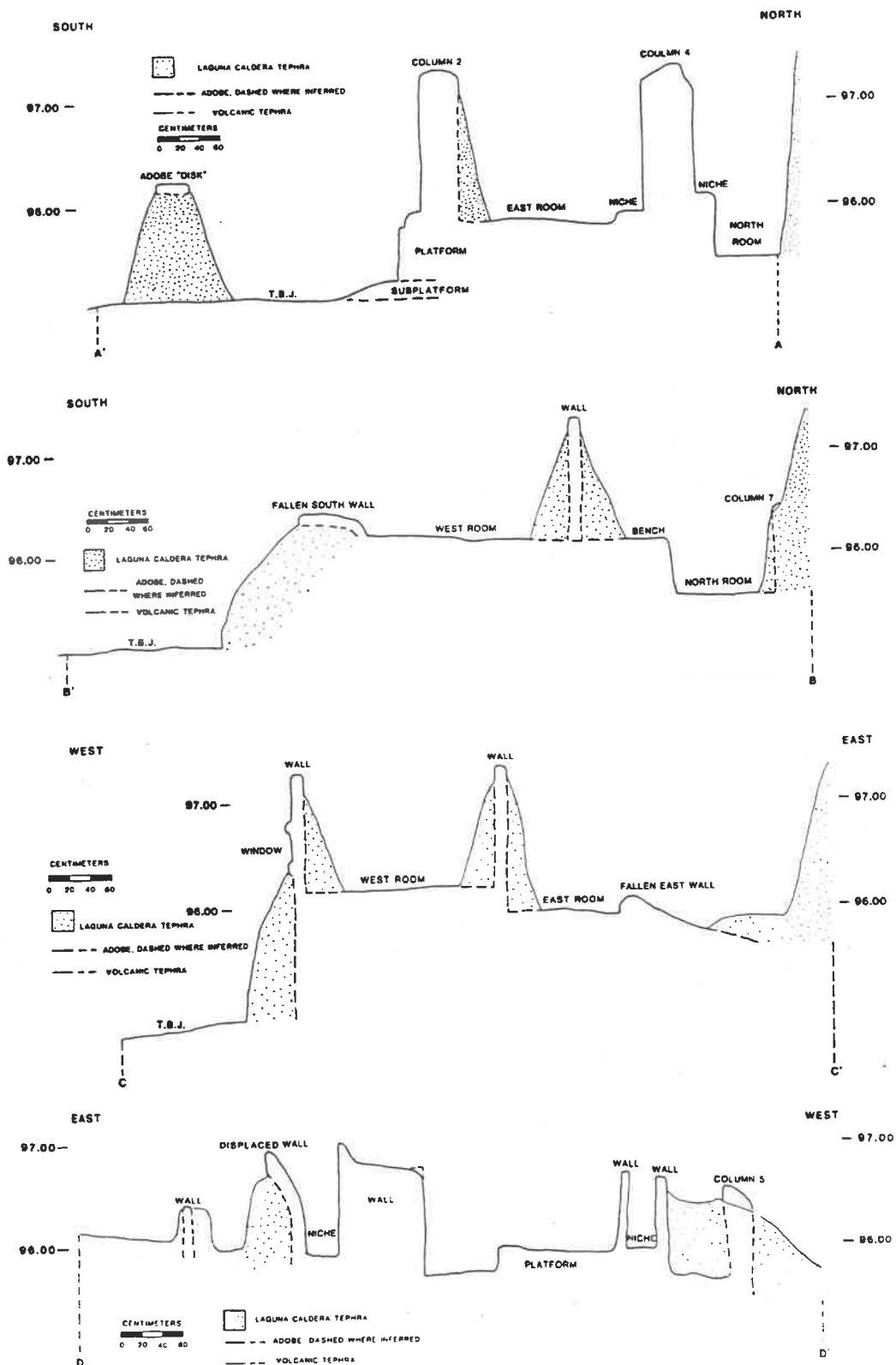


Figure 2. Two East-West and Two North-South Profiles of Structure 12. Note the Volcanic Ash Left Unexcavated to Stabilize Walls.



unusually thin walls, delicate features, and it was painted. Therefore, much more volcanic ash was left, in sloping taluds, around the platform and standing walls than with any other structure excavated to date. Therefore, some measurements are precise and others are estimates. Most estimates are accurate to within 5 cm.

The platform, including the cornices, measures 3.17 m along its southern edge and an estimated 3.7 m along its northern edge. It appears to have been built very well, of good construction clay, and finely finished. At the southeast and southwest corners, between the column bases and the platform, mouldings of clay were constructed, perhaps to reinforce the corner. These are 10 cm high and 15-20 cm wide.

Columns and walls were built on top of the platform. The two southern columns are almost square in cross section, measuring 39 cm N-S and 40 cm E-W. The finished surface of the southeastern column is 145 cm high; the southwestern column is missing the top 1/2 meter and now measures 94 cm in height. The top part probably was knocked off by the eruption from Laguna Caldera and likely is in the tephra to the south of the column, under the fallen south wall. It is possible that the adobe "disk" (Fig. 1) to the south of the structure is part of that column top. If the disk was a part of that column, it probably was dislodged by the pyroclastic flow of Unit 5.

Along the northern part of the platform two columns were mounted, and they measure 3.24 m (est.) from outside to outside. Both are difficult to measure because of various refurbishings. Both have been covered by walls abutting them, extra adobe surfacing, and vertical column niches. The northwestern column (# 3) measures 44 cm N-S and 40 cm E-W. The northeastern column (# 4) is 42 cm N-S and E-W. Each probably was smaller, perhaps the same as the southern two columns, before it was built up by remodellings, resurfacings, and wall intersections. The floor of the east room is not perfectly flat, and it is 20 to 25 cm below the level of the main (west) room. Thus, there must be a step up from the east to the west room, associated with a doorway in the interior wall, but these could not be excavated due to wall and adobe lintel fragility. For conservation purposes taluds of intact volcanic ash were left on both sides of the wall.

The overall platform length, N-S along the west edge, is 3.27 m. The entrance to the building is from the north, stepping up onto the platform midway between columns 4 and 3. West of that entrance is an elevated bench with a horizontal niche constructed inside of it. The niche is 31 cm wide at its base and 29 cm wide at the top, making it slightly trapezoidal in cross-section. It is 64 cm deep and 11 cm high, and its roof is supported by a sizeable laja supported by rocks built into the niche margins.

The west wall measures 7.5 to 11 cm in thickness and 120 cm in height from the floor of the west room. It has a window 34 cm below the top of the wall (measured to the top of the window). The window itself is 39 cm high and 86 cm long, made of slanted sticks covered with adobe. It has ten sticks, five slanting in each direction, to give it a lattice structure. It is surrounded by a molding that probably is made of sticks covered by adobe.

The internal wall that separates the west from the east room is 1.32 m high. It is generally 10 cm thick, with 11 as a maximum and 9 as a minimum.

The north wall, that connects Columns 3 and 4, is inset 20 cm to the south. Thus, it does not connect the columns directly. The inset is achieved by short walls; the effect is to create a vertical space on the south side of each column. Each of those vertical spaces is enclosed on three sides; two sides are created by walls and the third side by the column. These vertical spaces seem to be a deliberately constructed feature of Structure 12, and they are given the name "vertical niche" to denote them. They do receive special treatment, either with artifacts being placed in them, or by smoothing and some organic staining of their bases. The volcanic ash was left in the vertical niche south of Column 3, because of perceived fragility of the walls. The vertical niche south of column 4 was excavated, because one wall had fallen away during the eruption, and thus was not vulnerable to damage after excavation.

The north wall is 128 cm high, and 9 to 11.5 cm thick. The wall was stabilized at the top by a horizontal beam which was covered by adobe. That beam was only 113 cm above the floor, creating a barrier to human movement between the north and east rooms. Most doorways at Cerén are about 1.5 m high, but the doorway between the north and east rooms would have been only about 110 cm above the floor, based on an estimated distance between the floor and the adobe coating the bottom of the beam. The doorway was not excavated due to fragility of the architecture. The beam was 9 cm in diameter.

Column 4 has a vertical niche on its north side created by two walls extending northward. One short wall extends 26 cm north from the column, and extends 109 cm up above the floor of the niche. It is 13 cm thick. It forms a side of a vertical niche on the north side of Column 4. The other wall heads northward 24 cm and then turns westward for 83 cm, forming a passageway connecting the north and east rooms. That wall extends 135 cm above the north room floor. The wall is only 7 cm thick.

Column 3 has a vertical niche on its west side, formed by two short walls extending northward. The space is 32 cm N-S, 30 cm E-W, and is 84 cm high. The niche has an elevated floor that is 65 cm above the room floor. It is very well formed, and has an unusually compacted adobe bottom that shows some organic staining and almost a polish from use.

Between that niche and column 5 is an elevated surface, 41 cm above the north room floor. It remained unexcavated. Immediately north of that surface, along the wall between columns 5 and 6, was a broad band of red paint on the vertical wall surface. The red paint was on top of the adobe and the white wall paint. Only a very small area was exposed, measuring 15 by 15 cm. A horizontal band of red paint, about 5 cm wide, along with two vertical bands, were exposed. It appears to be an iron-based pigment, based on the color.

The south wall, that connected columns 1 and 2, fell to the south but remained relatively intact. The fallen wall cracked badly but did not separate into discrete pieces. Before it fell, the wall height above the west room floor was 133 cm. Only the bottom portion, 20 cm high, of the wall remained vertical. The wall fell in Unit 5, which was a pyroclastic flow propelled from the volcano with considerable velocity.

The east wall, that connected columns 2 and 4, fell to the east. It was not fully excavated, because of the proximity of the eastern excavation cut, but its original height above the floor of the east room was 1.15 m, lower than most. Just to the south of Column 4 there is a slightly elevated adobe surface which is the base of a vertical niche. The adobe surface is 26cm N-S, 29 cm E-W, and 11 cm high above the floor of the east room. It had a 5 cm thick layer of wood ash placed on it, with a small mano placed on top of the wood ash. The wall apparently fell during the latter part of the deposition of Unit 3, prior to the fall of the south wall.

The north room is an addition to the building, off the platform. It has a continuous floor that is 56 cm below the top surface of the bench that contains the niche, and 31 cm below the step up into the building. The room is open to the north, but excavations could not continue farther north because of the proximity of a land boundary. The northern edge of the excavations is only a meter from the boundary of Patrimonio Cultural property and the Instituto Regulador de Abastecimientos, and complex negotiations will be necessary before the northernmost part of the building can be excavated.

Assuming that the building is bilaterally symmetrical, the north room is bounded by the front of the building and the walls of *bajareque* headed outward, northward, and then inward. Each corner is anchored by an adobe column. The *bajareque* walls are relatively thin, measuring 8.5 to 10 cm. The vertical poles are fewer in these walls than in most *bajareque* walls. The distance from the center of Column 5 to Column 3 is 138cm. The center of Column 6 is 151 cm north of Column 5, and Column 7 is 172 cm east of Column 6. (Measurements are made to column centers in the north room because so much volcanic ash had to be left that the sides of the columns remain largely buried.) The entrance to the structure would have been between Column 7 and a yet-to-be excavated Column 10; if there is symmetry the entrance would be about 1.3 meters wide.

A part of the top of the west wall of the north room was missing, providing a view into the wall. It was created by sandwiching *tierra blanca joven* volcanic ash, perhaps mixed with a binder, by a layer of clay inside and out. The reason for having an earthen wall with a vertical zone of white volcanic ash inside is unknown. This kind of construction presumably is weaker than the more typical *bajareque* wall at the site. The wall does contain some vertical poles, but rarely did the poles extend above the adobe portion.

The east end of the north room is created by a *bajareque* wall connecting columns 4 and 8 and then heading northward to a probable additional two columns. The distance between the centers of the two columns is 152 cm. The *bajareque* walls are 7.5 to 8.5 cm thick.

THE ARTIFACTS

The artifacts of Structure 12 are described here as related to the architecture, beginning with those in the north room, then the east room, and finally the west room and artifacts found outside the structure. Artifacts that were in roofing or on wall tops are described before artifacts that were placed on the floor. Structure 12 was excavated after Marilyn Beaudry completed her ceramic analyses of the season; she will analyze the ceramics from this structure in 1991.

An obsidian blade (295-5-14) was found in tephra two centimeters above the floor at the west end of the north room. It evidently was placed on top of the nearby wall, or on top of Column 6, and was blown onto the floor while Unit 1 was being deposited. Fragments of a seashell, probably a clam, was found in similar stratigraphic position in the center of the room (FS 19) and could have been on top of a wall or column. Unfortunately a large (80 cm long) lava bomb fell in the east-center of the room, doing some damage to artifacts and architecture. The bomb badly fractured a vessel that was sitting north of Column 4 (FS 21) on the floor of the north room. The bomb barely missed a trough metate that had been placed on the floor of the room, leaning up against the north edge of the building.

A smaller lava bomb landed on the eastern end of the niche and fractured its top badly along with two vessels placed on the bench surface above the niche (FS 15 and 17). The bench-niche area had the highest density of artifacts of the structure. The bench is the elevated adobe surface, containing the niche, to the east of Column 3. It is different in size and placement from the benches in Structures 1, 2, 3, and 9. It is likely that there are more sherds or even vessels still in the tephra which was left in this area to protect the architecture. Two vessels were found together, one on top of the other sitting in the southwest corner of the bench, against Column 3. The bottom one (FS 10) had no visible vessel contents, but may have contained a liquid. The other, a large scraped-slip open bowl with handles (FS 9), was inverted and formed a cap for #10. Just west of these two vessels some sherds of another vessel damaged by the small lava bomb were collected (FS 22). It was resting on top of the bench above the niche.

The niche itself contained a few artifacts. From the open eastern end to the western end they are a small scatter of a few beans, some fragments of shell (FS 25), a pottery figurine (FS 24), half of a ceramic double ring (FS 26), a deer antler (FS 24), and a ceramic animal head (FS 28). The three ceramic items all had old breaks that were very worn. They appear to be heirlooms, items that were curated for their personal value. The human figurine and the broken double ring were particularly worn on their old breaks. The antler was also used but the tip had broken off, taking with it virtually all the evidence of that use. Only a small polished zone remains of the tip. The antler tine still retains a section of skull bone. These may have been placed in the niche individually, as there does not seem to be any relationship between them.

The area of Structure 12 with the second highest density of artifacts was the floor of the east room. The east room, entered through a narrow doorway at its north end, probably also has a doorway into the west room through the wall that separates them. There must be a step up from the east to west rooms of about 20 to 25 cm. The presumed doorway and step remain buried in tephra.

The east wall and the inset of the north wall form a small niche south of column 4, as described above in the architecture section. On the bottom of the niche, slightly raised above the floor, were found a deposit of wood ash with a slightly used one-hand mano (FS 5) placed on top. A sherd of a polychrome cylinder vessel (FS 6) was found adjacent to the mano but with tephra from Unit 1 between it and the zone of wood ash. It evidently was elevated, associated with roofing or architecture, and fell during the early stages of the eruption. It may have been from a complete vessel or might have been a sherd before the eruption.

Additional artifacts from the east room floor include a small pot just inside the doorway, and a pile of beans on the floor near the east wall (FS 12 and 17). They appear to have been placed on the floor directly; there was no evidence of a container. Two pots (FS 4 and 11) were placed on the floor at the south end of the room. Both were constricted neck jars with handles. These two vessels are very similar to vessels still made and used in El Salvador that are locally called "chicha jars." It is possible that the prehistoric pots were used for chicha, a corn beer, but we have no direct evidence of this. FS 11 has a face on the neck, modeled with fillets of clay, and it was placed on top of four olivella shells. The shells were perforated, perhaps for use as a necklace. Two of the shells were broken. It is not known if they broke when the pot was placed on them or when the overburden of tephra began to mount up. It is

surprising that they were not more broken. Although this is a narrow little room, it had many artifacts on the floor. The artifacts do not seem to have been a working assemblage, but may be individual artifacts placed on the floor, perhaps by different people at different times.

Although the west room is much larger than the east room, we found only one artifact, a large open-mouthed bowl (FS 8). It was in floor contact in the extreme southwest corner. It might have been used for liquids. It had no discernable contents. It is possible that a few other artifacts are still buried in the volcanic ash that lines the three standing walls around the west room.

The areas excavated around the structure contained only a few artifacts. The area shown in Figure 1, to the southwest, south, and southeast of the structure, was excavated down to the tierra blanca joven ground surface that existed just before the eruption. It is a smooth surface, somewhat compacted, and gently sloping to the south. It had only a few sherds, all of which were small and had rounded breaks, indicating that they were refuse. The area certainly was not used for agricultural purposes, nor was it sufficiently compacted to be called a high-use patio or plaza area.

A mano (FS 13) was found to the east of the structure, and well up in the tephra units. It was resting on top of the Unit 3 tephra, and up into Unit 4, and probably was dislodged from a walltop or column 4 top by one of the last horizontal blasts of Unit 3.

A bivalve seashell (FS 20) was found to the south of the fallen south wall, in Unit 1 tephra. It apparently was elevated in the structure and was blown southward.

A miniature pot (FS 18) was found outside the building, west of the west wall, at the juncture of tephra units 1 and 2, and below the thatch roof. Given the directionality of the blast, it is probable that it had been placed on top of Column 5, or on the wall close to it. When it fell the neck broke off and was found a few centimeters away. It was empty except for a faint trace of red pigment on the inside and on top of the vessel neck. It is a paint pot similar to the cache found in Structure 7. It is very well made, with an effigy face, four legs, on a highly polished surface.

Neither the nature nor the location of the artifacts indicate a household assemblage. Many of the artifacts show considerable wear, including the metate, obsidian blade, mano, ceramic ring, and the figurines. Many seem to be carefully but individually placed, perhaps as offerings or payment for some service rendered.

SUMMARY, CONCLUSIONS

It is far easier to determine what Structure 12 was not than what it was. Clearly it was not a bodega, a dwelling, a kitchen, or a workshop. In all other structures excavated at Cerén to date, access to the innermost room was straightforward. However, in Structure 12 one needs to pass through an entryway into the northern room, step up and turn past a short wall, duck under a low lintel, enter a very narrow room (less than a meter wide), turn right again and step up while going through an apparently low door, and finally duck under a very low horizontal beam. The structure was unusual in having a very short thatch roof, one that only extended about a half meter beyond the walls. It is the only building to have been covered, inside and out, with a white paint or surfacing. The north room had bold red lines painted along the base of one wall. The finding of some fragments of white and then red painted walls dislodged during the eruption indicates that more than one wall was painted red, and when the final excavations are done, it is likely that several walls will be found to have been painted red.

Most structures excavated at Cerén to date have orientations rotated about 30 degrees clockwise from our magnetic directions. Its location along a low ridge overlooking the river may have set up microtopographic constraints on orientation, but it is more likely that the special function of the building exempted it from the usual orientation. The ridge was not so narrow as to have constrained the building in any detectable way.

Structure 12 is the only building found to date that has a window. It was made by covering slanting sticks with adobe to give a lattice window, and it was framed by a rounded cornice. The platform was elegantly decorated with rounded cornices on its horizontal and vertical edges. It had a series of vertical niches associated with or near columns, and a specially inset wall created two vertical niches. Some of the vertical niches have yet to be excavated, due to architectural fragility. Many of the vertical niches were empty, but one held artifacts carefully placed there. A mano was placed there on a layer of wood ash.

Many other artifacts were carefully placed. A globular jar with handles, of the kind locally called "chicha jar," was placed on the floor in the long narrow room on top of a set of four olivela shells. It is possible that the shells were a necklace, as they were perforated for suspension.

Many of the artifacts placed in special positions were used, and gave the impression of artifacts that had been in a person's possession for some time. Both the human clay figurine and the broken double ring placed in the main niche in the bench of the north room had old breaks that had worn considerably. The prismatic blade that was placed somewhere high in the extreme northwest corner of the building had been used so much that it must have been approaching discard.

The artifacts may have been brought individually to the structure and left by people receiving a service there. A possible service, one that is still widespread in Mesoamerica and the Intermediate Area, is curanderismo or shamanism. As a possible explanation, this is not one that I reach lightly. I have looked for other possibilities, more in the realm of economic, social, political, or familial activities, yet the architecture and artifacts do not seem to indicate a function in those realms. I consider shamanism to be a possible function, but I do not see any data that indicate shamanism unequivocally. If a shaman used this structure for his or her practice, then the bringing of items to exchange for shamanistic services rendered, and their careful placement would make sense. Some of the items could be consumed by the shaman, while others could be sold or exchanged.

ACKNOWLEDGEMENTS

A better crew of Salvadoran workers could not be reasonably expected. Their names are listed in the acknowledgements of the final chapter. Helga Romero's support and interpretive suggestions are greatly appreciated, along with her bringing chicha jars to the site that match in form the vessels in the east room. Both types of chicha were enjoyed by all. Brian McKee critiqued a draft of this chapter.

APPENDIX A CATALOG OF ARTIFACTS, SAMPLES, OF OPERATION 5

FS#	Date	Strat.	Item
1	1-3-91	U 5 & 6	Sherds in tephra
2	1-4-91	U 6	Samples of white painted wall -fallen from wall, north room
3	1-8-91	U 6	Carbonized roofing beam, center of structure, the principal viga
4	1-9-91	Floor	Unbroken vessel, "chicha pot" jar
5	1-9-91	Floor	1-hand mano on floor of niche with wood ash
6	1-9-91	U 1	Polychrome sherd in tephra, near floor contact, east room
7	1-9-91	Floor	Small pile of beans on floor, east room, against east wall.
8	1-15-91	Floor	Large open bowl, west room, SW corner
9	1-9-91	Vessel	Inverted large bowl, scraped slip, handles, north room, on bench, capping vessel FS 10
10	1-9-91	Floor	Large jar under bowl FS 9, on bench, in north room.
11	1-10-91	Floor	Jar, "chicha pot" on floor of east room, south end; fractured but complete, with face decoration on neck, with four olivela shells below it.
12	1-10-91	Floor	Pot broken on floor of east room, toward center.
13	1-9-91	Units 4/3	Mano in tephra east of east room, dislodged by end of Unit 3 tephra.
14	1-10-91	Unit 1	Obsidian blade in tephra 2 cm above floor in north room, west side.

15	1-14-91	Floor	Sherd scatter on bench of north room, hit by lava bomb
16	1-15-91	tbj surf.	Sherd scatter on previous ground surface to south of structure; trash discarded.
17	1-10-91	Floor	Pot on NE corner of bench of north room, hit by lava bomb
18	1-14-91	Units 1/2	Miniature pot, "paint pot" below roofing, at top of Unit 1, dislodged from wall op.
19	1-14-91	Unit 3	Seashell fragment, north room, was disl dged from a high perch by turbulence.
20	1-15-91	Unit 1	Seashell fragment (same appearance as FS 19) to south of structure, dislodged by turbulence.
21	1-17-91	Floor	Sherds from pot N of Column 4, hit by large lava bomb
22	1-17-91	Floor	Pot on bench in N room, just east of FS 10.
23	1-17-91	Wall	Sample of painted wall, N room, West wall, dislodged during eruption
24	1-17-91	Floor	Ceramic human figurine in niche
25	1-17-91	Floor	3 shell fragments in niche
26	1-17-91	Floor	broken double ring in niche
27	1-17-91	Floor	deer antler in niche
28	1-17-91	Floor	pottery animal head in niche
29	1-17-91	Floor	Trough metate inverted on floor against north wall in north room.

APPENDIX B. DESCRIPTIONS OF UNUSUAL ARTIFACTS

This appendix describes the unusual or unique artifacts that are not described in other chapters, such as in the chipped stone or groundstone chapters.

295-5-11 Four olivella shells placed under vessel (FS11) in south end of east room. Only two of the four shells broke, in spite of the weight of the vessel, the roof falling in on it, and the tephra overburden. The tephra that packed around the pot after the roof fell probably assisted supporting the pot more than adding more direct overburden. The shells are very similar, ranging in length from 3.5 to 4.0 cm, and in diameter from 2.2 to 2.5 cm. Three have relatively large holes (ave. diameter .9 cm) drilled into the surface, toward the centers, and each hole shows considerable wear at their upper ends. The other has a hole placed close to the end created by sawing a long and broad incision (3.8 x .4 cm) into the shell until it intersected the inside. The result is a small perforation (.4 x .2 cm). The fact that the hole shows only slight wear at the top probably indicates that this shell was a later addition to the other three. All had been strung, and may have been strung when placed on the floor under the pot, but no evidence of string was found.

295-5-18 Fired clay miniature vessel. This is an effigy vessel, with minute traces of bright red pigment on rim and a thin film of pigment in the inside. A face, probably of a frog, was modeled and then polished, and four legs ending with four toes adorn the front and back of the vessel. The vessel body and neck were highly polished. This paint pot closely resembles the five found in a group in the back of Structure 7, Operation 2. The height is 4.3 cm, diameter is 4.3 cm, and mouth inner diameter is 1.5 cm. The neck broke from the vessel body when it fell from the northwest side of the building during the early stages of the eruption, but both pieces were found a few cm apart, in the same tephra unit, and were reunited.

295-5-19 Bivalve shell found in north room. Measures 5.1 x 4.4 x 1 cm. Very poor condition; no sign of fashioning or use remains. Species unidentified but may be an oyster. Almost certainly is the same species as FS 20, found on the other side of the structure.

295-5-20 Bivalve shell found in Unit 1 tephra south of Structure 12, probably dislodged from high up in the structure by turbulence at the beginning of the eruption. Species unidentified; probably some kind of oyster. Measures 6.3 x 5 x 1.5 cm. This is very deteriorated. No signs of shaping or use.

295-5-24 Ceramic figurine. This is a female figurine, as evidenced by the presence of two breasts just below the necklace. This is handmade, not moldmade, and is hollow with a large firing hole (1.1 cm) in the back. It is 7.3 cm high and averages 4.1 cm in diameter. The method of construction began with a hollow cylinder of clay to which were added fillets for the eyes, nose, ears and earrings, necklace, and breasts. The fillets and the clay cylinder were then shaped into the face and body, smoothed, dried, and then fired. Prior to firing a band of black paint was added above its left ear, extending 1.2 cm along the temple. Red paint was also added to the breasts, ears, and the base. The face is not completely symmetrical, as one eye has a horizontal slit yet the other does not. The mouth is sloping slightly. The ears are decorated with large ear rings. It was taller, with a headdress that broke off. It was handled or moved around a lot after it broke, as the edges are quite rounded. Apparently, small amounts of fired clay were also broken from the earring areas and also became very rounded after breaking. This was found in the niche in the bench of the north room.

295-5-26 Broken double ring, fired clay. This presently measures 4.5 x 3.6 x 1.9 cm, with a hole diameter of 1.7 cm. This was one half of a ceramic double ring, with the rings at right angles to each other. This was found in the niche in the bench of the north room. The other ring, likely about the same size as this ring, broke off some time before this was placed in the niche, as the edges of the break are very worn. The surface of the ring shows considerable abrasion and scratching. The ring was slipped and moderately polished. This could have been an artifact from an earlier period that was picked up by someone and ultimately taken to Str. 12.

295-5-27 Deer antler with skull bone attached. This is an almost complete deer antler tine with a portion of the skull bone still attached. Complete length is 18.4 cm, tine is 15 cm and skull bone is 3.4 cm. Only the most distal portion, the tip, is missing, which represents an estimated additional .5 cm. Some smoothing from use before the tip broke can still be seen. After the tip broke off it was used only slightly, as evidenced by a small amount of fine abrasion that rounds off the fresh break. After the break and the abrasion a very small rodent chewed on the end of the main tine and the smaller side tine, leaving tiny parallel inciser cuts. This must have occurred in the time interval between someone's placing the tine in the niche and Laguna Caldera erupting. The fine abrasive use wear could have resulted from use as a corn shucker or as a basket making tool, or possibly other use against relatively soft organic materials. This was placed in the center of the niche in the bench of the north room.

295-5-28 Fired clay figurine, animal head, type unknown. This was placed in the niche in the bench of the north room. As with the two other fired clay artifacts, this has a break, at the neck, that had occurred long enough before it was placed in the niche for considerable abrasion to occur. It is not a fresh break. This is a solid piece of fired clay measuring 3.5 x 2.2 cm. It was modelled by hand with a sharp implement and then smoothed, but not slipped or polished. The details are by incision, generally about a mm wide and deep. V-shaped lines come from the back of the head over the top to come together on the forehead. Two of the three zones between the incised lines have punctations. Some white paint still remains in the bottom of the incised lines and punctations. The eyes are made by deep conical holes. The lower facial area is broken off. The back of the neck has a fillet which appears like a high collar.

Chapter 11. CONSERVATION REPORT: 1990 SEASON

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INTRODUCTION

At the time of their excavation, most materials -- whether architecture or artifact -- are no longer in the same condition as at the time of their burial. Initial equilibration and then long-term exposure to an "unnatural" burial environment often result in physical or chemical changes which leave the component media in a weakened state. Additional damage may occur with rapid exposure to ambient conditions, brought about by the excavation process itself. The survival of the architectural and artifact record may ultimately depend on anticipating such changes and installing a conservation program on site to respond appropriately.

Until the current season, conservation efforts at Cerén had been oriented primarily toward the stabilization of the site's earthen architecture. The discovery in 1989 of an extremely fragile "possible codex" resulted in my becoming involved with the Cerén Project and prompted a series of discussions with Payson D. Sheets about the inclusion of artifact conservation staff on the team for subsequent field seasons. Given the extraordinary circumstances of the site's destruction, the potential for ordinarily fragile artifacts to be preserved, and the quantity of fully reconstructable ceramic vessels, this seemed to be a prudent response. The establishment of a conservation laboratory on site emerged as an even higher priority as the likelihood increased of finding artifact assemblages which included vulnerable organic materials.

While all artifacts automatically become part of the collection at the *Museo Nacional David J. Guzman*, the shortage of trained museum personnel to address these conservation challenges in the field and to reconstruct the large number of complete ceramic vessels has placed the responsibility for the conservation of artifacts with the Project. I was subsequently invited to participate in the 1990 season as field conservator. This report summarizes my activities during the two periods in which I was able to work on site: from September 7 to 28, 1990 and from January 13 to 25, 1991.

The initial phase of the Project's artifact conservation program is defined by the following objectives, which take into consideration my participation on a part-time basis as the field conservator:

- (1) to establish a conservation laboratory and appropriate procedures for the processing of newly excavated artifacts;
- (2) to provide training for team members in various conservation techniques for the period when no conservator would be present; and to provide guidance or training as needed to *Museo Nacional* restoration lab staff in the treatment of Cerén materials; and
- (3) to treat newly excavated artifacts or any materials from the 1989 season as needed.

For the future, the goal is to have a fully staffed laboratory for the entire field season. This would encourage further refinement of the procedures for the processing of newly excavated artifacts, provide immediate response to difficult problems of artifact lifting or stabilizing, and enable newly excavated ceramics to be reconstructed in a timely fashion. In addition, the laboratory could become a continuing source of training both for the archaeological team as well as for conservators (both U.S.-trained and Salvadorean) in techniques appropriate to the conservation challenges which this site so amply affords.

ESTABLISHMENT OF A FIELD LABORATORY

In September, an inventory of supplies was brought from the United States and additional materials were acquired in San Salvador for field treatments and museum-based conservation activities. In addition, a small selection of relevant conservation articles and books was brought for reference.

A laboratory space at the *Museo Nacional David J. Guzman* was established in two rooms (formerly the photographic suite) connected to the registrars' office. The front room was organized for "active artifacts": ceramics awaiting conservation, examination and wet treatments, equipped with tables and a microscope. The back room was to be used for additional treatment space (laying out sherds and gluing), storage of the Project's conservation supplies, and storage of 1990 artifacts (and some 1989 materials from contexts that may adjoin the 1990 materials), with small tables and shelving.

As excavations had not yet begun, some basic procedures for processing newly excavated artifacts in the field were devised, in conjunction with the archaeologists. Preliminary examination, washing and numbering were to be carried out in the field. This field operation would involve tubs for washing, perforated drying racks, inking supplies and other materials necessary for special lifting situations. The dried artifacts would then be brought on a periodic basis to the *Museo Nacional* "Cerén Suite" for temporary storage. All 1990 ceramic material was to be washed but otherwise untreated, pending evaluation in November by the ceramics specialist Marilyn Beaudry-Corbett, at which time priorities for reconstruction/restoration would be assigned. Responsibility for the treatment of the 1990 material was as yet undelegated.

Records of treatments carried out on Cerén material would be maintained in a conservation record book, with artifacts logged in by date, with provenience information, description including notes on condition, itemizing of treatment steps and materials used, and the date of completion. This book would be maintained by the Project's conservator. In September, only 1989 ceramics were being treated, and information about work previously carried out by museum restoration staff was solicited for inclusion in the record book. It was not clear how work carried out in between seasons could be adequately incorporated, nor was any attempt made to have the archaeologists enter information about basic treatments or lifting procedures during the period when no conservator was present. These issues await further clarification.

Soon after my departure at the end of September, the construction of a field laboratory structure was completed, which included ample shelving, counter space and a central table for artifact processing and temporary storage. An adequate inventory of materials for lifting and basic consolidation treatments was available on-site, with back-up supplies in the Cerén Suite at the museum. The procedures as developed above were generally followed, with the most fragile finds being stored on-site until they could be further stabilized and transferred to the *Museo Nacional*. Ceramics, both sherds and whole vessels, chipped and ground stone artifacts and small finds in other materials were brought to the museum on a regular basis.

Another notable change by the time of my January visit was alteration to the Cerén Suite. The front room had been reclaimed for an office space and the Cerén Suite was now entered directly into what had been the back room. This room was now used as a holding area for completed ceramics, with any continuing reconstruction work being carried out in the museum's restoration lab. The former darkroom connecting to it was revamped as the principal storage area. I anticipate that most of the conservation of artifacts, potentially including reconstruction of ceramics, will continue to be carried out on-site, with the Cerén Suite used for additional fine or microscope work and storage.

While some basic treatments were carried out on-site by the archaeologists and at the museum (ceramics only) by restoration staff, the conservation record book was not used to record these treatments. Only in the case of work subsequently carried out by me were these artifacts entered, with any previous treatment information included in the entries.

CONSERVATION EDUCATION

In September, training activities included a demonstration at the site of various lifting techniques for use on fragile objects. Among these were bandage wrapping and various block-lifting methods, with and without the use of plaster of Paris as a support material. Several team members requested some hands-on work in appropriate methods of cleaning and gluing ceramics, and there were numerous informal discussions of treatment issues (particularly focused on adhesive and consolidant choices).

Because most of my initial work took place in the museum, there were many opportunities to discuss a variety of conservation methods. These involved the two *Museo Nacional* restoration lab staff and several volunteers. Of particular interest were issues of appropriate adhesives, methods of making reversible fills, and removal of "hongos" and inorganic accretions on ceramics. A significant portion of my time was devoted to providing guidance and hands-on assistance to them in specific treatment aspects of the Cerén ceramics. In response to expressed interest, I drafted two guidelines: Notes on Adhesives in Ceramics Conservation and Notes on Cleaning Treatments for Ceramics.

Several slide lectures on the treatment of the "possible codex" treatment were delivered: on 25 September at the Patronato Museum, in conjunction with Payson Sheets' overview of the Cerén excavation project (in English), and on 27 September at the *Museo Nacional* (translated into Spanish).

My work in January was focused on the stabilization of a variety of fragile finds and packing them for storage during the closure of the excavation season. This is detailed in the following section.

CONSERVATION TREATMENTS

Treatments during September were exclusively of ceramic vessels from the 1989 excavation season. In conjunction with Beaudry-Corbett, a select group from the 1989 pottery corpus was identified and a list developed with the following information: designations of high, medium and low priority; appropriate conservation steps required (e.g. preparation of fragments, joining, gap filling, inpainting); and projected date of completion (based on reasonable estimates of time required for treatment). Not including those on display in Tazumal and 5 others whose treatment had been completed prior to my arrival, there were 28 vessels on the list. The highest priority vessels were those intended for a planned museum display on the Structure 6 "bodega"; others required fuller design or form analysis. The list, *Horario de Trabajo de las Ceramics al Sitio del Joya de Cerén*, was intended to be used as a guide for the museum lab staff. The goal was to have all pottery reconstructed (but not necessarily fully restored) by Beaudry-Corbett's return in November 1990.

The bags of fragments were first gathered from the museum's storeroom, then tagged and organized by priority and projected completion date in the Cerén Suite. Each was entered in the Conservtion Record book with all information that could be found on previous treatment; these entries were updated with all treatment steps carried out during the current season.

Of the 28 vessels, 21 were partially glued (from the 1989 season) and a number had segments taped together with masking tape. Elmer's glue (a polyvinyl acetate emulsion) seems to have been used primarily; the glued sections could be separated by soaking in water and the adhesive residues mechanically removed with brushes. The deteriorated masking tape and its stains on the ceramic body were removed with xylene. I encouraged Project members to avoid both of these materials as they become increasingly insoluble and therefore difficult to remove with time.

The surfaces and broken edges were cleaned with a soft toothbrush, and carefully with a scalpel where concretions obscured design. Stains from heat contact during burial or from "hongos" were not removed. The pieces were joined with Acryloid B-72 adhesive (a methylacrylate-ethyl methacrylate copolymer, in acetone). This adhesive is strong, readily reversible in acetone, chemically inert and stable over time. Where additional structural support was needed, fills were cast into gaps with dental plaster, after sealing the break faces with a dilute B-72 solution. By the end of September, 12 vessels had been reconstructed and another 7 were in progress. Reconstruction of the pottery continued after my departure, with some oversight provided to the museum restoration staff by Beaudry-Corbett during her November-December on-site work.

My return trip in January was specifically for the purpose of stabilizing the most fragile artifacts uncovered during the season. Some had been completely excavated, some block lifted and others left *in-situ*. These were primarily organic materials, such as fiber and shell, or painted objects whose organic substrate had completely deteriorated leaving only the fragile paint layer. The treatments are summarized below by artifact material. For each material, the number of entries in the conservaton record book is indicated in parentheses; an entry may consist of one artifact or an associated group of similar items.

SHELL (10 entries)

The principal problems with the shell material -- both univalve and bivalve, worked and unworked -- were powdering and delamination with drying, and potential loss of applied red paint. They were gently cleaned with a soft brush or puffed air, and consolidated where needed with a dilute solution of Acryloid B-72 in acetone. Any reattachment of fragments was done with B-72 adhesive. One shell required reinforcement of a join using a small patch of fine Cerex nylon web glued to the interior with B-72 adhesive. One shell had been block lifted using a plaster collar to contain the deposit. This item was left in its surrounding soil, but further cleaned and consolidated as described above.

BONE/ANTLER (3 entries)

All were gently cleaned. One bone artifact (a bead with applied paint) was consolidated with B-72; an antler and a bone figurine were each reconstructed with B-72 adhesive.

NUTSHELL (1 entry)

A spindle whorl made from a carved nutshell and a wooden spindle wrapped with thread deteriorated rapidly after excavation with drying; these were consolidated initially with B-72. The nutshell fractured with subsequent handling, and was completely reconstructed with B-72 adhesive. Additional reinforcement patches of Cerex nylon net were glued to the interior. The charred wooden spindle (in 2 pieces) and the nutshell were left separate for packing.

FIBER MATTING (3 entries)

One section of an *in situ* woven mat was block lifted, using a plaster collar as support during the lift. This was allowed to dry and then consolidated using dilute B-72. Fragments of the mat were then gently removed and packed for further study. The mat remaining *in situ* in Structure 7 was gently cleaned, then consolidated with a 4% aqueous solution of Acrysol WS-24 (an acrylic dispersion, useful in damp to wet conditions). The majority of this section of the matting was lifted subsequent to my departure by the archaeologist. The mat flooring of the corn crib *in situ* in Structure 4 was also gently cleaned and consolidated with the Acrysol solution. The solution was applied to the surrounding plaster pole casts and exterior clay, but the principal protection to these will be provided both by tephra left in place by the archaeologist around a third of the perimeter, and by polyester cloth bags filled with ash. The perforated wooden box which covers the corn crib should provide significant physical protection and help maintain somewhat constant environmental conditions.

FIBER BASKETS (2 entries)

One basket had been block lifted by the archaeologist, with a margin of surrounding tephra, a section of the adobe floor and a plaster collar for support. Because of the unwieldy condition of the artifact and the additional risk of damage by ants nesting in the soil, the decision was made to excavate the basket more fully from its burial matrix. The visible upper woven surface was gently cleaned, then consolidated with diluted Acrysol, and cracks and fragile edges reinforced with small strips of Cerex nylon adhered with B-72. The surface was protected with a layer of the nylon net, then covered with a layer of aluminum foil. Plaster was poured to form a closely conforming support, and the entire block was flipped. The plaster collar and all the surrounding tephra and adobe were removed down to a thin layer just above what is the actual base of the basket. Any exposed fibers were consolidated with B-72 and the final excavation of the basket was left for a future season. Other remains of organic containers (baskets, fiber rings, net bags) left *in situ* in Structure 11 were gently cleaned and consolidated using Acrysol. Because these items are exposed, their durability over time is doubtful although erosion may be slowed by the consolidation.

CERAMIC (2 entries)

Red paint was consolidated on a terracotta figurine with B-72, and the broken neck of a miniature pot was readhered with B-72 adhesive.

PAINT DEPOSITS (6 entries)

A number of painted artifacts whose organic substrates had completely disintegrated were discovered this season. Three of these deposits retained a hemispherical form within the ash surround. When the interior ash was removed, only the inner white surface of the exterior paint layer was visible in two cases; the other had remnants of a painted interior. These deposits were lifted by the archaeologist: plaster of Paris was poured into the interior space to secure the fragments, and extended to form a plaster collar to provide lateral support during the lift. The matrix ash was then removed after lifting to reveal the exterior painted surfaces, variously decorated with simple rim bands or stripe motifs with red, green, yellow and brown paint. These may have been painted fruit shells (*morros*), used as containers. Subsequent treatment consisted of mechanically removing the plaster collar to reduce the mass of the lifted artifacts and consolidating the visible paint layer using B-72. Accretions of plaster on this paint layer represent leakages through losses or breaks in the paint layer: they can be carved off at a later time although the plaster cannot be safely removed from any paint which has been covered. It is hoped that the consolidation may also provide some protection from efflorescence of sulfate salts. Three other paint deposits whose original form could not be determined by the fragmentary remains were block lifted by

the archaeologist; all of these appeared to consist of two back-to-back paint layers. Two of these were left in block form; the upper paint surfaces (solid red) were gently cleaned and consolidated with B-72. The paired paint layers of the third artifact were removed from the block, by attaching Japanese tissue patches to the red upper surface with methyl cellulose and B-72 solutions. The faced sections were lifted, to reveal another paint layer below; these fragments were similarly adjoined with tissue patches and lifted, revealing a pattern of red strokes on green.

ANALYSES

On-going treatment of Cerén's "possible codex" at the Smithsonian's Conservation Analytical Laboratory has provided the impetus to investigate pigment materials used in pre-hispanic Mesoamerica. This includes review of published analyses of pigments from wall paintings, codices, post-fire painted ceramic wares and other pigmented artifacts, as well as my own analyses from a small group of painted artifacts. The deposits of paint fragments and the pigment pots excavated this season at Cerén offer a unique opportunity to investigate the palette available to the people in this pre-hispanic town. Summaries of these findings are provided in Chapter 15 (this volume) and the treatment of the "possible codex" will be discussed in subsequent publication of the Cerén Archaeological Project.

TABLE 1. LIST OF 1990 ARTIFACTS TREATED

FS #	Artifact Description	Cons. Lab 90: page reference
295-		
-1-234	Fiber basket (block lifted)	26
-1-237	Paint deposit, morro (lifted)	20
-1-247	Paint deposit, morro (lifted)	21
-1-310	Paint deposit, morro (lifted)	20
-2-204	Paint deposit (block lifted)	31
-2-205	Paint deposit (block lifted)	31
-2-212	Shell, bivalve (block lifted)	31
-2-219	Shell, cowrie	30
-2-220	Shell (bivalve), worked	30
-2-227	Bone (?) bead	31
-2-228	Shell bead	30
-2-229	Shell (bivalve), worked	30
-2-231	Shell pellet/bead blank	30
-2-232	Shells (2), olive-type	30
-2-248	Paint deposit (block lifted)	23
-2-298	Bone figurine	19
-2-333	Spindle whorl, nutshell, wood, threa	22
-2-360	Fiber matting (block lifted)	27
-5-11	Shells (4), olive-type	22
-5-18	Miniature pot, ceramic	29
-5-19	Shell fragment, bivalve	19
-5-20	Shell fragment, bivalve	19
-5-24	Terracotta figurine	29
-5-27	Antler	29

In situ

Op.1, Str.11:	Baskets, fiber rings, bag	23, 28
Op.2, Str.7:	Fiber matting	24
Op.4, Str.4: stakes, clay	Corn crib: matting, plaster-cast	25

Chapter 12. JOYA DE CEREN CERAMICS: CLASSIFICATION AND PRELIMINARY ANALYSIS OF HOUSEHOLD INVENTORIES

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BACKGROUND

Initial field work at Joya de Cerén in 1978 produced a small ceramic collection that was classified and reviewed within the context of the Protohistoric Project's settlement research objectives (Beaudry 1983:161-190). During the 1989 season of the Joya de Cerén archaeological project, pottery recovered from the various field operations was incorporated into the ceramic typology and some preliminary observations about different aspects of this unique data set were presented (Beaudry 1989:81-90). The 1990 field season enlarged the ceramic data set¹ which is being utilized to meet a number of objectives:

1. To continue developing and refining the classification of the pottery in order to establish the site's ceramic complex (Gifford 1976), that is, the complete range of pottery available to the community at the time of the Laguna Caldera eruption. The 1989 sample was heavily biased toward the Household 1 area of the site. The 1990 data from three new structures amplifies the intra-site coverage.

2. To analyze the pottery inventory by structure (and where possible by implied household corresponding to structure groupings) as a means of hypothesizing the role or status of different households within the Joya de Cerén prehistoric community.

3. To capitalize upon the sizable corpus of pottery that was in active use or being conserved for reuse at the time of the village's destruction to investigate economic aspects of the community's organization. This is approached in two ways. First, study by instrumental neutron activation analysis (INAA) of the raw material resources represented in the village's pottery provides information on the production locus for ceramics in different households or of different types. Second, detailed study of the decoration and finishing processes of different vessels leads to insights about standardization, pottery-making specialization, stylistic canons, etc.

METHODOLOGY AND PROCEDURES

Two four-week periods were spent during the 1990 field season working on the Joya de Cerén pottery. The first period (August-September) was devoted to developing a schedule for reconstructing vessels from the 1989 field season, sampling 1989 specimens for INAA, and establishing procedures for field processing of 1990 pottery. The second period (November-December) was used for the following tasks: inventorying the recovered ceramic materials, determining the amount of each vessel recovered as well as the feasibility and need for reconstruction; describing the form, decoration, and measurements of each 1990 vessel; studying the reconstructed 1989 vessels for precise metric data as well as for detailed analysis of decoration and surface finish; and sampling the newly recovered pottery for INAA.

The ceramic analytical procedure developed during the first two seasons of the Joya de Cerén project is one that I envision as an ongoing process, being refined with the addition of material from new field operations. The key ingredient is the initial examination and description of each recovered vessel. The procedure is schematically shown in Figure 1.

For the 1990 field season a form was prepared and used in the description phase. (See Table 1.) This standardization saved time and insured the consistent recording of data. It will be revised for future seasons, based on this season's experience.

A few comments are in order about the INAA project. Trace element analysis of the paste (fired clay) of each vessel will be done in collaboration with Dr. Ronald L. Bishop, Research Archaeologist, Conservation Analytical Laboratory, Smithsonian Institution. This laboratory technique uses a very small quantity of powder removed from the wall of the pot to identify proportions of elements present in the clay in trace amounts (parts per million). Since it has been determined that clay deposits differ in their trace elemental composition, this type of analysis can separate pottery vessels according to different clay resources that were used. From that, we can reconstruct the production system that supplied pottery to the residents of the village. For example, were all the storage pots made of clay from the same deposit that had been prepared in a similar fashion? Did the painted serving vessels come from a

TABLE 1. JOYA DE CEREN POTTERY DESCRIPTION FORM.

Catalog No. _____ Other identification _____
Provenience Notes: _____

Amount recovered and degree of fragmentation:

Laboratory priority: alta ___; media ___; baja ___

Form: Overall _____ lip _____ rim _____ neck _____

wall _____ base _____ support _____

handle _____ other _____

Surface treatment and decoration

Exterior from lip down (as for form):

Interior (repeat as appropriate):

Paste: Color

Inclusions and other details

Metrics

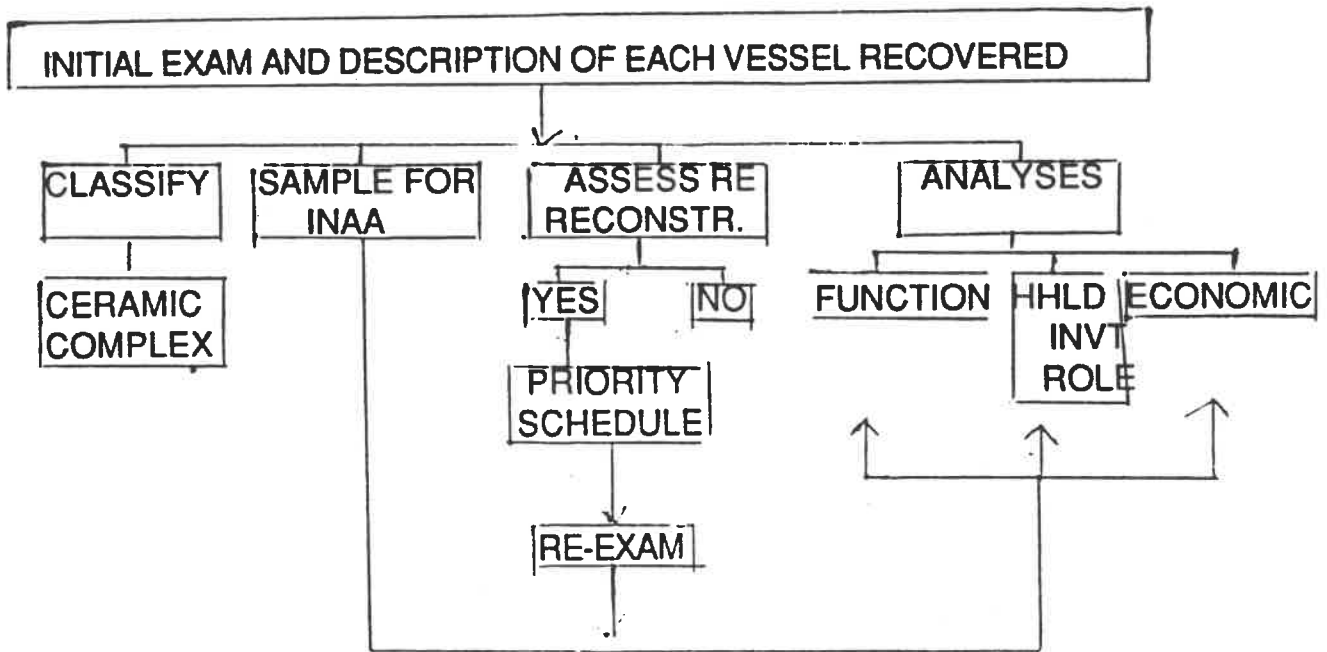
Rim dia: _____ height, overall _____ wall thickness _____

Max dia: _____ height, support _____ handle info: _____

Other: _____ height, neck _____

Designs and profile (on other page)

FIGURE 1. SCHEMATIC OF ANALYTICAL PROCEDURES.



different clay source than the utility pottery? We will use the data to evaluate the extent of specialization of production as well as the pattern of distribution to the using households.

RESULTS

The analysis of the ceramics has not been completed. Vessel function cannot be fully assessed until botanical data are available. Detailed study of pottery manufacturing steps including fine-grained analysis of decoration motifs has begun with the recording of information but has not progressed to a point of synthesis. The INAA samples have not yet been analyzed for information on resource selection. Consequently, only two aspects of the ceramic analysis will be summarized in the following sections -- classification and household inventories.

CLASSIFICATION

The taxonomic units described on the basis of the 1989 ceramic sample (Beaudry 1989:81-90) encompassed the expanded collection quite adequately; no major new components were found in the 1990 pottery sample. A few specialized vessels were recovered and isolated specimens of possible new types were noted.

Specialized vessels

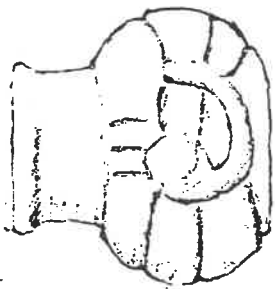
1. Five miniature pigment pots (295-2-213,-214,-215,-222,-230) were found along with beads and shells in an organic container that had fallen in the southwest corner of Structure 7 (Figure 2). They ranged in height from 2.9 to 4.5 cm with maximum diameters from 3.1 to 3.8 cm. The rim diameters were extremely consistent in size (2.5 cm) and finish (a flattened lip), suggesting a standardized production procedure such as fashioning them around a cylindrical form. The vessels are cream-colored and smoothed or polished. Each is decorated somewhat differently with incising, grooving and appliquéd elements. The most elaborate is 295-2-213 which has an applied modeled head and upper torso on one side and a modeled *caracol* (snail) on the other. Each pot contains varying quantities of powdered red pigment. In Structure 11 a very shattered miniature vessel (295-1-289) was found inside a scraped slip jar in the southern area near a shelf feature. The surface color, decoration and traces of red pigment all suggest a form and function similar to that of the Structure 7 examples.

2. An unslipped but painted vessel, very fragmented and incomplete, was found just west of Structure 7 in the roof thatch (295-2-294). It was mixed with a Gualpopa vessel (295-2-289), a Tazula Black vessel (295-2-297) and an unclassified brown-black vessel (295-2-321; see below). From the recovered fragments it appeared that the vessel had one long (12 cm) handle probably attached from near the rim to the lower wall (Figure 3). The rim is very thickened; the base probably was flattened. The surface was left rough and red paint was casually applied without evidence of a pattern or design. The surface texture is like the unclassified cup incensario from the 1989 excavations at Structure 2 (295-2-66) in the same household area. The cup incensario shared similarities with the Chichontepec Unslipped Type from Chalchuapa (Beaudry 1989:88-89; Sharer 1978:3:43). The current specimen (295-2-294) seems generally similar to the description of Jupula Red Painted: Jupula Variety at Chalchuapa (Sharer 1978:3:61). It should be noted that Jupula is in the same ceramic group as the Mocal Modeled-Appliqué Type, examples of which have been recovered at Joya de Cerén (Beaudry 1989).

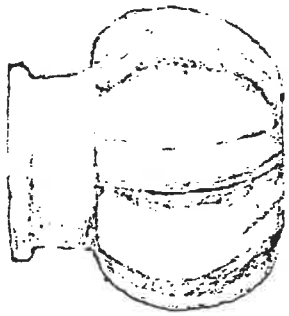
Single Examples of Possible New Types

1. Small coarse paste jar (295-2-271) (Figure 4) -- slightly thinned lip with vertical neck, rounded wall and base. Two small round-section handles are attached from just below the neck-shoulder juncture and extend 5.5 cm. The surface is completely fire-altered so the surface color and finish can not be determined. The vessel is very poorly fired and very friable with dense white inclusions. (Height: 16.5 cm; rim dia: 10.0 cm.)

2. Painted recurved bowl (295-2-246) (Figure 5) -- rounded lip and direct rim with recurved wall and slightly flattened base. This piece is so fire-altered that it is impossible to determine the details of decoration or paste. The part above the curve seem to have had two very narrow registers; below the curve a 4-cm register with a well-executed rectilinear design can be vaguely distinguished. The motif is not well-known from other painted types found in the region. (Height: 12.0 cm; rim diameter: 18.0 cm.)



295-2-222



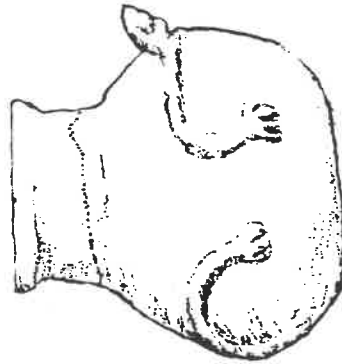
295-2-214
(215 is similar)



295-2-230



295-2-213



295-5-18



FIGURE 2. MINIATURE VESSELS WITH PIGMENT CONTENTS, OPERATION 2. DRAWN BY DAVID TUCKER.

UNCLASSIFIED COARSE PASTE JAR, 295-2-271.

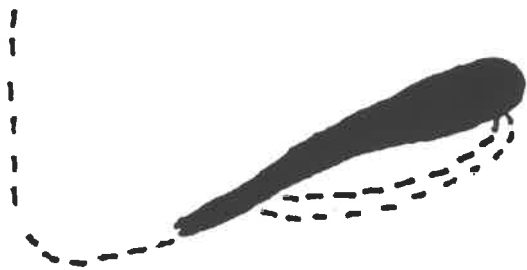


FIGURE 3.

UNCLASSIFIED VESSEL, 295-2-294.

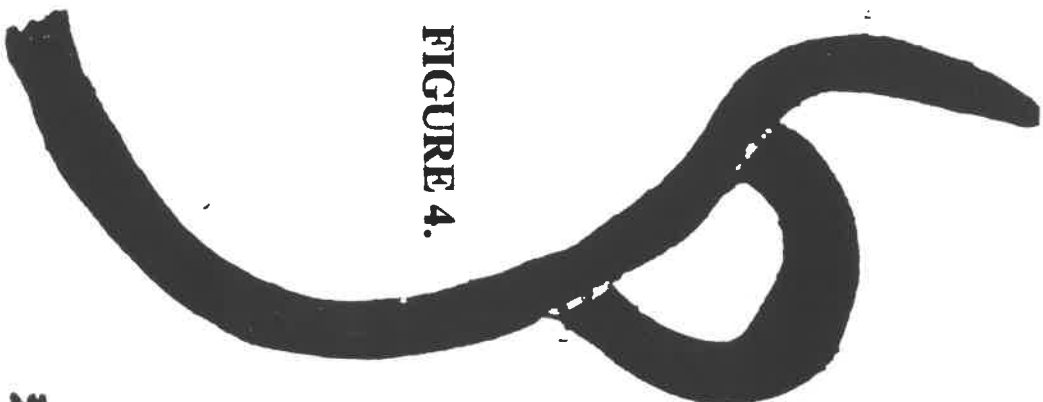


FIGURE 4.



FIGURE 5. UNCLASSIFIED PAINTED RECURVED BOWL, 295-2-246.



3. Polychrome dish (295-2-274) (Figure 4) -- the simple decorative motifs and the red paste suggest that this piece is not a part of the cream paste tradition of Copador and Gualpopa. The dish shape and the motifs also preclude its classification in the Campana, Quelepa, or Arambala groups. The dish has a rounded lip, a slightly outflared wall, and a flat base. The exterior has two wavy red-painted lines placed in the center of the wall on a streaky cream-orange slip. On the interior a one-cm red rim band is located above the main wall register which contains three repeats of a simple "animal" (?) design (see Figure 6). Very faint black outline details can barely be seen. (Height: 4.5 cm; Rim dia: 16.5 cm.)

4. Incurved wall brown-black vessel (295-2-321) -- none of the rim was recovered. A large sherd with a sharp basal curvature and other wall sherds were recognized (Figure 7). The exterior is left roughened with finishing marks evident; the interior is well-smoothed and polished. The finishing is curious because the implied shape would have a very restricted orifice; usually less care is taken in treating the interior of that form. Surface color varies from brown to black; it is unknown if this coloring is from the original firing, use, or eruption circumstances. (Height: 13.0 cm (existing); rim diameter unknown).

General Observations:

1. The Guazapa Ceramic Group components. In the 1989 preliminary report (Beaudry 1989:83) a comment was made about the dominance of the Miltitlan painted variety in which the upper part of the vessels is decorated with scraped slip and the lower part red painted. This mode had not been reported at Chalchuapa nor recognized during the 1978 Zapotitan Basin project. It was hypothesized that the mode probably had been present in the 1978 sample but not recorded because of the reliance on rim sherds for the Zapotitan classification. The 1978 Cerén materials were re-examined after the 1989 season and a number of cases were noted where there is faint evidence of the zoned use of red paint. The greater familiarity with the entire decorative pattern on whole vessels now enables me to detect clues that would lead to the classification of some 1978 pieces as Guazapa: Miltitlan rather than as Guazapa: Majagual (without any red paint component).

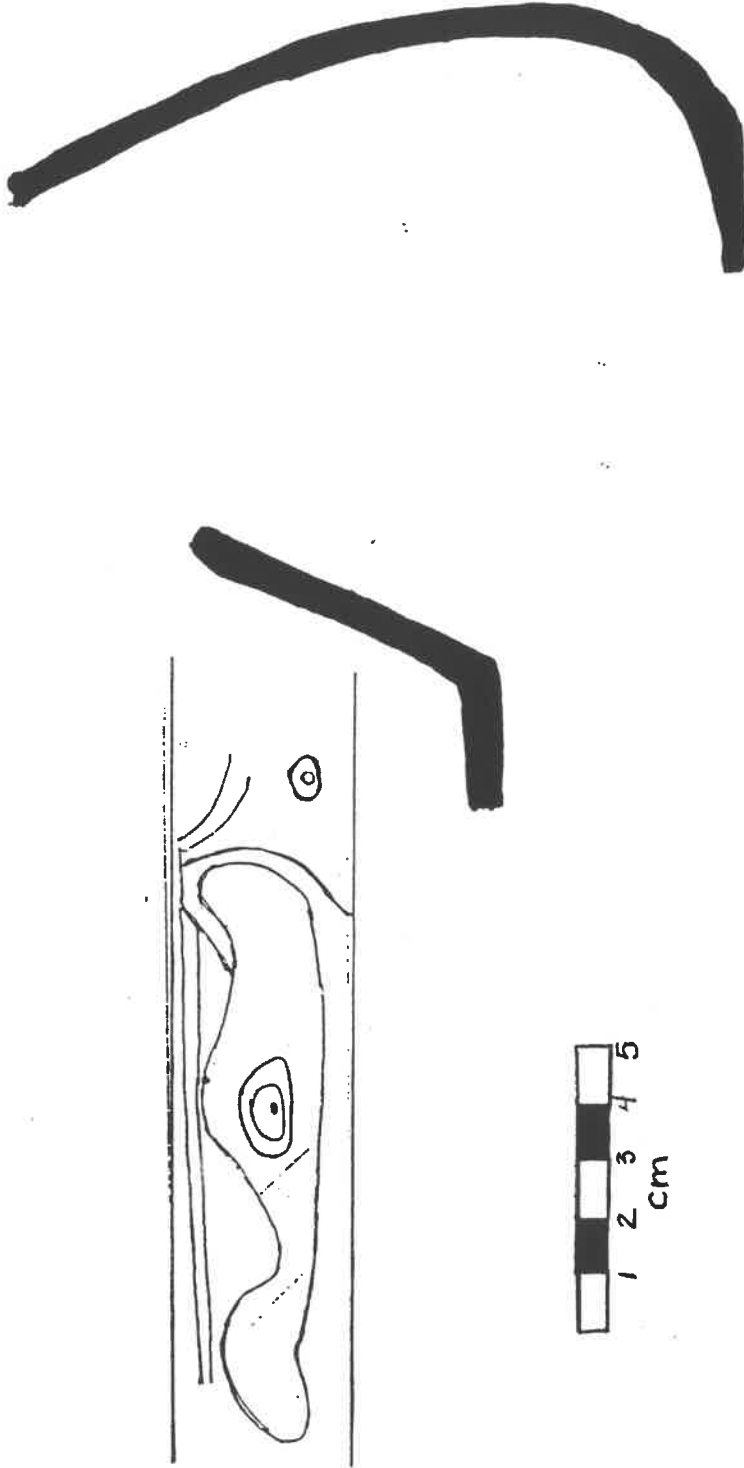
Approximately 25% of the 1978 material from Cerén identified as Guazapa: Majagual should be classified as Guazapa: Miltitlan. The re-examination also indicated that some of the Cerén Chorros type (both Chorros and Thin Wall varieties) is better classified at the Guazapa group level or moved to Guazapa: Miltitlan. The red-painted Miltitlan Variety and the unpainted Majagual variety of scraped slip decorated pottery seem to have been almost equally popular in Cerén households. The 1978 Cambio pottery classified as Guazapa: Majagual was also reexamined and approximately 25% of that would also be classified as Guazapa: Miltitlan. The other taxa within the more sizable Cambio corpus were not restudied.

2. Cashal Cream slipped: Caldera red painted. A review of the material from both field seasons in this taxon allows some interesting observations. Several modes are present: 1) a high-necked jar form without handles; 2) a ridge either on the neck of jars or on the upper wall of bowls. This type is much less prevalent than the Guazapa Group materials but has been recovered from each household. Most of the vessels were in floor contact in storeroom structures. Two had been used as "lids" on large Guazapa: Miltitlan vessels: one in the Household 1 domicile; the other in the Household 1 storeroom. Data from the INAA analysis should provide interesting insights into resource-related differences between Cashal and Guazapa vessels.

3. Painted decoration and shapes. Within the cream paste polychrome sample there appear to be atypical shapes and a dominance of simplified decorative motifs. For example, tripods are more common at Joya de Cerén than in materials studied from Copan and other areas within the cream paste distribution zone. The dish or plate with supports is quite common in the eastern part of El Salvador at the same time period. Thus, we may have an example of a frontier blending of influences. Also, specific aspects of the Copador decorative repertoire seem to be emphasized at this site. The dominance of the "melon stripe" bowl format was commented on last year. The use of the "swimming figure" motif was noted this year. Usually placed in the lower register of open bowls, it has been found on two Cerén cylinder pieces, adapted to a vertical spatial layout rather than the horizontal one for which it seems designed (Figure 8).

This formal and decorative program is provocative and may provide insights into the ethnicity of the Cerén residents. I already have commented on the varied execution of some of the painted designs,

**FIGURE 7. UNCLASSIFIED INCURVED
WALL VESSEL, 295-2-321.**



**FIGURE 6. UNCLASSIFIED POLYCHROME
PAINTED DISH, 295-2-274.**

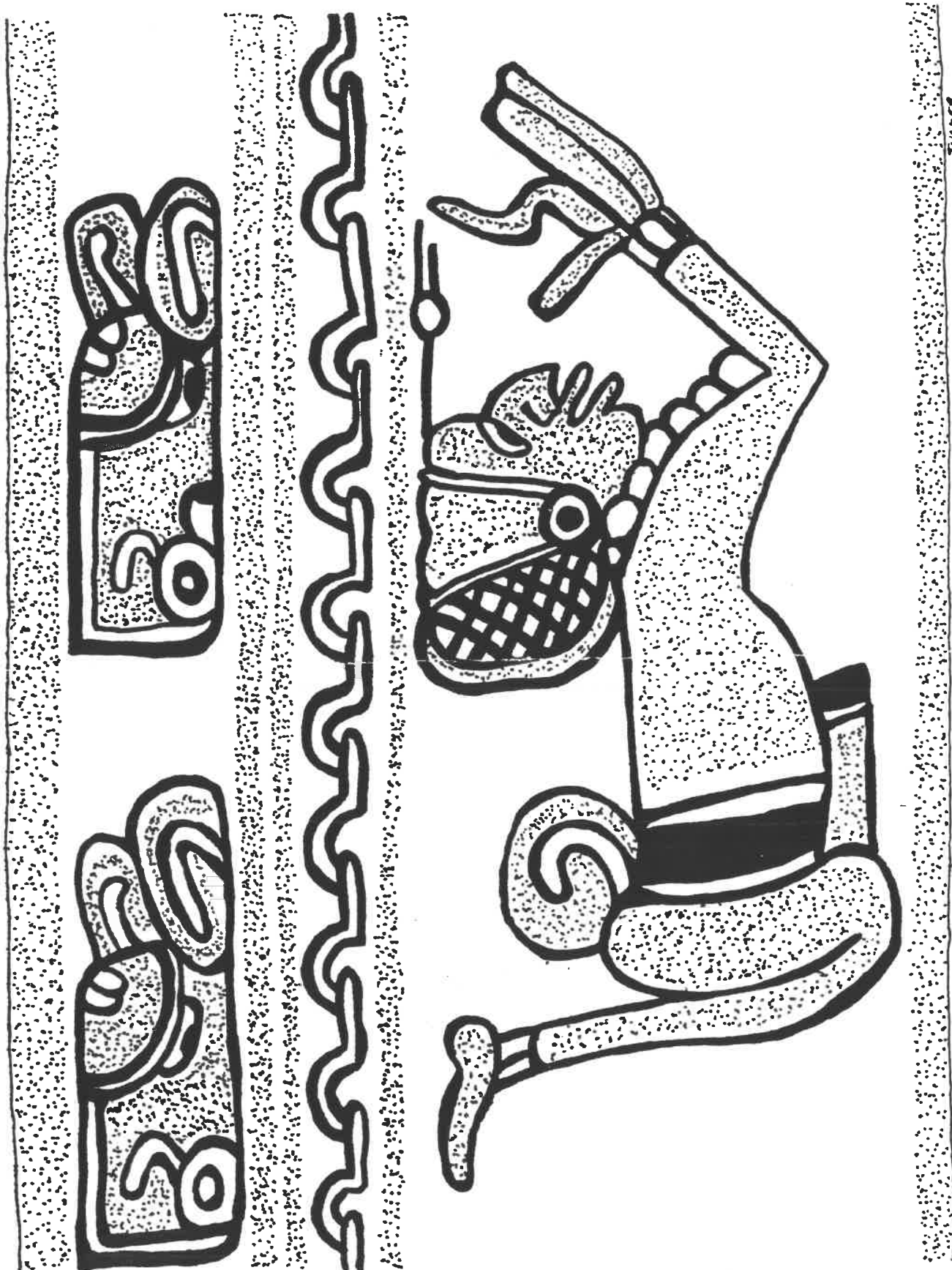


FIGURE 8. COPADOR CYLINDER WITH
"SWIMMING FIGURE," 295-4-201.

CENTIMETROS

hypothesizing that " if the imprecise execution is related to copying without fully understanding the nature of the designs ther could be important ramifications concerning the ehtric identity of the group copying the designs as opposed to that originating the designs" (Beaudry 1989:89). That, in combination with atypical shapes could signal a non-Maya occupation.

HOUSEHOLD INVENTORIES

Excavations during 1989 and 1990 have exposed a total of nine structures. As mentioned previously, Structure 12 data will not be considered in this report. Structure 9 did not contain any pottery. The remaining seven structures group into four units, three of which can be thought of generally as "Households." The composition of these units is postulated to be as follows.

Household 1

- Structure 1 -- daytime activities/sleeping (domicile)
- Structure 2 -- storeroom
- Structure 11 - food preparation and cooking (kitchen)

Household 2

- Structure 2 -- daytime activities/sleeping (domicile)
- Structure 7 -- storeroom

Household 4

- Structure 4 -- storeroom

The fourth unit, Structure 3, seems to have served a different function, one that is not yet fully understood. Pottery from Structure 3 was reviewed in the 1989 report and will not be dealt with at this time.

Pottery found in each of the other six structures has been grouped into size and shape categories, reflecting general functions. Work was done with measurements of vessel rim diameter, maximum diameter, height, neck and handle details. Associations among these variables were noted to the point where it was possible to assign jars, for instance, to size groupings if two measurements could be made. This method will be described fully in a more technical publication. For now, a "shorthand" identification of size will be used, based on rim diameter for utility jars and bowls and on general vessel shape for painted pottery.

Pottery recovered during excavation within structures did not always represent completely intact vessels. Ceramic material fell into a number of categories:

1. Complete vessels with handles, supports, entire rims, etc.
2. Complete but "imperfect" vessels which lacked part of the rim, a handle, etc. -- the equivalent in a modern-day household of a chipped bowl, a handleless cup, and so on.
3. Partial vessels broken in such a way that their use as a container is preserved -- usually represented by a rounded wall or wall and base segment (a horizontal section of the pot) that can serve as an informal shallow tray or plate in "secondary use" to apply Schiffer's term (Schiffer 1987:30).
4. Partial vessels broken in such a way that they could not continue to be used as a container -- represented by a more or less vertiacal section from the rim to the lower wall or base, suggesting that the piece was being conserved for "recycling" (to make sherd disks or plugs for pot-mending, to use the handles in wall construction, etc.)

In the following sections Categories 1 and 2 are included as "vessels" or "whole vessels" while Category 3 is called "partial vessel-horizontal section" and Category 4 is referred to as "partial vessel-vertical section."

Inventories can be compared among architecturally similar structures -- storerooms (Structures 4, 6, 7), daytime/sleeping (Structures 1 and 2); among components of the same Household (Structures 1, 6, 11 of Household 1 or Structures 2 and 7 of Household 2). It is not possible to compare the total household inventory for different households since it is not certain that all the components of any one household have yet been identified. (It must be remembered that Household 1, with the most components currently uncovered, lacks an unknown part of its living area due to the bulldozer activity

that occurred in 1976.) In spite of this limitation, some comparison can be made in terms of the combined daytime/sleeping and storeroom components of Households 1 and 2.

STOREROOMS

The total number of vessels in each storeroom is similar but the inventories are quite variable in terms of the size and shape categories (Table 2). The most notable differences are the following:

- Household 1 has considerably more jars without handles than either of the other two households and also has open utilitarian bowls which the other two lack.
- Household 4 has a dominance of medium sized (16-19 cm rim diameter) jars with handles and of Copador serving vessels in a variety of shapes. All of the Household 4 painted serving vessels are of the same classified type while those in the other storeroom structures cross typological units.
- Household 2 has a variety of pottery that is not well-represented at other structures, including the suite of 5 miniature paint pots. However, the Household 2 storeroom does not have as many jars with handles as either of the other two households nor as many partial vessels as the other storerooms.

The storeroom-located pottery was reviewed from the standpoint of its pre-eruption location: floor contact, on top of another vessel, on a shelf, stored in the roof area. In each household the prevalent pattern was for the medium and medium-large necked jars with handles as well as the jars without handles to have been placed directly on the floor. The painted serving dishes were usually elsewhere -- on a shelf, atop another vessel, stored in the rafters. One exception was noted in Structure 4 where three round-sided painted Copador bowls were nested in a corner removed from general "traffic." Some interesting observations can be made about inter-household differences within this structural category.

Structure 6 (Household 1) probably served as a work area as well as a storage area (Beaudry and Tucker 1989: 35-38). The completed excavation of the structure in 1990 (Mobley Tanaka, this volume) produced few additional artifacts in the extreme eastern part of the structure where the door was located. That appears to have been a traffic area which was kept clear. Approximately one-half of the vessels in this storeroom were in floor contact.

Structure 7 (Household 2) contained a shelf feature whose specific use has not yet been determined although two painted ceramics had been placed on top of it. A row of large storage jars with handles was located along the southern wall (away from the door) and a few others were close to the north wall. More open space was available in the center of this structure than in Structure 6 and a slightly lower proportion (one-third) of the vessels were in floor contact. (More may be along the west wall, however, since the fallen lower portion of that wall has not been removed.)

Structure 4 (Household 4) had the largest number of vessels in floor contact. More than half of those were medium-sized necked jars with handles, all classified as Guazapa: Miltitlan. The north room contained a number of *in situ* ceramic vessels. Three jars were in the western part of the room, but the eastern half of the north room was nearly clear of artifacts. A ladle incensario and at least nine whole or partial ceramic vessels fell from the roofing in the north room. The south room contained a dozen *in situ* ceramic vessels. The majority were jars. The three vessels that were not jars were a nested set of polychrome bowls and a polychrome cylinder vase. One polychrome bowl fell from the roofing, as did a number of sherds. The analysis of locational characteristics will continue when data from botanical analyses can be incorporated into a functional assessment.

DOMICILES

This architectural unit has been uncovered for Households 1 and 2. Even though a small portion of this part of Household 1 was lost during the leveling activities prior to the 1978 archaeological work some observations can be made.

The general layout of the two structures was similar; in each case a bench was located on the east side of an interior room. However, the households' use of space seemed to vary, as reflected by the ceramic inventory.

Structure 1, Household 1 contained three times as much pottery as did Structure 2, Household 2. The vessels in Structure 1 relate to storage and craft activities (pots with pigment, for example) as well as to food serving and household ritual. The Structure 2 ceramic inventory is restricted to food serving and household ritual vessels (See Table 3.)

TABLE 2. POTTERY INVENTORY OF STOREROOMS

Utilitarian Vessels	HH1	HH2	HH3
Jars			
Necked Jars With Handles			
Small (<12cm)	0	1	0
Small-Med. (12-15 cm)	2	0	2
Medium (16-19 cm)	3	3	6
Med-Large (20-27 cm)	2	2	5
Large (>27 cm)	0	0	0
Jars without Handles	5	1	1
Small Bichrome Painted Jars	0	0	0
Bowls			
Open Bowls with Handles			
Small (20 cm and less)	2	0	0
Large (25cm and more)	2	0	0
Incurved Bowls	0	1	0
Painted Serving Vessels			
Round-Sided Bowls	0	3	4
Recurved Bowls	0	1	0
Cylinder Vases	0	0	2
Dish (Tripod and Poss. Tripod)	0	2	1
Other Vessels			
Incensario/Censer	1	1	1
Slipped Incurved Bowl	0	1	0
Miniature	1	5	0
Total Complete Vessels	18	21	22
Partial Vessels			
Utilitarian, Horizontal Section	3	0	3
Utilitarian, Vertical Section	2	1	1
Serving, Horizontal Section	1	0	2
Serving, Vertical Section	3	2	0
Unclassified, Horizontal Section	0	1	0
Total Partial Vessels	9	4	6
Grand Total	27	25	28
Painted Vessels Classified by Type (Whole and Partial)			
Copador	3	2	9
Gualpapa	1	3	0
Campana	0	1	0
Suquiapa	0	0	0
Unclassified	0	2	0

TABLE 3. POTTERY INVENTORIES OF DAYTIME/SLEEPING STRUCTURES (DOMICILES)

Utilitarian Vessels	HH1	HH2
Jars		
Necked jars with handles		
Small (<12 cm)	0	0
Small-Med. (12-15 cm)	1	0
Medium (16-19 cm)	2	0
Med.-Large (20-27 cm)	0	0
Large (>27 cm)	2	0
Jars Without Handles	2	0
Small Bichrome Painted Jars	2	0
Bowls		
Open Bowls With Handles		
Small (20 cm and Less)	0	0
Large (25 cm and More)	0	0
Incurved Bowls	0	0
Painted Serving Vessels		
Round-Sided Bowls	1	2
Recurved Bowls	1	0
Cylinder Vases	0	0
Dish (Tripod and Possible Tripod)	1	1
Other Vessels		
Incensario/Censer	1	1
Slipped Incurved Bowl	0	0
Miniature	0	0
Total Complete Vessels	12	4
Partial Vessels		
Utilitarian, Horizontal Section	3	2
Utilitarian, Vertical Section	0	1
Serving, Horizontal Section	1	0
Serving, Vertical Section	0	0
Unclassified, Horizontal Section	0	0
Total Partial Vessels	4	3
Grand Total	16	7
Painted Vessels Classified by Type (Whole and Partial)		
Copador	1	2
Gualpopa	2	1
Campana	1	0
Suquiapa	2	0
Unclassified	0	0

A more detailed review of ceramics by location allowed some interesting comparisons.

Household 1 kept their two largest storage jars within the domicile structure by the column of the rear wall. Each had organic contents and was topped by a smaller jar without handles (one was an imperfect pot lacking a rim). The location of these jars was out of the traffic area but not in either the storeroom or the kitchen area. It is not yet known if this seeming preferential location relates to the nature of the contents or to other factors. Perhaps the contents were more valuable so they were left where there was restricted access. Perhaps the contents were more subject to pests so they were kept where greater family activity might scare away rodents.

In this same area was a painted tripod. Perhaps it, too, was slightly more special so it was not kept in either the kitchen or the storeroom. It is classified within the Campana Fine Line polychrome type which is less common than other painted taxa. A handled censer was near the bench, suggesting it had been recently used rather than being stored with others in the household's storeroom.

The rafters above the bench were well-utilized for storage of vessels as well as organic supplies (see the discussion in Beaudry and Tucker 1989). The bench itself served as a surface for placing food containers; during the 1978 partial excavation, four pots, two with vegetal contents, were recovered from the northern surface, near the outer room.

The Household 2 domicile was less "cluttered" in terms of pottery. Only two horizontal sections of partial vessels were stored in rafters above the bench; nothing was on the floor in the room with the bench. (The outer northern room of Structure 2 had the vertical section of one partial vessel in the rafters.) A niche below the bench provided space in which three serving vessels had been placed. An incensario of a different shape than that in Structure 1 was found on the bench. The presence of a censer in each domicile structure suggests recency of use of these objects, perhaps in some community-wide observation related to petitions for protection from the suspected impending natural disaster.

THE HOUSEHOLD 1 STRUCTURES (TABLE 4)

Among the different structures, fewer ceramic vessels were located in the domicile structure than in either of the other two structural units. Qualitative differences as well were noted.

-- The largest jars with handles were in the domicile structure rather than in either the storeroom or food preparation/cooking structure. This was not expected and has been commented upon in the preceding section.

-- The food preparation/cooking structure had a concentration of medium-large sized jars with handles.

-- Open utility bowls which are assumed to have been used for food preparation and cooking were as likely to be in the storeroom as in the "kitchen" area. This could represent the need to "warehouse" this type of vessel because of its more frequent replacement need. When available, data about discarded vessels will be useful for testing this hypothesis.

-- The storeroom had more jars without handles than either of the other two structures. This could represent the practice of having "stationary" vessels into which commodities are transferred after being transported.

-- Painted serving vessels were located in each of the structures, probably indicating that this type of pottery "moves around" in terms of having food put into it in one place which is then consumed in another place. Interestingly only partial painted vessels were recovered from the storeroom.

-- This household was using a lot of ceramic vessels as reflected by the combined total number of complete vessels from the three structures. Additionally, the inventory of partial vessels is also sizable, indicating secondary use as well as recycling.

The location of artifacts in Structure 11 has been described thoroughly by Mobley-Tanaka in her chapter related to the excavation of that structure. A few additional observations will be made about the ceramic inventory since this is the only kitchen-food preparation structure yet uncovered at the site.

Utilitarian open bowls with handles probably functioned both as cooking vessels and as containers for food during preparation. They were found in the hearth-metate area as well as in Area 4 which very likely served as a "pantry" for less frequently used objects. Since three of the four larger bowls were in Area 4, the size may correlate with special-occasion preparation needs. In the same area were two jars without handles (one Guazapa: Miltitlan; one Cashal Cream: Caldera Red Painted), suggesting a function not requiring much movement. This area with more open space than elsewhere in the structure

TABLE 4. POTTERY INVENTORY OF HOUSEHOLD 1 STRUCTURES

Utilitarian Vessels	Domicile	Storerm.	Kitchen	Total
Jars				
Necked jars with handles				
Small (<12 cm)	0	0	0	0
Small-Med. (12-15 cm)	0	2	0	2
Medium (16-19 cm)	2	3	2	7
Med.-Large(20-27 cm)	0	2	8	10
Large (>27 cm)	2	0	0	2
Jars Without Handles	2	5	2	9
Small Bichrome Painted Jars	2	0	0	2
Bowls				
Open Bowls With Handles				
Small (20 cm and Less)	0	2	2	4
Large (25 cm and More)	0	2	4	6
Incurved Bowls	0	0	0	0
Painted Serving Vessels	1	0	3	4
Round-Sided Bowls	1	0	3	4
Recurved Bowls	1	0	1	2
Cylinder Vases	0	0	1	1
Dish (Tripod and Possible Tripod)	1	0	1	2
Other Vessels				
Incensario/Censer	1	1	1	3
Slipped Incurved Bowl	0	0	0	0
Miniature	0	1	1	2
Total Complete Vessels	12	18	26	56
Partial Vessels				
Utilitarian, Horizontal Section	3	3	2	8
Utilitarian, Vertical Section	0	2	2	4
Serving, Horizontal Section	1	1	0	2
Serving, Vertical Section	0	3	0	3
Unclassified, Horizontal Section	0	0	0	0
Total Partial Vessels	4	9	4	17
Grand Total	16	27	30	73
Painted Vessels Classified by Type (Whole and Partial)				
Copador	1	3	2	6
Gualpopa	2	1	3	6
Campana	1	0	0	1
Suquiapa	2	0	0	2
Unclassified	0	0	0	0
Gualpopa/Copador Variant	0	0	1	1

could have been a locus for initial preparation with food being taken in containers to other parts of the structure. Most of the painted serving vessels were located in the area of the shelf, which seems to reflect "active" storage (see Mobley-Tanaka). Two other painted serving bowls had been placed inside one of the open utilitarian bowls with handles near the hearth.

The recovery of a miniature vessel (paint pot?) and an incensario in the area of the shelf indicates that small, non-food related objects also found their way into this structure.

THE HOUSEHOLD 2 STRUCTURES (TABLE 5)

The domicile structure has very few vessels of any type. A total of four complete vessels were recovered, three of which are serving vessels. The storeroom, on the other hand, was replete with both serving vessels (N=6) and utilitarian vessels (N=8) as well as specialized vessels (N=7). Each structure contained a few partial vessels.

As mentioned previously, this storeroom contained a number of vessels not well-represented in other loci at Joya de Cerén. (The paint pot assemblage in this storeroom takes on significance related to craft activity since a painted artifact was recovered from the niche in this household's domicile structure.

HOUSEHOLD 1 - HOUSEHOLD 2 COMPARISON (TABLE 6)

At this level of analysis, there appears to be some comparability between the two households when the inventories of the domicile and storeroom structures are combined and analyzed as one unit: 1) the types of painted vessels are similar; 2) each household had several censers which probably represent community ritual practices performed at the family level. Household 1 kept fewer complete painted serving dishes in these two structures than did Household 2 (3 vs. 9). Several differences were also noted in the assemblage of utilitarian vessels:

1) Household 1 had a greater number and size range of necked jars with handles than did Household 2.

2) Household 1 had significantly more jars without handles than did Household 2. This shape frequently is hypothesized to have been used for stationary storage where foodstuffs are poured into the jar which is not itself moved or transported. This would suggest a storage function differentially performed by Household 1.

3) Household 1 had four open bowls with handles while Household 2 had none, a further suggestion of variation in household functions between the two residential units, at least in terms of the inventory of the combined domicile-storeroom structures.

4) The two bichrome jars in Household 1-- one of which contained prepared cylinders of pigment, a spindle whorl, and a miniature metate -- point to a craft activity which probably contrasts with the craft activity represented by the five carefully made miniature vessels with powdered pigment recovered from Household 2. X-ray diffraction analysis of the pigments in cylinder form found in Structure 1 and the powdered pigments in the miniature vessels from Structure 7 revealed different mineralogical composition, pointing very strongly to different craft specialization at the two households. The Structure 1 pigment is hematite and quartz; that in Structure 7 is cinnabar (HgS) (Beaubien, Chapter 15 this volume). The hematite could relate to pottery-making since it is frequently used for pre-firing painting of ceramics. (Material recovered from the 1978 excavation at Structure 1 included some unfired clay which had suggested pottery production in this household. Cinnabar, on the other hand, does not withstand the temperatures which must be achieved to fire pottery. It produces a brilliant red color but is restricted to decorative use other than as a fired-on pigment.

A more definitive comparison will be carried out after a kitchen structure for Household 2 has been excavated. Also, it should be remembered that the Household 1 sample is incomplete and may not completely accurately represent that household's activities.

SUMMARY

The preceding description of similarities and differences among pottery inventories is preliminary and allow us primarily to draw attention to the emerging community pattern. For instance, we can state that each of the three households used pottery appropriate for all normal family maintenance functions: transport, storage, food preparation without heat (soaking, mixing), cooking, and serving. Additionally, "non-functional" pottery in the form of incensarios or censers were present in each household and partial

TABLE 5. POTTERY INVENTORIES OF HOUSEHOLD 2 STRUCTURES

Utilitarian Vessels	Domicile	Storeroom	HH Total
Jars			
Necked Jars With Handles			
Small (<12cm)	0	1	1
Small-Med. (12-15 cm)	0	0	0
Medium (16-19 cm)	0	3	3
Med-Large (20-27 cm)	0	2	2
Large (>27 cm)	0	0	0
Jars without Handles	0	1	1
Small Bichrome Painted Jars	0	0	0
Bowls			
Open Bowls with Handles			
Small (20 cm and less)	0	0	0
Large (25cm and more)	0	0	0
Incurved Bowls	0	1	1
Painted Serving Vessels			
Round-Sided Bowls	2	3	5
Recurved Bowls	0	1	1
Cylinder Vases	0	0	0
Dish (Tripod and Poss. Tripod)	1	2	3
Other Vessels			
Incensario/Censer	1	1	2
Slipped Incurved Bowl	0	1	1
Miniature	0	5	5
Total Complete Vessels	4	21	25
Partial Vessels			
Utilitarian, Horizontal Section	2	0	2
Utilitarian, Vertical Section	1	1	2
Serving, Horizontal Section	0	0	0
Serving, Vertical Section	0	2	2
Unclassified, Horizontal Section	0	1	1
Total Partial Vessels	3	4	7
Grand Total	7	25	32
Painted Vessels Classified by Type (Whole and Partial)			
Copador	2	2	4
Gualpopa	1	3	4
Campana	0	1	1
Suquiapa	0	0	0
Unclassified	0	2	2

TABLE 6. COMPARISON OF POTTERY INVENTORIES, HOUSEHOLD 1 AND HOUSEHOLD 2

Utilitarian Vessels	HH1	HH2
Jars		
Necked jars with handles		
Small (<12 cm)	0	1
Small-Med. (12-15 cm)	2	0
Medium (16-19 cm)	5	3
Med.-Large(20-27 cm)	2	2
Large (>27 cm)	2	0
Jars Without Handles	7	1
Small Bichrome Painted Jars	2	0
Bowls		
Open Bowls With Handles		
Small (20 cm and Less)	2	0
Large (25 cm and More)	2	0
Incurved Bowls	0	1
Painted Serving Vessels		
Round-Sided Bowls	1	5
Recurved Bowls	1	1
Cylinder Vases	0	0
Dish (Tripod and Possible Tripod)	1	3
Other Vessels		
Incensario/Censer	2	2
Slipped Incurved Bowl	0	1
Miniature	1	5
Total Complete Vessels	30	25
Partial Vessels		
Utilitarian, Horizontal Section	6	2
Utilitarian, Vertical Section	2	2
Serving, Horizontal Section	2	0
Serving, Vertical Section	3	2
Unclassified, Horizontal Section	0	1
Total Partial Vessels	13	7
Grand Total	43	32
Painted Vessels Classified by Type (Whole and Partial)		
Copador	4	4
Gualpopa	3	4
Campana	1	1
Suquiapa	2	0
Unclassified	0	2

vessels were kept for various uses. Variations in the assemblages through which these common household roles were carried out have been cited in the preceding sections. Also, fired clay objects such as figurines and spindle whorls have been differentially recovered, suggesting varied craft and religious activities among the community's residential units. It has not been possible at this point in the investigation to postulate reasons for the inter-household differences. Among other things, variables such as the contents of the storage jars cannot be factored in until specialized analyses are completed.

With the cooperation of the Ethnographic Section of the National Museum, ethnographic data have been gathered on current-day inventories of households in the Joya de Cerén community. This information will be incorporated into subsequent analyses in an attempt to hypothesize reasons for the observed variability.

The expanding data base of pottery from Joya de Cerén is extremely exciting. It provides a great opportunity for a searching type of analysis rarely possible within archaeology. I look forward to continued work with the corpus.

ACKNOWLEDGEMENTS

The detailed description of the recovered vessels benefited greatly from the immense quantity of work done by the Restoration Department of the National Museum in reconstructing the 1989 vessels. They willingly devoted their entire time for a number of months to the Joya de Cerén ceramic materials to enable me to work on them during my second work period in the country. Their dedication and unstinting efforts are appreciatively acknowledged and applauded.

End Notes:

1 Pottery from field Operation 5 will not be discussed in this chapter. Those excavations were carried out after the pottery was studied in El Salvador and details of the ceramics in Structure 12 are not available to me. That pottery will need to be analyzed and reported at a later time. Ceramics from field operations 1, 2, and 4 form the basis of this report.

2 Included in this discussion are four vessels which were recovered from outside Structure 1 but which had been stored in the rafters of the domicile before its destruction.

Chapter 13. CHIPPED STONE, CEREN, 1990 SEASON

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INTRODUCTION

The chipped stone artifacts from the two previous seasons of excavations, 1978 and 1989, have been described previously (Sheets 1983, 1989). The emphasis here is to describe and interpret the chipped stone artifacts from the 1990 season, but frequent reference will be made to the previous season's results. The individual artifact descriptions are presented in Appendix A. The text of this chapter discusses various aspects of the chipped stone of the site.

METHODS

The exceptional preservation conditions at Cerén have warranted unusual artifact treatment procedures. Often, artifacts are not subjected to water cleaning until they have been carefully inspected and cleaned of tephra with fine brushes. Some artifacts, including all chipped stone, are never water-cleaned, as water could contaminate organic residues adhering to artifacts. Each chipped stone artifact, after discovery and recording, was taken to the on-site laboratory for inspection under the microscope and brush cleaning. The microscope used is an AO Spencer zoom, with magnifications from 150 to 1000. We have found that gentle mechanical cleaning by brushing is the best way to remove the volcanic ash down to the original artifact and leave possible organic residues intact. A difficulty is distinguishing between organic residues from implement use and residues from the burning of the thatch roof. Most obsidian tools in working condition (i.e. not discarded) were stored in the thatch roofing, and when it burned it often implanted some organic residue on the blades. As a general rule, the thatch burning implants a widespread residue over both ventral and dorsal surfaces, and it often has a directionality or "grain" to it that reflects the palm or grass thatch matrix. On the other hand, residues from uses apparently are more concentrated along used edges, are more clumped or agglutinated, and do not have an overall "grain".

THE CHIPPED STONE ASSEMBLAGE PER STRUCTURE: A FUNCTIONAL VIEW

A useful means to place the chipped stone artifacts into a functional perspective is to group them by structure, and occasionally into activity areas within those structures, and relate them to other artifacts and features inside and outside those structures.

Both last season and early this season we had hoped to find a kitchen, in order to study and understand the food processing that was closely associated with cooking. We were very pleased to encounter Structure 11, the kitchen of Household 1. Compared to *bodegas*, the kitchen had relatively few chipped stone artifacts.

A thin scatter of discarded prismatic blade fragments was found outside Structure 11. They were small pieces, generally between 2 and 4 cm in length, and therefore difficult to use because of their shortness. All were extensively used before discard, as evidenced by the edge abrasion and microflaking on both edges. All showed evidence of trampling after discard as well. These were found in low traffic areas, and not outside the front porch or doorways of structures. A scraper was kept in the thatch roof over the porch, on the east side. Its edges were extensively used, and someone had begun to resharpen its distal end, but had not completed the resharpening. Only one prismatic blade was found in the structure, and that was kept close to the scraper, in the thatch roofing just past the bajareque "columns" inside the structure, in the northeast part of the roof. Presumably the thatch roof would have been relatively low at this location, and thus the blade was easy to reach. It was a very new pristine blade, with a cutting edge-to-mass ratio of 3.2cm/g.

Structure 7, the *bodega* of Household 2, had seven prismatic blades in good condition stored in the roofing thatch (two excavated in 1989 and five in 1990). The two most accessible blades were stored in roofing thatch just inside the doorway to the left (east). The other blades were in a relatively inaccessible location, the roofing thatch in the back of the *bodega*, in the southwest corner. Three of those blades were stored in a group or cache and stayed together when the roof collapsed. They fell as a group into the large open-mouthed jar (FS 285) that was sitting on the floor below. They probably are equivalent to the cache of new blades stored in the thatch of Structure 6, the *bodega* of Household 1

(Sheets 1989). Two other prismatic blades were found in thatch that also fell into the same vessel; they likely were stored with the other three, or were very close to them. Most blades were relatively long, in the 5-12 cm range, but two were short. Edges generally were in very good, sharp condition. Two macroblades were also stored in the thatch, and both probably were scrapers, but the intensity of roof burning thermally fractured the distal ends of both. The heavy abrasion of their lateral edges may have come from processing agave into fibers.

Structure 4, the *bodega* for Household 4, had less obsidian than the other *bodegas*. It had no relatively inaccessible cache of new prismatic blades, in contrast with the two other *bodegas*. It had three good useable prismatic blades stored up in low thatch roofing north of the platform, over the "porch" area. FS 141 was 90 cm north of the platform edge, FS 142 was 30 cm north of it, and FS 162 was 80 cm north of it, all close to the centerline of the building. Thus they were very accessible and stored near each other. All blades were relatively long, 8-10 cm, and had cutting edges in excellent condition. One macroblade was found in the roof thatch in the north room just north of the doorway, an accessible location. It was thermally fractured into two pieces that were found 30 cm from each other. Both pieces also have internal thermal fractures that did not completely sever them into smaller pieces. The distal end is missing, because of a thermal fracture, but this likely was a scraper. The lateral edges show only slight use wear.

The two abovementioned *bodegas'* obsidian is rather similar to the Structure 6 *bodega's* obsidian of Household 1 excavated in 1989 (Sheets 1989). Structure 6 had two obsidian prismatic blades in excellent working condition stored in thatch in accessible locations. It had two obsidian scrapers, both of which had notably strong use wear on their lateral edges. One was stored up in roofing thatch and one was stored on the floor in a corner behind a roof support post.

Structure 12 had a single prismatic blade that evidently had been placed on top of the northwesternmost wall, which was dislodged during the early phases of the Laguna Caldera eruption. Of all the curated blades found at the site to date, this one shows the most use wear. Based on the usual state of use wear when blades are abandoned, this was not far from discard and abandonment. It was largely used up when placed on the walltop.

Structure 9, the oven/sweathouse, had no obsidian whatsoever, which is not surprising given its function of heating. The other structure with no obsidian is Structure 3, the largest structure found at the site to date. It probably was a communal activity building, so the lack of obsidian is not a surprise there either. Structure 5, the ramada workshop of Household 1, had an obsidian flake on its otherwise clean floor. Nearby it had the greatest concentration of obsidian yet seen on the site, a scatter of 25 pieces of obsidian, largely prismatic blades, in a 1 x 3 meter area to its south.

Two domiciliary buildings, where the household members shared food, slept, and conducted other household business, can be compared. Structure 2 had more obsidian than Structure 1. Structure 2 had two prismatic blades stored in roofing thatch, and had a stemmed macroblade and a scraper. Structure 1 only had one prismatic blade in a relatively accessible area of its thatch roof, and one andesite flake that probably was a pottery smoother found on the floor of the north room.

The scrapers found in various structures at Cerén generally exhibit pronounced end and edge abrasion similar to scrapers from Chalchuapa (Sheets 1983) and Oaxaca (Hester and Heizer 1972). Hester and Heizer argue that Mesoamerican scrapers were used often in agave processing, and they supply ethnographic accounts describing the de-pulping of agave leaves to free the fibers to make rope. The ethnographic cases of agave fiber manufacture also include uses of bone tools. As they note, some scrapers from dry caves in the Tehuacan Valley were found with fibers still adhering to them. According to Hester and Heizer, using scrapers for agave fiber extraction extended into aboriginal and historical California.

SUMMARY, CONCLUSIONS

Obsidian is not uniformly distributed in the structures so far excavated at Cerén. The differences are striking, and are evidence of specialized structures for different activities. At one end of the spectrum is Structure 3, the largest structure yet excavated. In spite of the fact that its roof covered almost 100 square meters, no obsidian has been found in its roof, on the floor, or anywhere else. Other structures have roofs that cover some 25 to 30 meters, and they often have quite a lot of obsidian in them. Placing obsidian implements in the thatch roofing not only helped maintain the sharp edges when

they were not in actual use, it protected infants and young children from cutting themselves. Allen Johnson (personal communication 1989) notes that tropical South American natives frequently stick their machetes up in roofing thatch as they enter their homes, as exemplified by the Machiguenga in southeastern Peru.

I had hoped that length alone could be used as a characteristic to distinguish prismatic blade segments that were discarded from those that were still in use. In most cases, blades shorter than 5 cm were discarded, but there are exceptions. Occasionally, a very short piece of obsidian with sharp edges was curated in thatch. Blades that are discarded tend to be short, shorter than 3 or 4 cm, and have considerable use wear. Blades discarded near structures usually have incurred considerable post-discard edge damage, presumably by trampling, field tillage, and other activities.

The roof of Str. 11 collapsed and was buried during the emplacement of Unit 1, and thus it did not catch fire from the arrival of hot clasts from Unit 2, as did most roofs. Therefore, its obsidian does not show the effects of high heat like that of Str. 7. The obsidian in Str. 7 exhibits a lot of thermal fracturing, particularly the macroblades. Macroblades suffered more thermal damage than did the prismatic blades presumably because they have a higher mass:surface area ratio. Pieces of *laja* also suffered thermal damage.

Laja, the naturally-occurring flat-fractured (exfoliated) volcanic stone, was useful to Cerén residents in a number of ways. It was used for portable grinding stones as informal metates, and it served as a vessel cap. It also occasionally capped an adobe column, probably to serve as a base for a vertical post to support the roof. *Laja* sometimes was used to wedge round-bottomed vessels on flat floors. And, for reasons that are not clear, *laja* was placed up in the roofing supports or even on top of the thatch roofs. *Laja* could be presented in a chipped stone or groundstone chapter, as they often are chipped to shape around their margins, but they often are used as portable grinding stones. In this report they are included in the chipped stone chapter.

ACKNOWLEDGEMENTS

Allen Johnson (Anthropology, UCLA) was helpful in supplying ethnographic information on contemporary ways of protecting cutting edges and family members among native groups in the Amazon. I appreciate Brian McKee's annotations on an earlier version of this chapter.

APPENDIX A. ARTIFACT DESCRIPTIONS

All artifacts are obsidian, unless otherwise indicated.

295-1-201 1 prismatic blade 1.8 x 1.5 x .3cm, 1.0g, from Area 5 of Structure 1. This is a small medial segment, probably used up and discarded. Both edges were heavily used, resulting in almost continuous microflaking, with little irregular inadvertent damage. Both edges have the same kind of damage, one slightly more than the other.

295-1-203 3 prismatic blades and 1 andesite flake from platform fill, north end of Str. 1. The flake, of dense non-vesicular andesite, is a secondary flake, with a small bit of stream cortex remaining on the distal end of the dorsal side. A broad percussor was used to remove it. No evidence of use was seen. 2 x 3.5 x .8cm.

1 prismatic blade 3.4 x 2 x .4cm, 3.2g. Extensive usewear, and moderate irregular edge damage probably from post-discard trampling. Medial segment.

1 prismatic blade 4.4 x 1.5 x .3cm, 3.2g. Significant use wear, and considerable irregular edge damage. Medial segment.

1 prismatic blade 4.1 x 1.4 x .2cm, 1.6g. The usewear is moderate to slight, with moderate irregular edge damage probably from post-discard factors. This is a distal segment.

295-1-205 1 prismatic blade 3.3 x 1.1 x .2 cm, from remodelling of north end of Str. 1. The edges are very beat up, with abrasion and micronicking all along both edges. Each side has a notch created by multiple flaking; these may be deliberate. This looks like discarded trash, and its context also so indicates, in fill, north end, Structure 1.

295-1-219 Prismatic blade medial segment, 3.1 x 2.1 x .4cm, 3.6g. This was found on the tierra blanca joven surface south of Str 6, in the garden. The edges are very dulled by microflaking, abrasion, and trampling. Clearly a discarded implement.

295-1-231 Scraper 7.0 x 4.2 x 1.3cm, 41.3g. Platform is 2.7 x 1.1cm, non-striated. Was kept up in roof thatch of Str. 11. The platform has the dorsal cone of impact. Resharpener encountered a .5cm phenocryst and they did not finish resharpener the edge. Why this flawed implement was replaced in the thatch is not known. The distal end is relatively straight, not the uniform rounded surface of finished scrapers, and it is rather irregular. The lateral edges are very nicked and dulled, with some abrasion, evidently from a lot of use. It is possible the edges were used in agave processing, to de-pulp the leaves in the first step of manufacture of cords.

295-1-233 Prismatic blade in roof thatch of Str. 11, 6.4 x 1.6 x .3cm, 4.0g. The platform is .6 x .2cm, and is moderately striated. Each edge is pristine, with no use wear, and only an occasional tiny 1-2mm flake missing. Those tiny flakes could be from the roof falling or compression from overburden. There are some very tiny patches of wet-laid organic residues along both edges.

295-2-256 Prismatic blade medial segment, 1.8 x 1.3 x .3cm, 1.0g. This was on the clay surface outside Str. 7, on the north side, near the discarded corncobs. One edge had light use-nicking, the other had moderate use wear in terms of nicking-microflaking. It is a very short blade; I suspect it was discarded because it broke into this short segment rather than due to edge dulling.

295-2-272 Three prismatic blades from roof thatch, Str. 7.

The first is complete, with slight patches of organic residues along both edges, but too small to sample. There are three sizeable nicks along the edge, likely from falling roof; this was being stored in the thatch roof of Str. 7. Both edges are sharp, with no evidence of use wear visible at 500 power magnification. 12.3 x 1.6 x .3cm, 8.9g. The platform was striated moderately to heavily, measures .6x.3cm, and had the platform removed by rapid scraping, leaving a welter of tiny hinge and step fractures. The distal end has a small (1.5 x .5cm) area of very flat smooth cortex. A large flake gouged out of the platform end may have happened during roof fall.

The second is a medial segment 6.8x1.9x.2cm, 4.6g. There is an organic residue on both faces, which may have come from roof burning. Two nicks almost certainly are from roof fall; there is no evidence of use wear.

The third is a tiny fragment, 1.4 x 1.3 x .3cm, 0.3g. This is a medial segment, and does not match any blade segments excavated from Str. 7. No evidence of use wear.

295-2-288 Proximal portion of macroblade, 8.6 x 5.5 x 1.5cm, 72.8g, from roof of Str. 7. The platform is very slightly striated but probably that occurred after manufacture; it measures 2.5 x 1.2cm. There was a moderate amount of scraping removal of the platform overhang. The edges have the strong use wear often found on macroblades: primarily microflaking, with some abrasion and a few longer flakes in the .2 to .4cm range. This would have been an effective edge for de-pulping agave leaves to free the fibers. There are no definite organic residues. A thermal fracture terminates this artifact; the crinkly surface, which indicates the side suffering thermal stress and fracture initiation, shows that it was maximally heated on the ventral surface. This probably was a scraper. It was found in Unit 3, with thatch of Str 7, indicating that it was in the roofing, was heated by the burning roof, and then fell.

295-2-300 Two prismatic blade segments that connect, that were broken by roof fall, found side-by-side, 7.7 x 1.4 x .3cm, 3.8g. Found in Str. 7. Proximal segment's platform measures .5 x .3cm, moderately striated, scraping overhang removal. Edges are quite sharp, with only slight to moderate use wear by microflaking on both edges. No organic residues were observed.

295-2-304 Prismatic blade distal segment measuring 3.1 x 1.7 x .2cm, 1.4g. This was found inside vessel FS 285 in Str. 7, having fallen into it when the roof collapsed. The edges are pristine and very sharp. A faint organic residue is encrusted all over both sides, probably from the thatch burning.

295-2-313 Prismatic blade medial segment found in Unit 3 inside of Structure 7, apparently in roofing material, measuring 4.2 x 1.2 x .3cm, 2.3g. There is virtually no organic residue seen. One edge has slight use-nicking, and one edge very slight.

295-2-337 Macroblade, proximal segment in Unit 3 tephra of Structure 7. Measurements: 5.7 x 5.2 x 1.7cm, 47.7g. The percussion manufacturing blow was sufficiently strong to develop a Hertzian cone throughout the platform, dorsal and ventral, and fracture away all of the original platform except the .7 x .4cm area directly contacted by the percussor. This is not a very regular macroblade, it is from an early phase of macrocore reduction or it is from an irregular macrocore. The two lateral edges have heavy edge abrasion primarily from microflaking with some abrasion and a few longer flakes in the .4 to .9cm range. The distal end terminates in a thermal fracture, probably from roof burning. It probably was a scraper. It was found below the level of fallen thatch, so it probably fell from the roof while it was burning and tephra was being blown into the structure by turbulent winds. There is a very slight deposit of organic residue along both edges.

295-2-340 and 341. Two prismatic blade medial segments that fit together, from roof thatch of Str. 7. They measure 4.5 x 1.4 x .2cm, 2.5g. The use wear is slight to moderate, by microflaking, and no organic residues were observed.

295-3-271 1 prismatic blade 2.6 x 1.3 x .4cm This is a medial segment close to the distal end. Found on previous ground surface, east of Str. 3, by W. Michigan University excavations. It has 3 dorsal facets. Both edges have slight edge-nicking, which could be due to use or damage after discard, or likely both.

Note: The following five items, with 295-4 designations, all were found in Operation 4, Structure 4, a *bodega*.

295-4-141 Medial segment of prismatic blade, missing an est 1 cm at the distal end and 2 cm at the proximal. 8.5 x 1.5 x .3cm, 4.0g. This is essentially unused; no use wear was detected even with the microscope.

295-4-142 Medial segment of prismatic blade missing an est. 1/2cm of distal end and 1 cm of the proximal. This was found in roofing thatch that had fallen into Vessel 17 in Str. 4. Measurements: 10.1 x 1.4 x .2cm, 5.5g. The fall of the roof and overburden broke the blade into 5 segments. There is a thin organic residue visible, with one larger patch, evidently from use.

295-4-159 Macroblade proximal fragment 5.5 x 2.9 x 1.3cm, 16.9g, from the north room of Str. 4, 12 cm above floor, in roof fall. The platform measures 2.4 x .6cm, non-striated. Two internal thermal fractures can be seen in it from the roof fire. The use wear is very slight to nondetectable along the less acute edge, and slight to moderate microflaking at the more distal end of the more acute edge, but it is not dulled significantly. This fits FS 198, found at the same stratigraphic level 30 cm away. The separation is indicative not only of the fire but of the turbulence accompanying the three early phases of the eruption.

295-4-162 Prismatic blade only missing about 2 cm of the distal end. 8.8 x 1.4 x .2cm, 3.4g. Platform is .8 x .2cm, moderately striated, with moderate scraping removal of platform overhang. There are slight traces of organic residues evidently from use, but too little to sample. The residue was wet when it was deposited, and is only along one edge. One edge shows no detectable nicking or abrasion. The other edge shows extensive use in terms of microflaking. That microflaking is in two zones; between the zones of use the edge is apparently pristine, at least up to 500 power magnification.

295-4-198 Medial segment of macroblade, fits FS 159 (above). Measures 3.6 x 2.6 x .6cm, 5.8g. This has two deep internal transverse fractures from roof burning. Microflaking from use is very slight along both edges. The proximal and medial portions were found, and the distal portion is missing.

295-5-14 Prismatic blade from north room, west end, of Structure 12 (Operation 5). Found in tephra, 2 cm above floor. It was stored below the thatch and above the floor, thus it probably was on top of the northernmost wall of the structure. Dimensions: 6.5 x 1.4 x .4 cm; platform is .5 x .3 cm, weight 4.4g. Platform edge is lightly scraped to remove the overhang prior to detachment; platform surface was only very slightly striated. Both edges are very used, and are about to the point where discard would be wise. Usewear takes the form of an unbroken series of microflakes, sometimes more on the ventral and sometimes more onto the dorsal surfaces. Of all the blades still being curated at the Cerén site that have been analyzed to date, this shows the most use.

Laja:

Pieces of "*laja*", flat-fractured andesite, are found commonly at the site. The closest known source is at Los Chorros, 13 km south-southeast of the site, but some local people report a *laja* source near San Juan Opico, 6 km to the north.

295-1-201 2 pieces of *laja*, probably thermally fractured. No evidence of use.

295-2-344 *Laja* in contact with the floor of Str. 7. Measures 18 x 12 x 3cm. No evidence of shaping or grinding.

295-4-189 *Laja* that was serving as a cap for a large ceramic vessel. Measurements 25 x 16 x 2.6cm. It fell over on top of corncobs stored in the corn crib in the south room of Structure 4, and bears the impression of the corncob preserved in fine tephra adhering to the *laja*. It has a rectangular shape and has one very flat surface. It would be an effective deterrent to a rodent trying to get into the stored grains, but not to small insects. The periphery was shaped in a minor way by at least 10 percussion blows removing small flakes.

295-4-197 Broken *laja*, with no evidence of shaping or use. Measurements: 20 x 16 x 1.5cm. Was found in the north room of Str. 4, under FS 163.

295-4-248 2 small pieces of thermally fractured *laja* found in Unit 3 tephra in Str. 4. Apparently a larger piece of *laja* was up in roofing, and thermally fractured during roof burning. These measure 9 and 7 cm in length.

295-4-256 *Laja*, small thermally-fractured piece, 5cm long. Fell into vessel #3 in Str. 4.

295-4-259, 260, 261 Three pieces of *laja* that fit together. The shape is a semi-circular disk or half-moon, with a diameter of 42cm, and a thickness of .4cm to 4cm. It was shaped only on the periphery by a series of percussion blows. No sign of surface grinding. Found in Str. 4.

Chapter 14. GROUNDSTONE ARTIFACTS FROM THE CEREN SITE, 1990 SEASON.

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INTRODUCTION

Because the Cerén site was never abandoned, or at most catastrophically abandoned, the opportunity presents itself to study the material culture of its inhabitants as full assemblages. Because of the nature of preservation, groundstone artifacts were subjected to careful mechanical cleaning at the field laboratory with brushes to see if organic residues still adhered to them, as described above with chipped stone artifacts. If no residues were found, the artifacts were washed, dried, catalogued, and analyzed. The groundstone artifacts of the 1990 season are described individually in the appendix to this chapter in considerable detail, and interpreted as components of functioning households. Household 1 now is the most completely excavated, followed by 2 and 4. In the case of Household 4, only one structure, the *bodega*, and part of its garden, have been excavated, and the groundstone inventory is limited.

THE ARTIFACTS

The groundstone artifacts excavated in the 1990 season were differentially distributed. Operation 1 recovered 12 groundstone artifacts, Operation 2 recovered 4, Operation 4 recovered 2, and Operation 5 recovered 3. This is counting artifacts that were in functioning condition, and does not include discarded fragments. However, the differential distribution of groundstone artifacts is not surprising, when the nature of structures is taken into account. The predominant function of groundstone artifacts at Cerén is food processing, and the principal objective of Operation 1 was to excavate the kitchen of Household 1. That kitchen was well supplied with grinding stones for food processing. The other operations focused upon excavations of *bodegas* or specialized structures. The artifacts of the various operations are discussed by operation in numerical order below.

Three metates, three manos, a celt, three donut stones, a *laja*, and a polishing stone were found in Operation 1 in 1990. A few groundstone artifacts were found in the limited excavations in and around Structures 1 and 6, and they are described in the appendix. The focus here is on the artifacts in and near the kitchen, Structure 11. A metate was found upside down to the north of the kitchen, between Structures 1 and 6. It was resting on the ground surface between two *horqueta* post holes. Either it was just about to be mounted before the eruption struck, or it had just been dismounted and was in a storage mode. The latter is more likely, because of the smoothness of the posthole-ground surface juncture (the postholes were not dug recently before the eruption), and the embeddedness of the metate into the ground.

Two donut stones, formally called biconically-perforated stone disks, were on the kitchen floor. It is possible that one was used as a perforated mortar for processing relatively small amounts of food, as discovered with some donut stones the previous season (Sheets 1989), but no direct evidence was encountered. One was a very well made donut stone, while the other was very crudely made, and apparently broke during manufacture. These two suggest that a simple ordering of donut stones from a site, from fancy to informal, would not correlate with a social ranking or wealth differentials of their owners.

Two metates were inside the kitchen. One was immediately inside the entrance, mounted on twin *horquetas* to hold it up near waist level. As with the other two *horqueta*-mounted metates found in Household 1, this metate showed only a very slight degree of wear, and it was relatively close to the ground. Its mano was not found, inside or near the structure, probably indicating that it was not used as often as the other metate.

The other metate was found resting directly on the floor, with its matching mano sitting on its lower end. It is a trough metate with extensive wear; the base is only 8 cm thick. Its upper end was propped up on a rock. It was well-shaped, in contrast to all the *horqueta*-mounted metates at the Cerén site. The mano also is notable for being carefully shaped. It has one principal grinding surface, and two secondary surfaces on its top. All three surfaces match the metate surface, and would have had to have been used often enough for all three mano surfaces to wear down together with the metate. It is

interesting that this floor-mounted metate was much more extensively used than the *horqueta*-mounted metates. It was found adjacent to a pottery vessel that evidently had corn kernels soaking, in preparation for grinding.

The kitchen (Str. 11) had two other pieces of groundstone. A celt was stored at the south end of the building, up on a shelf or in roofing materials. There is no evidence of its having been hafted, which is similar to the other unhafted celts from Cerén. The last artifact of groundstone found in the kitchen is a small mano that was used only slightly for grinding. It is possible that it was used on a portable *laja* grinding slab.

Operation 2 recovered only four groundstone artifacts, in spite of the amount excavated. Two manos were found just outside the west wall of Structure 7, the *bodega*. Both were on top of the wall or on roofing supports, and fell at about the time that the roof and walls collapsed, during the emplacement of Unit 3. One is a well-shaped two-hand mano that had been used quite a lot; its matching metate has yet to be found. The other is a one-hand mano that was only slightly used, which also had served as a hammerstone.

A celt was found in the south end of Structure 7. The other two celts from the 1990 season were also found in the south ends of Structures 4 and 11. As with the other two celts, it was stored high and fell when the roof collapsed. It was very well shaped, but had been used enough to dull the edge considerably, and need a resharpening. The final groundstone artifact found during the season was a donut sone that broke in half during manufacture. The perforation was in process when the piece broke. Both halves were discarded in the trash area west of Structure 9.

Operation 4 recovered the fewest groundstone artifacts of all operations. A celt was found in Unit 1 tephra, indicating that it was stored high, on a wall top or with roofing, like the other celts found at Cerén. This is the only celt that might have been hafted, as a long hollow space was found near the poll end, but it was parallel with the celt's long axis, and I doubt that it was a handle. This is the largest, heaviest celt found at the site to date. It had been used quite a bit since its last resharpening, probably for cutting or shaping wood.

The other groundstone artifact from Operation 4 is a metate mounted on the *horquetas* just outside the northwest corner of Structure 4, but under the eaves. It is close to the beginning of another structure to the northwest. It was moderately used, more used than any of the *horqueta*-supported metates of Household 1.

Three groundstone artifacts were placed in Structure 12 of Operation 5, two manos and one metate. Neither mano matches the metate, and the metate was not in a position of use, as it was largely upside-down, tilted up against a wall. One mano, which also had served as a hammerstone, was found in the vertical niche south of Column 4, resting on a layer of wood ash. It was used multidirectionally, likely on a portable *laja* grinding stone. The other mano was found at the interface of Units 3 and 4, just east of the structure. It probably was on top of the nearby wall, or up in roofing supports, and was dislodged at the end of the Unit 3 emplacement. It was a well-shaped and well-used mano. The metate was of the well-shaped type, which probably means that it was used on the floor rather than mounted on *horquetas*. Further evidence of use on the floor was the impregnation of a mixture of clay and organic substances on its bottom. There is no similar mixture of clay and organic materials within Structure 12. It appears to have been brought from another location and placed, upside down, leaning up against the wall in the north room.

In overview, it is not surprising that Operation 1 encountered the majority of groundstone artifacts from the season, given the need to grind large amounts of food in and near a kitchen. The *bodegas* had less groundstone, and it apparently was more in storage than active use. Structure 12 had various pieces of groundstone, but they were individual artifacts, not a functioning assemblage within a household context. Structures 5 and 9 had no groundstone artifacts whatsoever. If the interpretations of their functions, as a male chipped stone workshop and as a sweathouse, are correct, then this is not surprising.

SUMMARY AND CONCLUSIONS

Numerous groundstone artifacts were recovered during the 1990 excavations of the Cerén project, and the interpretation of their uses assists in the understanding of human activities in and near those structures. Some of the artifacts excavated during 1989 and 1990 were subjected to a thorough analysis by Jeffrey Bonevich (1991). Bonevich also studied contemporary metate manufacture in the village of

San Rafael Cedros, east of San Salvador. Structure 11, the kitchen for Household 1, contained numerous groundstone artifacts. In or near it were three metates, three manos (although only one was used significantly), two donut stones, and a celt. Like Str. 11, Strs. 6 and 1 contained many groundstone artifacts, probably because they were a part of the same household. It appears that Household 1 was manufacturing a lot of groundstone tools, perhaps more than they were using within the household.

The *bodegas* of Households 2 and 4 contained only a few groundstone artifacts. Structure 7 had two manos that were stored high along the west wall and a celt just inside the south wall. Structure 4 had a celt just inside the south wall, and a metate mounted on top of the *horquetas* just outside the northwest corner of the building, under the eaves. Although the *bodegas* of Households 2 and 4 contained few groundstone artifacts, that does not hold for all *bodegas*. Structure 6 had four donut stones, two metates, four broken metates, two manos, *laja*, potrests, and hammerstones (Sheets 1989).

The number of hammerstones found in Household 1 excavations is far greater than needed for chipped stone manufacture or resharpening. Excavations during 1978 around Str. 5 encountered evidence of chipped stone work, but it was minimal. Apparently, the principal use of hammerstones was in manufacturing and re-roughening groundstone implements, within the household. The only groundstone artifact found in Household 1 that probably was beyond their abilities to manufacture internally was the celt. The groundstone assemblage from Household 1 indicates that they were craft-oriented, manufacturing many groundstone items for internal use, and perhaps using produced items for exchange. Household 1 had numerous artifacts that were not completely manufactured, or artifacts that had been only partially resharpened.

There is not a single type of groundstone artifact found in all three *bodegas*. That is testimony to the differences among households. Evidently, the households at Cerén were specialized in certain activities within a framework of a complex economy. The groundstone differences also probably indicate variations in social status; groundstone implements are utilitarian, basic items, and the household making and exchanging them may be lower on the social hierarchy than households receiving those artifacts.

ACKNOWLEDGEMENTS

I appreciate Brian McKee's efforts and time spent critiquing an earlier version of this chapter.

APPENDIX A: ARTIFACT DISCRIPTIONS

At Cerén groundstone artifacts are found near to where they were placed by the inhabitants. In a few cases they were moved slightly by the turbulence of the eruptive phases, such as the artifacts that were on walltops or were resting on elevated shelves and fell when the roof collapsed. Even where there was movement during the eruption the original location can be reconstructed with considerable accuracy. Thus, the Cerén site was never abandoned by its inhabitants, or at most suffered a catastrophic abandonment. This means that they did not carry away their valuable items, and therefore the household inventories of artifacts are complete, and their distributions are indicative of human activities at particular locations. This warrants detailed descriptions of individual artifacts.

295-1-202 Metate fragment of slightly vesicular andesite measuring 17.7 x 6.2 x 3.3cm. Found in the adobe platform for Area 5 of Structure 1 with some sherds and lithics; it was used as structural fill after breaking and being discarded. The metate was used extensively, but the original form is unknown. Before breaking its use changed significantly and another grinding surface was established. That more recent grinding surface ceased to be used when it broke, when the grinding surface was only 2.8 cm from the bottom surface.

295-1-202 Hard greenstone polishing stone, 12 x 10 x 4.9cm. This is a hard green metamorphic rock that does not occur naturally in the Zapotitan Valley. It likely comes from the Metapan area of NW El Salvador. Use wear is slight, from polishing or light grinding. One small and probably inadvertent flake was removed from one end. Streamwear is evident on all sides.

295-1-211' Metate fragment of moderately vesicular andesite on the floor in the northeast corner of Str. 6. This was a relatively well-shaped trough metate that broke for unknown reasons; this fragment measures 29 x 23 x 12cm. Broken metates were not useless, as round-bottomed ceramic vessels often were stabilized on a flat floor by rocks of various sorts, including metate fragments.

295-1-212 Donut stone fragment, diameter 16cm, height 8.5cm. The perforation's diameter at the outside is 5.5cm, and it constricts down to 1.1cm in the middle. The hole is asymmetric, it bulges into the body of the stone near the point of greatest constriction, probably due to being used as a perforated mortar. It was used extensively before it broke. It was only roughly shaped, and has only one vertical groove as decoration; originally it probably had two vertical grooves.

295-1-213 Flat grinding stone found on the floor of Structure 6, in the northeast corner. It was of nonvesicular andesite *laja*, and measures 33 x 21.4 x 9.6cm. Although it was the bottom stone for grinding, it is not a metate because the grinding was multidirectional and informal. Usewear is slight, resulting in smoothing and some polishing of one face. This is a portable stone that likely was used for grinding various substances. Metates probably are more specialized for maize, but also were used for other substances.

295-1-214 Metate found upside down between Structures 1 and 6 resting on the *tierra blanca joven* tephra (original ground surface). At either end is a large posthole; spacing is correct for *horquetas* (large forked sticks to hold it up at waist level), and it apparently was mounted on the *horquetas* sometime before the eruption. Prior to the eruption it was removed from the *horquetas* and the *horquetas* were removed from their postholes. It was stored where it evidently was used before, perhaps with the intention of re-mounting it if deemed necessary in a future that never materialized. Compared to most Mesoamerican metates, it was minimally shaped. Its back was pecked slightly to shape it into a rough humpback that fits the U-shape of the forked *horquetas*. It measures 54 x 39.5 x 19.6cm. Its top working surface has only a slight amount of use. In fact, it has not been used sufficiently to have a grinding surface over the entire top, as five areas of streamwear can still be seen around its periphery. The material is a slightly vesicular andesite, and it weighs over 60 lbs. The actual used surface measures about 23x8cm.

295-1-235 Donut stone decorated with 5 vertical grooved lines and one horizontal line around the circumference from the floor of Str 11. The diameter is 15.5cm, the height is 9.9cm, and the hole diameter begins at 5.5cm and constricts down to 2.4cm. There is some smoothing from use in the part of the perforation that is maximally constricted, but not a lot. The direction of motion that resulted in use wear is not clear.

295-1-236 Donut stone with very irregular shape, from the floor of Str. 11. The maximum diameter is 20.1cm, with a minimum diameter 17.5cm, height 7.9cm. This is made from a quite vesicular, low-density basalt. A portion of the top apparently broke off during manufacture, while making the perforation from below. Part of the top looks and feels like a cut surface, but how such a stone could be cut is unknown. The decoration was only roughly done, probably with the plan to finish it when the hole was finished and the rest was more finely finished. It has 4 large lobes with 4 incised and pecked vertical grooves between them, and a ring around the top. The perforation begins with a diameter of 5 cm and constricts to 3.3cm; it is not completed, and is irregular inside.

295-1-241 Large metate, 55.5 x 35 x 20cm. Found on two *horquetas* just inside the entrance to Structure 11, the kitchen for Household 1. This was a stream rock probably selected for vesicularity (moderate) and shape. Some slight shaping by harsh percussion pounding was done on the bottom and the sides, especially where the *horquetas* were in contact with the stone. Shaping by pounding essentially crushes the rock between the vesicles, so this degree of shaping could be accomplished within a few hours. The usewear is very slight, almost identical to the other two metates on or near *horquetas* from the area between Structures 1 & 6. It appears that three metates were shaped, mounted on *horquetas*, and used at about the same time. For some reason, two continued to be used and one was

discontinued, at least temporarily (FS 214). Given the fact that all three have almost identical amounts of usewear, it is probable that the FS 214 metate was discontinued shortly before the eruption occurred. This metate has a wedge-shaped longitudinal section, and thus fits the *horquetas* well. No mano has been found to match this metate. This does not match the only shaped mano (FS 266) found in Str. 11.

295-1-242 Mano, small 1-hand, 12 x 10 x 9cm. This is an almost round stream cobble, with only a slight bit of pecking to shape it. Only one surface has evidence of grinding, and it was used extensively, in multidirectional fashion. Very likely this was used on flat *laja* grinding stones like FS 213 above. These two were separated by a few meters, and could have been a set. Made of nonvesicular andesite, slightly phyrlic.

295-1-265 Metate on floor of Structure 11; found with mano (FS266) on it but no evidence of masa (ground corn) on the metate. Measures 58 x 36 x 16cm, made of slightly-moderately vesicular andesite. The base is 8 cm thick; it has been used extensively, probably for many years, but it became thin enough that the 5m of tephra overburden snapped it into two pieces. It is interesting that Str 11 had two metates, one on the floor and one on *horquetas*, and the one on the floor showed much greater use wear and had a mano on it. The shaping is extensive over the entire back, by strong pecking, for a smooth curve. It evidently was manufactured for use not on *horquetas*, but on the ground. The regular grinding surface is 32 cm long, and beyond that is an area 15 cm long that rises before the far end of the metate is reached. This area, away from the person grinding, would be effective in catching the maza, or ground corn.

295-1-266 Mano found on east (lower) end of metate (FS 265 above) on floor of Structure 11, near hearth and near vessel with corn soaking in it. This mano does match the metate; a metate and mano are a matched set, and only work efficiently if their surfaces wear together. This mano does not match any other metate found in the site. It measures 25.4 x 7.2 x 6.6 cm, and is made of a slightly vesicular andesite. It has a principal ground surface, but there are two other secondary ground surfaces on the top, giving the mano a slightly triangular cross-section. All three surfaces match the metate. Final manufacturing and shaping was by fine pecking. All use striations are perpendicular to the mano's long axis.

295-1-284 Celt 7.3 x 3.8 x 1.5cm, 80.0g. Found in Str. 11, south side, in tephra above floor; was either in roof or elevated on a shelf. Is somewhat roughly shaped, with stronger pecking along sides and the poll end than on the faces. The bit end is highly polished, evidently largely from use. It was resharpened along the bit end, extending in only some 8mm from the edge. Resharpening was by motions in all directions: perpendicular, parallel, and oblique to bit edge. The abrasive or stone was effective in uniform grinding; perhaps crystalline quartz was used? The edge radius is approximately .1mm. There is no evidence of haft wear, and there was no cavity found during excavations where a handle would have been. Might these have been used unhafted?

295-1-300 A one-hand mano of an unshaped stream cobble of slightly vesicular andesite. There is a very slight degree of grinding on the flatter surface, in multiple directions. Perhaps it was used on *laja* slabs. Is a very dense, slightly phyrlic andesite. Measurements: 11.1 x 8.5 x 4.6cm.

295-2-290 2-hand mano, from Structure 7, the *bodega* for Household 2, in Unit 3 tephra. Measures 17.5 x 8.5 x 4.6cm. Made of a moderately vesicular andesite. It is very well shaped by pecking. Was up high, probably on top of the west wall of Structure 7, or in the rafters, and fell off to the outside. One face was roughened by pecking shortly before the eruption occurred. The metate that matches this mano has not yet been found.

295-2-291 1-hand mano from Str. 7, just outside the west wall. It had fallen from above, perhaps it was resting on top of the wall. It was barely used for grinding. The two ends were used for pounding, so it also was a hammerstone. Measures 11 x 9.5 x 5 cm.

295-2-299 Celt, from south end of Str 7. Measurements: 8.4 x 4.0 x 2.2cm, 138g. This is very well shaped by fine pecking, and is ground and polished only at the bit end, extending back 2.5cm. This was stored high, probably in roofing, and fell into a large ceramic vessel when the roof failed. The edge still is sharp enough to cut wood, with an approximate edge radius of c. .2mm. However, with much more edge rounding the celt would need resharpening. The use of this has resulted in polishing of the bit, as clearly evidenced by some polishing that occurred on the scar of an edge-damaged flake.

295-2-410 Donut stone from the trash deposit west of Structure 9. This was broken in half during the process of manufacture. It is not very round; it measures 13.5 x 11 x 6.1 cm. The perforations, made from each side, had not met, as 1.7 cm more rock needed to be removed before the holes would touch. The holes are 4 cm in diameter and about 2 cm in depth. Each was being ground out when the piece broke. The outside was pecked to shape, but the holes were being ground. It would have been difficult to peck out a deep hole; the grinding must have been done with some elongated item. It is not known what was used to grind the hole. This apparently was a slightly-rounded stream cobble, of a phyrriic andesite.

295-4-112 Celt, from southwest corner of Structure 4, in Unit 1 tephra. As with the other celts found during 1990, this was stored high, on top of the wall or with roofing supports. Measurements: 12.2 x 4.8 x 3.2cm, 349g. This celt is heavier than the celts from the other households. The length, width, and thickness measurements only give some idea of the size differences, but with a celt the weight is the best indicator of size differences. A possible handle was found in the form of a hollow cavity about 1.5 cm in diameter and 14 cm long, extending from the poll end of the celt along the celt's long axis. However, this was not clearly a handle. If it was the handle, this celt was hafted to a handle parallel to its long axis. Some slight smoothing can be seen from 2 to 3.5 cm from the poll end, where it is slightly indented. This could be interpreted as haft wear or merely where someone hand-held the celt. The shaping by pecking was very well and thoroughly done. The bit polishing extended 4 cm from the edge. The celt was used considerably since its most recent resharpening; the average edge radius is about .3mm. It still is sharp enough to be effective in cutting hard organic materials such as wood.

295-4-220 Metate from northwest corner of Structure 4 (*bodega*) on *horquetas* which elevated it to waist-height. Is moderately used (more than any of the *horqueta*-held metates from Household 1). Material is a quite vesicular andesite. Measurements: 63.5 x 39 x 14.4cm. The grinding surface is about 10 cm thick, so it probably had many more years of service. The effective grinding surface is 27cm wide and 56 cm long. The shaping is somewhat rough, but better than the *horqueta*-mounted metates of Household 1. It probably was manufactured by someone else. Metates could have been manufactured within the household.

295-5-5 Mano from Structure 12, placed in niche south of northeast column. Dimensions: 12.2 x 10.2 x 6 cm. It was used on both sides, but minimally. Striations are multidirectional. Material is a slightly vesicular andesite. It also was used as a hammerstone, resulting in some pecked marks at each end, and a flake removed from each end.

295-5-13 Mano from the east edge of the excavations of Structure 12, It was found at the interface of Units 3 and 4, 1.20 m south of the northeast wall of the structure. It probably was placed up on the top of the wall and was blown off by the last blast of Unit 3. Dimensions: 7.7 x 9.6 x 6.9 cm. Made of a slightly vesicular and phyrriic andesite. This was very well shaped, and used a lot. Both faces show equivalent use wear.

295-5-29 Metate from north room of Structure 12, leaning up against the wall, upside down. There was no sign of *horquetas* anywhere in the building. Length 49cm, width 33 cm, height 16cm, distance from base of grinding surface to bottom 8cm. Material is slightly vesicular andesite. This metate had many years left of use. The back was relatively well formed by pecking. Judging from the differences in back shaping among mounted and nonmounted metates at Cerén, this metate was used on the ground surface. The bottom (back) does have a heavy incrustation of dark orange-stained material that seems to be a

mixture of clay and organic substances. This appears to be direct evidence of it having been used directly on an earthen floor.

APPENDIX B: NEWLY FOUND GROUND STONE TOOLS IN STRUCTURE 11, OPERATION 1.

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During the consolidation of Structure 11, two previously undiscovered artifacts were uncovered in the ash balk left to support the west entrance wall. A mano and a large ground stone cobble lay only centimeters beyond the extent of the 1990 excavations. Both were examined *in situ* and were not removed for fear of destroying the wall support. Neither were assigned FS numbers.

MANO

A mano was found just inside the doorway on the edge of Area 1. It is an elongate type, bi-convex thick to sub-square in cross-section. It is approximately 28 cm long and 6-7 cm thick. Because it is still partly buried in ash it is difficult to be exact. It is composed of a slightly vesicular andesite. The visible use surface displays moderate grinding and slight polish. It is very similar to the long mano found in Structure 6 in 1989 (FS-104).

The mano is embedded in Unit 1 and 2 ash about 70 cm southeast of the west entrance wall section. It lies with its use surface facing east and slightly upward. Under the north end of the mano are the carbonized remains of what may be roof poles. There are two possible explanations for this context. The first is that the mano had been stored in the roof and fell with the roof early in the fall of Unit 2. However, more likely the mano had been resting on the metate mounted on *horquetas* only about 80 cm to the south. It was probably dislodged early in Unit 2, landing to the north on roof material at the top of Unit 1 and the base of Unit 2.

LARGE COBBLE

A large cobble ground stone tool was also found in the entrance way of Structure 11, Area 1. It is a circular cobble, plano-convex in cross-section, approximately 15-16 cm in diameter. It is made of slightly vesicular andesite. The flat side of the stone shows slight grinding. Its exact function remains unknown, although it may have served as a large handstone.

The cobble is in contact with both the clay paved surface and the west wall section. It is underlain by Unit 1 ash at its southerly end. It was probably originally leaning against the wall, flat surface up. It was then slightly dislodged when the wall was pushed inward, allowing ash to accumulate under part of the stone.

CONCLUSION

The discovery of these two items concludes one mystery and adds strength to previous interpretations. The mano apparently belongs to the mounted metate, solving the question of the whereabouts of its handstone. Both objects strengthen the interpretation of Structure 11 as a food processing area.

Chapter 15. TECHNICAL ANALYSIS OF PIGMENT MATERIALS

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Pigment materials have been associated with a number of artifacts excavated during the 1989 and 1990-1991 field seasons. These have occurred in two principal forms:

(1) powders, loose or compressed into "crayons," found as the contents of containers. The containers have been primarily ceramic pots, including miniature vessels, but at least one concentration of pigment has been excavated that appears to have been stored in a now deteriorated organic container.

(2) paints, applied as decoration on a variety of substrates. Substrates include bone and shell, as well as various organic materials which have completely disintegrated during the period of burial.

Microscopic samples of pigment materials from a selection of these artifacts have been taken for the purpose of analyzing their components. These analyses are being conducted at the Smithsonian Institution's Conservation Analytical Laboratory in Washington, D.C. For each sample, identification of the primary colorant(s), additives and binders are being sought using analytical techniques appropriate for both inorganic and organic materials.

The charts below summarize the results of analysis carried out thus far. Items are grouped by field season, and listed by catalogue number (note that the preface 295-, designating the archaeological site of Cerén, is omitted here; the remaining digits indicate the operation and sequential artifact number). The analytical technique employed is indicated by the following abbreviations:

XRD = x-ray diffraction analysis, using tiny powdered samples mounted in a Gandolfi camera, analyzed with a Philips PW 1720 x-ray diffraction unit.

SEM = scanning electron microscopy, using paint samples mounted in cross-section, carbon coated and examined with a JEOL JXA-840A Electron Probe Microanalyzer in backscatter mode.

EDX = energy dispersive x-ray analysis, using a Tracor Northern SEM/EDX attached to the SEM above.

PLM = polarizing light microscopy, using a dispersed sample mounted on a glass slide with Aroclor, viewed with a Leitz polarizing microscope.

TABLE 1. PIGMENTS FROM THE 1989 FIELD SEASON

Cat. #	Desc. of Sample	Method	Results (*Primary Component)
1-40	pigment cylinder inside Pot 7 (Str. 6)	XRD	*hematite [Fe ₂ O ₃] quartz [SiO ₂]
1-41	pigment cylinder inside Pot 7 (Str. 6)	XRD	*hematite; quartz
1-158	pigment cylinder inside Pot 7 (Str. 6)	XRD	*hematite; quartz
1-65	ceramic pot, red powder interior	XRD	*hematite; quartz
2-133	"possible codex" (Str. 2)		
	White ground layer	XRD	*kaolinite [Al ₂ Si ₂ O ₅ (OH) ₄]
	Red Paint	XRD, PLM, SEM/EDX	*cinnabar [HgS]
	Yellow Paint	XRD, PLM SEM	*yellow ochre [FeO(OH)]
	Green Paint	XRD, SEM/EDX	unidentified serpentine or micaceous mineral, Mg-bearing

TABLE 2. PIGMENTS FROM THE 1990-1991 FIELD SEASON

Cat. #	Desc. of Sample	Method	Results (*Primary Component)
1-247	"painted morro" (Str. 11)		
	White Ground	XRD	*kaolinite
	Yellow Paint	XRD	*goethite [aFeO.OH]
	Green Paint	XRD	unidentified, sim. to 2-233
1-275	Deposit (Str. 11) mica particles	XRD	*muscovite [KAl ₂ (Si ₃ Al)O ₁₀ (OH,F) ₂]
	Red Powder	XRD	*hematite
2-213	mini pot (Str. 7) red powder, contents	XRD	*cinnabar
2-214	mini pot (Str. 7) red powder, contents	XRD	*cinnabar
2-215	mini pot (Str. 7) red powder, contents	XRD	*cinnabar
2-222	mini pot (Str. 7) red powder, contents	XRD	*cinnabar
2-230	mini pot (Str. 7) red powder, contents	XRD	*cinnabar

1990 RESEARCH AT THE CEREN SITE, EL SALVADOR: SUMMARY AND CONCLUSIONS.

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The 1990 field research season was the longest season at the Cerén site to date, slightly more than doubling the total amount of time spent in investigations. Considerable amounts of new information in various academic disciplines have been added to the data base. Excavations were conducted in six separate structures. The multidisciplinary mode, established in the early work conducted at the site in the late 1970's, has continued with significant research in volcanology, geophysics, biology, and archaeomagnetism integrated with the archaeology. This season particular emphasis was placed on architectural conservation, with a 9-person crew working to preserve buildings, and objects conservation, with the assistance of the Conservation Analytical Laboratory, Smithsonian Institution.

VOLCANOLOGY

Dan Miller continued the volcanological research that he initiated the previous season (Miller 1989), which extended the earlier work of Virginia Steen-McIntyre, Bill Hart, and Rick Hoblitt. The basic stratigraphic descriptions he presented in his report from 1989 work have been further refined. In particular, occasional problems occurred in defining the boundaries of Units 1, 2, and 3 in the various excavations. Reliable correlations of the various events of the eruption require consistent definitions of the boundaries between stratigraphic units. These units provide temporal control and relate the phases of the eruption to their impacts on the site. Only then can the times of roofs catching fire, walls falling, columns toppling, and other volcanic-to-structural relationships be compared. The identification of Unit 2 in particular caused difficulties in some cases. There are several airfall beds in the lowermost three units, and the lowest airfall bed in Unit 3 sometimes was confused with Unit 2. The stratigraphic identifications are complicated by most roofs sustaining Unit 1, catching fire by Unit 2, and collapsing during Unit 3 emplacement. The stratigraphic units often are jumbled by the collapse of the roofs and their overburden.

Unit 2 is the fourth coarse-grained bed of the Laguna Caldera eruption found within the sites, and is located immediately below the distinctive brown-gray-brown base surge deposits toward the bottom of Unit 3. It can be distinguished from the lowest airfall bed of Unit 3 by its lower percentage of accidental fragments. These accidental fragments give the Unit 3 coarse layer a distinctive mottled "salt and pepper" appearance.

Miller continued to collect information on the interaction between tephra units and the various structures. He found that the thatch roofs of most structures held during the deposition of Unit 1, the first warm (100 degrees C) fine-grained tephra unit. The fall of the hot (c. 600 degrees C) Unit 2 ignited fires in most thatch roofs and their wooden supporting beams and posts. Most thatch roofs collapsed to the floors early during the fall of Unit 3, as the burning weakened the roofs and the tephra overburden accumulated. The exception, the roof that collapsed earlier, during Unit 1 deposition, was notably thinner than the usual thatch roof at the site. The roof of Structure 11 fell during the emplacement of Unit 1.

The thatch and wooden supports of various buildings had partially burned when they collapsed. I think the fact that most roofs were ignited by Unit 2 and then collapsed during the emplacement of Unit 3 indicates that very little time elapsed between the end of Unit 2 and the beginning of Unit 3, probably only minutes. That is based on the fact that thatch roofs, with their wooden support members, burn fast. Had more than a few minutes elapsed between Units 2 and 3, the roofs would have burned more completely. A procedure needs to be developed to study the interval between the end of Unit 1 and the beginning of Unit 2, because buildings could have offered protection to people against Unit 1 but not against Unit 2. Thus, if there were a significant time interval between these units, people could have escaped.

Bajareque walls, with the poles tied to roofing beams, are resistant to collapse until the upper connections are weakened or removed. That weakening occurred from the fires ignited by Unit 2 tephra,

as the buffeting of Unit 3 stressed roofs, and the tephra from Unit 3 added weight. As with roofs, more bajareque walls failed during Unit 3 emplacement than at any other time.

An exception to the general rule that most roofs collapsed during Unit 3 is provided by Structure 11, the kitchen of Household 1. It had an unusually thin thatch roof, probably to allow smoke from the cooking fire to escape, and the poles supporting the roof did not have adobe packed around them, which would have given them more strength as tephra accumulated on the roof. The poles were relatively thin. Those probably were the major reasons why the roof of Structure 11 collapsed during the early part of the emplacement of Unit 1. This roof apparently collapsed from the tephra overburden alone, while the other roofs in the site collapsed from the combined effects of overburden and weakening by fire from below.

Miller studied distal sections of the Laguna Caldera deposits, that is, deposits farther from the volcano yet still recognizable as coming from it at that time. He found that the deposits thin rapidly to the south of the site, and thicken rapidly toward the source. He suggests that sites more than a half kilometer south of the site may not have Cerén's excellent preservation, as depth of burial may be insufficient to protect features and result in good preservation. Given present technology, the optimum zone for further exploration extends from near the present site to about a half kilometer farther south, and extends east and west of the site.

GEOPHYSICS

In 1989 Hartmut Spetzler conducted a geophysical survey of the area currently under investigation, Lot 189A, and the communally-held plot, Lot 185 (Spetzler and Tucker 1989). He extended the geophysical survey this season to include the lot just to the south of the site, Lot 189B. The lot is approximately 50 by 200 meters in size. He used a resistivity instrument, powered by a 12 volt battery, to push an electric current underground and search for subsurface anomalies. At each measurement station four rods were pushed into the ground; the two outer rods transmit electricity into the ground and the two inner rods measure the potential. A metric grid was extended over the lot and measurements were taken at five meter intervals. Some experiments were conducted in varying the rod spacing, with some measurements taken with more widely spaced rods, and many measurements with closer rod spacing. That was done in the southwest corner of the lot, where a long subsurface anomaly was found along side a hill. Two 2x2m test pits were dug, named Kayla and Gabi, to try to determine what caused the anomaly. No cultural feature was found that could have caused the anomaly, but the two test pits included only a small fraction of the anomaly. The only unusual characteristic that was found was the lateral blast of Unit 5 had scoured out Unit 4 and part of Unit 3, and then the area was infilled with later tephra deposits. It is possible that, if the scouring was extensive, it could have caused sufficiently different moisture conditions below the surface to create the anomaly. Such scouring of exposed surfaces by pyroclastic flows is not unusual. Also, the anomaly was detected on a hill facing the volcano, and thus was vulnerable to scouring.

ARCHAEOMAGNETIC STUDIES

Five sample areas were collected for archaeomagnetic dating by Daniel Wolfman during December 1990. One series, consisting of nine specimens, was taken from the step on the north side of Structure 1, buried by later remodelling of the building. This series is from the earliest phase of construction known at the structure. If it can be discriminated by archaeomagnetic analysis, it may give information on the duration of occupation at the site. The second series was taken from the floor of Structure 7, and the third series from the mound underlying and providing drainage for Structure 7. The fourth series was taken from tephra unit 5 near Structure 12, and may be able to date the eruption itself because of the high heat upon emplacement. The final series was taken from four basalt lava bombs that were embedded in tephra unit five. They could also help to date the eruption and to see if archaeomagnetic dating could be applied to this kind of volcanic material.

BOTANY

Maria Luisa Reyna de Aguilar (1991), the director of the Jardín Botánico in San Salvador, identified a number of species at Cerén. Some were seeds being stored in structure, some were plants

growing at the time of the eruption, and some were wood or thatch used for roofing before the eruption. Her report (Reyna 1991) was issued as an article in the informative bulletin series called Pankia. Because the annual plants were mature, she reasons that the eruption occurred during the middle of the rainy season, in July or August. Previously we had thought that the eruption was earlier, in June.

She identified corn (Zea mays) growing in various milpas, most of it mature, but some of it juvenile, perhaps the second planting of the rainy season. Some of the corn plants with mature ears were doubled over, perhaps as a short term storage in the field, as is still done in rural areas of Central America. The most extensive corn milpas have been found with Households 1 and 2. None of the corn, juvenile or mature, has beans interplanted. A garden with some 18 plants of "maguey" or "agave" (Agave americana) was discovered south of Structure 4.

A line of bromeliacea plants were growing just south of Structure 6. They were either "piñuela" (Bromelia karatas) that has an edible inflorescence and is much used in atole, or "pita floja" (Acochmea magdalenae) that was used much for string.

Clumps of flowering plants, called "macoyas", were found south of Structure 6, with 10 to 20 plants in a tight group. These could be one of five species, and could have been used for medicinal purposes.

Roofing support timber included laurel (Cordia alliodora), "caoba" (Swietenia humilis), "irayol" (Genipa caruto), "guarumo" (Cecropia spp.), "guachipilin" (Diphysa robinoides), "flor de mayo" (Plumeria rubra), "quebracho" (Lystoma divaricatum), "huilihuishte" (Karwinskia calderoni), and "cedro" (cedar: Cedrela odorata).

Two species of "caña brava" were used as the vertical poles in bajareque walls, that generally continued upward to assist in roof support. Both are in the bamboo family. they are Gynerium sagittatum that grows to 15 m high, and has a distribution from Mexico to Paraguay, and Chusquea pitterii that grows to 18 m, has a ring of spines at each growth node, and has a distribution within Central America and Panama. It is possible that "huiscoyol" (Bactris major), a straight pole that grows in wet areas, was also used in bajareque walls.

Roofing thatch evidently was of the grass "tule" (Cyperus canus) or the palm "palma de sombrero" (Sabal mejicana). The latter has a distribution from Mexico into the northern portion of South America, and remains the favored thatching material in ranchos in San Salvador.

Many species of seeds and other items were found stored inside of structures. They include corn, chiles, tomatos, gourds "morros" (Crescentia alata), cacao (Theobroma cacao), beans (Phaseolus spp.) with at least three species represented based on size and shape variation, "achiote" (Bixa orellana) that is edible and a pigment, squash "pepitoria" or "pipian" (Cucurbita pepo), "pacun" (Sapindus saponaria), "conacaste" (Enterolobium cyclocarpum), jocotes (Spondias spp.), and guayabas (Psidium spp.).

CONSERVATION

The good news is the Cerén site's domestic architecture has been preserved for more than a millenium in almost pristine condition. However, therein lies the difficulty, in how to treat and conserve it. It would be unconscionable to bring it into the present in such a way as to give it a very brief future. Therefore, considerable efforts have been made to conserve the site. Neville Agnew and Nicholas Stanley Price, Getty Conservation Institute, inspected the site and made recommendations and conducted analyses of the adobe. Anthony Crosby, National Park Service, is planning to visit the site and make recommendations. Two Peruvian architectural restorers, Carlos del Mar and Omar Benitez, spent December and January assessing the conditions of discovery, exposure, and conservation. They have had extensive experience with contemporary and prehistoric earthen architecture in South America. Their report is of assistance in the conservation effort (Del Mar and Benitez 1990). An international Cerén Advisory Board is being assembled to assist the Patrimonio Cultural and Ministry of Education in conservation of the Cerén site.

In March of 1990 Neville Agnew and Nicholas Stanley Price visited the site and provided suggestions for effective earthen architecture conservation. They took two samples of adobe from Cerén, which they analyzed at the Getty Conservation Institute and presented the results at the Adobe 90 conference (Coffman, Agnew, Austin, and Doehne 1990). Mineralogically, quartz was the most abundant component, followed by clays and feldspars in one sample and feldspars and clays in the other. Halloysite was the only clay mineral identified in both samples; none of the samples from other countries

that they analyzed contained halloysite. Of the eleven samples analyzed from various countries, the Cerén samples were the closest to the preferred composition of sand, clay, and silt for making adobe. Also, the Cerén samples were the most resistant to disaggregation in water of all samples tested, which is fortunate given the moist climate of El Salvador.

The importance of the conservation effort was realized by project staff and by Salvadorans in the Ministry of Education, and a group of fourteen conservation workers have been given permanent employment at the site. They are under the able direction of Victor Manuel Murcia.

The unusual conditions of preservation at the site have necessitated extra efforts in the field of object conservation. Following the 1989 discovery of what could be a codex or painted gourds in the niche of Structure 2, Harriet Beaubien was flown into the country to work on the multilayered painted object. Beaubien spent two two-week periods with the project this season, in September of 1990 and January of 1991, assisting in the conservation of fragile artifacts, particularly those of perishable materials. She conducted training sessions for Salvadorans and North Americans in the field and in the laboratory as well as setting up conservation labs at the site and at the National Museum.

ARCHAEOLOGY

In overview, the initial research in 1978 plus the 3 month 1989 season and the 6 month 1990 season have resulted in the excavation of ten buildings. They can be outlined as follows:

Operation 1

- Structure 1: the living-dining-sleeping building (domicile)
- Structure 5: men's workshop for stone tools
- Structure 6: storehouse for food, implements
- Structure 11: kitchen, with storage and processing areas

Operation 2

- Structure 2: the living-dining-sleeping building (domicile)
- Structure 7: the storehouse for food, implements
- Structure 9: possible sweathouse

Operation 3

- Structure 3: special purpose, probably communal activities

Operation 4

- Structure 4: storehouse for food, implements

Operation 5

- Structure 12: special purpose, perhaps shaman

In terms of structural-functional categories, we have a sample of three storehouses, two domiciles, and single examples of a kitchen, a communal building, a sweathouse or oven, a workshop, and what might be a shaman's building. The family communal building, for living, sleeping, and eating, is hereafter referred to as the domicile. The data base of excavated structures expands very slowly, given the mandatory slowness in excavating structures and artifacts that are so well preserved.

The following sections, on particular structures, operations, and artifact analyses, are based upon the above chapters written by project scientists during 1990 and 1991. The attempt here is to be relatively comprehensive in summarizing the major discoveries and conclusions. More details are available in the individual chapters.

OPERATION 1: STRUCTURE 11 AND NEARBY EXCAVATIONS

The primary focus of the 1990 excavations of Operation 1, under the field direction of Jeannette Mobley-Tanaka, was Structure 11. However, before looking at it in detail, the other excavations in Operation 1, directed by her and by David Tucker need to be described. Cleaning the north end of Structure 1, where the bulldozer first found it and removed its northernmost portion in 1976, divulged two earlier stages of construction. Each represented a remodelling and enlargement. Excavations between Structures 1 and 6 encountered a metate upside down on the ground, in between two *horqueta* (forked support posts) holes. Evidently it was being stored upside down to protect the grinding surface, and could be remounted on newly-placed *horquetas* when needed.

Excavations to the south of Structure 6 encountered a garden, whose northern boundary is just outside the thatch roof of the building, and whose eastern boundary is the heavily travelled walkway between Structures 6 and 11. The other boundaries have yet to be found, including the boundary between the garden and the maize milpa to the south. The garden consists of two rows of plants running parallel to the south wall of Structure 6. Three species were planted, one unidentified and two field-identified as manioc and agave. Each plant had at least some mounding of the tierra blanca joven around its base. A few sherds were found in the garden, all with rounded edges.

David Tucker conducted limited excavations in agricultural areas of Household 1 in February and March of 1991. He found two gardens, the "North Garden" which is west of Structure 6, and the "South Garden" which is west of Structure 11. The two gardens are separated by a southwestward draining ditch. The North Garden is a series of east-west low ridges with corn plants growing on top. The South Garden also has parallel east-west ridges, but with a wide variety of plants growing on the ridges. At least four species were growing there. One species may be "piña silvestre", useful in atol and for medicinal purposes, one may be a root crop, and the others are yet unknown. Just to the south of the South Garden is a maize milpa which is a continuation of the corn field excavated in 1978 (Zier 1983) and 1989 (Murphy 1989).

Structure 6 (formerly 1b) was almost entirely excavated during 1989. Only the easternmost part remained for 1990, and it contained only a few artifacts, including a partial metate and a *laja* grinding stone on the floor and a donut stone that was above the floor but below the roof, likely being stored on a wall top. The northern, western, and southern walls of the *bodega* were made of vertical poles, with only a touch of bajareque treatment at the bottom. That is, only the bottommost 20 to 30 cm were daubed with mud, leaving the rest open. Adding that to the height of the platform gives only about 40 to 80 cm of vertical wall as a barrier to four, six, or eight-legged creatures with designs on the grains stored inside. The east wall of the building was a surprise, in that it is an unusually tall bajareque wall, 1.8 meters high, with a pair of partial columns serving as doorjams. Broken vessel handles were mounted inside the doorway to secure the door. From corner to corner, Structure 11 is only 3 meters to the southeast of Structure 6, and the gap between the edges of thatch roofing was less than 2 meters.

Structure 11 was first suspected of being a building during the garden excavations when it was noticed that tephra layers, particularly Unit 3, bowed upward somewhat toward the east. Two test pits were excavated through the bulging tephra layers, and the presence of a structure was confirmed.

Structure 11 was the kitchen for Household 1. It was an ample and well-organized kitchen, with some features not seen in other buildings excavated to date at the Cerén site. It is unusual in that it is circular, with very little bajareque and no columns, and it was built on a very shallow platform. The floor was only 5 to 10 cm above the surrounding ground surface, and the interior floor was not of fired adobe, as in the other structures, but of volcanic ash from the Ilopango eruption. This would be a very practical floor, as spills would seep into the floor, but when the floor became too organic-laden it was easily replaceable. The edge of the floor, following the line of postholes, was 15 to 20 cm above surrounding terrain, probably a barrier to moisture during heavy rains. With a diameter of 4 1/2 meters and a small rectangular porch, it had about 20 square meters of roofed internal space. The building is also unusual in that it opens directly to magnetic north, in contrast with most building orientations. Its porch, of fired adobe, points directly toward Structure 1 and the entry to Structure 6, the *bodega*.

The roof was supported by a series of 44 thin poles running around the circumference as well as by the two large poles in the north of the porch and the two large poles running up from the bajareque "columns" at the entrance. They are 1.3 meters tall, a relatively short height for bajareque at Cerén. They probably are the remnants of a more extensive bajareque wall; it may have encircled the entire kitchen. They were replaced by the vertical poles with vertical thatch supporting the thatch roof. A thatch wall would permit more air circulation, but it would permit more small creatures to enter as well. The thatch roof was approximately a third the thickness of other thatch roofs excavated so far; this likely was to facilitate smoke leaving the structure. The roof collapsed earlier than that of any other building yet excavated at Cerén. It failed during the emplacement of Unit 1. This early failure facilitated the preservation of painted gourds inside, as tephra could fill in the inside and pack around the outside. Then, when the organic component decomposed, the painted layers did not collapse.

The south side, farthest from the entrance, had a shelf and a lot of artifacts. Two other postholes just inside the bajareque "columns" contained the *horquetas* that supported a metate at waist level. As

with all the other metates associated with *horquetas* in Household 1, this metate showed very little use. A matching mano has yet to be found. All Household 1 metates may have been put on *horquetas* at about the same time, not very long before the eruption occurred. All are mounted relatively close to the ground, some 50 cm, and all have very slight use. If contemporary standards of mounting the metates so the grinding surface is just below waist level are applicable to the past, this indicates a short person was the principal food grinder in the family.

The southern end of the structure was used for storage. A shelf or long table was constructed at the southern end. Vertical posts supported a series of horizontal poles. Many artifacts were placed on top of the shelf, and some artifacts were stored on the floor under the shelf. Two large round-bottomed jars still were resting on their fiber rings that held them upright on the shelf. Also on the shelf were a celt (unhafted, like others at the site) and two small polychrome jars. Someone placed a red pigment with mica added, perhaps a "poor person's specular hematite," on the shelf. A large jar was suspended above the shelf with a fiber rope, probably of agave.

Under the shelf were two baskets, an incensario, a large jar, and a small bowl. A miniature ceramic pot containing red pigment fell into the large jar, probably from the shelf above. Below the end of the shelf, and resting on the floor, was a surface of leaf matting which had a pile of beans placed on top of it. Three sizes of beans indicated that three varieties of beans were being stored together. The organic layer, in both cases, probably was to decrease capillary moisture from below. Two rodent skeletons were found, one near the beans and one from the shelf. Chiles were stored on the shelf or hanging from rafters. Other species tentatively identified in the field include achiote, cacao, and pumpkin. Not a single vessel from this area was soot-incrusted.

The northwestern area was used for vessel storage. Two cooking vessels were stored there as well as some empty food storage and serving vessels. Two rodent skeletons were in the thatch above this area and one was on the floor.

The eastern side of the kitchen was the most actively used. East of the mounted metate was a well-used trough metate resting on the ground, stabilized by a rock, with its mano resting at the far, lower end. Less than a half meter away were the three-stone hearth and a pot with corn kernels soaking in it. The hearth had only a little charcoal in it, and no pot on top. Cooking pots, with their smoke-blackened bottoms, were concentrated in this area. Cooking vessels were kept in the kitchen, and food taken from the kitchen in serving vessels to the main structure for consumption. Cooking vessels are not found outside the kitchen. This area gives the appearance of being cleaned up for the night, rather than in active use during the day. The thatch roof was used to store an obsidian prismatic blade with an excellent cutting edge and five red pigment lumps.

The center of the room was kept relatively clear of artifacts. In addition to the entryway and the center of the structure, which give access, there were three functionally different areas. One, the east side, was described above. The porch surface was kept clean, but the roof was used for storing an obsidian scraper, a deer-sized mammal longbone, and a bone tool.

Many hemispherical painted gourds were found in the structure. Some were crushed by the overburden, but most had tephra packed inside and outside. Thus, when the gourd itself decomposed, the tephra assisted the painted surfaces to hold together. The fine, moist tephra is more effective than the coarse, hot tephra. The coarse tephra allowed the paint fragments to fall and disassociate themselves from the decomposed surface. Many of the gourds were painted red, while others were painted green, yellow, and other colors. That their greatest concentration in the site to date is in this kitchen, with a possible pile of nested gourds in the niche in Structure 2, indicates a function as food ladles and probably as food serving vessels for individuals. Based on ethnographic analogy in the gender division of labor, this apparently was a female activity area focusing on food processing. A probable male activity structure for daytime activities evidently was Structure 5, on the other side of the domicile. The kitchen was constructed with practicality in mind, and it was internally well-organized. An obsidian prismatic blade and a scraper were used for a variety of tasks. The structure was amply stocked with cooking, storage, and food processing vessels and implements. And, those implements often went beyond the minimal requirements for function, as decoration of them was common and sometimes quite elaborate.

OPERATION 2: STRUCTURE 7

Structure 7 is the *bodega* for Household 2, and was excavated under the direction of Brian McKee. The domicile, Structure 2, was excavated the previous season (McKee 1989). The nearest corners of the two buildings are only 1.2 meters apart, and their thatch roofs almost touched each other. Structure 8 is located a short distance east of Structure 7, and might be the kitchen for the household. It has not yet been excavated. If it is the kitchen, it probably is of more substantial construction than the kitchen of Household 1.

The architecture of Structure 7 is described here in order of construction. First, a sizeable clay mound was constructed, probably for drainage of surface water away from the building. Then, a square platform of solid adobe was constructed, some 3 x 3 meters, and about a meter above the surrounding terrain. A porch was added to the north side, of 3 1/2 square meters. The exposed portions of the mound, the platform, and the porch were fired before the adobe columns were mounted in the corners. The columns are 1.5 m high, and most bajareque walls are about the same height. The northern bajareque wall, with the entrance doorway, was emphasized and measures 1.67 m in height. This is similar to, but not as extreme as, the emphasis on the entrance wall of the Household 1 *bodega* (Str. 6). Handles from broken pottery vessels were mounted inside the doorway wall to secure the front door. The front door was made of vertical poles lashed together with twine, and resting on the lower surface of the porch. The vertical poles from the bajareque walls continued upward and supported the roof, assisted by large posts set into and north of the porch. Pieces of twine were found with roofing and probably were the lashing connecting vertical and horizontal members of the roof. The excavated thatch was 5-10 cm thick; the degree of thinning due to the fire and the tephra overburden is unknown. The thatch roof was extensive; in addition to covering the 10 square meters inside the walls it covered some 27 square meters outside the walls. A wooden shelf or table was constructed on the western side of the room, supported by large wooden posts. As in Structure 11, the shelf was made of horizontal poles. A mat was stored on its north end.

All walls and columns fell during the eruption, during Unit 3. Unit 1 packed on the roof and exposed surfaces, and a little blew into the building. Unit 2 set fire to the roof. Unit 3 continued to burden the roof until the combined effects of weakening by fire and overburdening by tephra resulted in collapse. The principal structural resistance to stress is in the interconnectedness of bajareque wall poles being tied to roofing members. Walls and columns were not structurally interconnected, but rather were only abutting, with their junctures smoothed over with clay surfacing. Therefore, the failure of the Str. 7 roof left the walls and columns vulnerable, and they all collapsed shortly after the roof fell.

The nature and density of internal artifacts indicate this was a *bodega*. Five large storage jars lined the back wall and were in direct floor contact. Most are Guazapa scraped-slip vessels. In addition, one medium-sized and two large pots were placed on the floor. They were storing various kinds of seeds.

A surprisingly large number of artifacts were suspended from roofing members inside the *bodega*. A couple of practical reasons are (1) rodent and insect pests would have more trouble getting to something suspended from the ceiling than sitting on the floor, and (2) efficiency in utilization of space. If all of the artifacts stored with the roof were placed on the floor, the structure would have to be expanded to be useable. A cache of five miniature pottery vessels, seven jade beads, two shell/bone beads, and six shell fragments were found in Unit 3, in the southwest corner. They had been stored high in an organic container and fell with the roof. Most of the jade beads were biconically drilled, but two were cylindrically drilled. They are 1.4 to 1.7 cm in diameter. A shell pendant, carved in the shape of a 5-pointed star, was found nearby, and may have been part of the same necklace. All miniature pots contained red paint, and all were decorated. The paint was liquid when the eruption struck. Nine other ceramic vessels or partial vessels were stored high, two probably on the shelf and the others connected with roofing. These include a polychrome tripod plate, a polychrome bowl with three monkeys, two medium sized jars, and two dishes. There were more ceramic artifacts stored above the floor than on the floor.

All five prismatic blades were stored in roofing thatch at the southern edge of the structure. The thatch roof probably was too high toward the center of the structure to reach. Although some blades were snapped into shorter segments when the roof fell, their edges were in excellent condition prior to the eruption and remained in very good condition.

All thatch roofs excavated so far at Cerén contain at least one small rodent, but *bodegas* have more than most. This *bodega* roof had five. As our workers noted, some things change with time and some things do not.

A carved bone figurine, in the form of a man with a hat, was found in very good condition. It was stored high, perhaps with roofing, and fell into a pot. Another important organic item is a nut shell perforated by a wooden stick, forming a spindle and spindle whorl. Unfortunately, these would not preserve at most archaeological sites.

The porch had no floor contact artifacts, but there were quite a few elevated items, including a large sherd for storage of some unknown substance in the rafters, 2 polychrome bowls, sherds, a prismatic blade and a macroblade of obsidian, some paint, two deer bones, and a hemisphere of wood ash.

Northwest of the structure were some sherds and obsidian blades that were discarded trash, a fragment of a bone needle, and some corn cobs. The corn cobs, now preserved by dental plaster, may have been tossed there by someone eating corn on the cob while seated on the porch. Six hemispherically-shaped clumps of wood ash were stored high, likely in unpainted gourds, and fell in this area when the roof collapsed. Collecting wood ash in hemispheres, likely in unpainted gourds, was common in *bodegas* (see Str. 4 below). Why no wood ash hemispheres were found in Structure 6 is unknown. Where limestone is rare, wood ash is often used as a substitute for soaking corn kernels before grinding.

West of the structure were found two bowls, part of an obsidian macroblade, 2 manos, and 2 hemispheres of wood ash. All of these were stored high.

OPERATION 2: STRUCTURE 9

Structure 9 is the third structure in Operation 2 to be excavated. It was excavated under the field supervision of Brian McKee. The first suspicions that there might be a structure at that location occurred when tephra layers were being removed and Units 10 and 11 were noted to be bulging upward. Tephra layers were removed down to Unit 8, and the bulging became more pronounced. The structure functioned either as an oven or as a sweathouse. In my opinion, the evidence supports the latter.

The building was built on top of a clay substructure. Then, a substantial platform was built of clay, measuring 3.8 by 3.8 meters, rising a half meter above the original ground surface. Instead of having an adobe top, the top of the platform was made of *laja* stones laid in a clay mortar, at least in the southeast corner. That surface forms the floor inside the structure. A 1-2 cm thick surfacing of volcanic ash from the Ilopango eruption covered the *laja* floor. The building is oriented 30 degrees east of magnetic north, like most structures at the Cerén site. Short walls of solid adobe were constructed on top of the platform. They are a meter high and some 35 to 40 cm thick. The walls are capped by a large cornice. The corners of the structure have short column bases of adobe.

The building has two roofs, an adobe dome and a protective thatch roof above. The roof that was connected directly to the building was a bajareque dome rising some 3/4 of a meter in the middle. It was reinforced by varas de castilla 1.5 to 2 cm in diameter every 20 cm. It was 10 to 15 cm thick. The domed roof of clay was a significant engineering accomplishment. The underside was thickly coated with black soot from the burning of a lot of wood. Above the domed roof was a thin roof of thatch, surely to protect it from rain and sun. The column bases at the corners of the structure may have supported short vertical posts which held up horizontal beams and the rest of the support structure of the grass thatch roof. Or, more likely they directly supported the horizontal beams upon which the thatch roof was built.

Unfortunately, a lava bomb blasted through the bajareque dome and did considerable damage. However, this damage did provide an opportunity to excavate a small test pit down to the interior floor, providing a glimpse inside. A sizeable firebox was built of river cobbles in a clay mortar in the center of the structure. Its chamber is about 80 cm in diameter and 80 cm high, with walls sloping inward toward the top. The clay was oxidized bright orange by intense fires. It was reached by a narrow doorway low on the structure's north side. The entry was only 50 cm wide and 80 cm high, with two beams covered with adobe to form the lintel. Above the entryway, on the outermost edge of the sloping dome, is the "donut". This feature was carefully built into the structure. It is a circular flattened ring of clay with an outside diameter of 35 cm and an inside hole 10 cm in diameter. The hole was plugged with an irregular

-adobe mass. With the plug removed it would have provided ventilation, and thus could have assisted in regulating temperature or smoke inside.

An extensive bench encircles the structure's north end, with a short gap for the north side entrance into the firebox. The bench is more ample on the west side, even with a triangular arm or bench termination at its southwest corner.

Although the building is sizeable in plan view, the roof is low and the interior space is constricted by the presence of the large firebox in the center. Around the edges of the room there is about 1.2 meters of headroom, and in the center the distance from the floor to the dome surface would be about 2 meters. However, the distance from the outer edge of the firebox to the inside of the walls is not great and does not leave much room. The room can be entered from the north entrance. It is possible that there is an entrance along the south wall; the tephra was not removed from that area.

A zone about 3 meters wide was maintained clear of artifacts and plants along the east side of the structure. The thatch roof extended over about a meter and a half of that zone, leaving another 1 to 1.5 meters of open walkway. Beyond that was a maize milpa. It was, as with most planted species, encountered as tephra casts around plants that had decomposed. Microtopographic slope management procedures were followed, as in the milpa of Operation 1 excavated in 1978 and 1989. The maize was planted, with multiple sproutings per locality, on top of ridges that were 10 to 20 cm high. The "wavelength", from ridge top to ridge top, was about 80 cm. The ridges run parallel to the northern and southern walls, and thus follow the spatial organization of the site. In addition to the ridges, additional mounding of the soil often was done around the maize clusters, perhaps to decrease the chances of wind throw. The prop roots were exposed in some cases. These were mature corn plants, as some stalks had ears of corn in husks.

The area to the west of Structure 9 was very different from that to the east. It did not have a layer of tierra blanca joven over the pre-Ilopango clay soil. Rather, the entire area was clay-laden, at least on one place covering the tierra blanca joven of Ilopango. A steep dip or ditch runs from the structures southwest corner toward the southwest, and it is loaded with garbage. It contains many sherds and some chipped and ground stone artifacts. It also contains corn cobs without the kernels, leaves, and tree branches. It may be the edge of a trash disposal pit.

Three enigmatic *laja* features were found west of the structure. Each is formed of a pair of *lajas*, a rounded and smaller flatlying *laja* with a larger *laja* set on edge nearby. The larger, and more angular, *laja* is almost vertical, gently sloping back from the smaller *laja* at about a 60 degree angle. They form a partial semicircle facing roughly toward the structure. They give the appearance of being seats, but they would not be very comfortable if occupied for very long.

In summary, Structure 9 clearly was designed for heating. It is an elegant and elaborate structure, with its surrounding bench and arm, a well-made cornice running around the entire building, a very impressive dome with four adobe column bases at its corners, a domed firebox with a sunken floor and accessway, a protective thatch roof, and prepared surroundings. Not a single artifact was found inside. Had it been a kiln I would expect to find a few sherds from firing failures inside and a lot of broken pots outside. The architectural embellishments seem more appropriate to a sweathouse than a kiln. A kiln would work well, perhaps better, with a clay floor than a stone *laja* floor because it is not so hard and pottery breakage rates while being removed from the kiln might be slightly lower. In contrast, a stone floor would be less affected by the moisture of a sweathouse than a clay floor. Based upon the above, I favor a sweathouse interpretation over a kiln, but the evidence is far from definitive, and it is possible that something else was being heated, such as food.

OPERATION 4: STRUCTURE 4

Andrea Gerstle excavated the *bodega* (Str. 4) of Household 4. It was first detected as a geophysical anomaly in 1979, 1980, and 1989, using resistivity and ground-penetrating radar (Loker 1983, Spetzler and Tucker 1989). Its excavation was delayed somewhat by complex land ownership negotiations, and it was decided that Structure 3, some 15 meters east, would be excavated first because it was owned by the Patrimonio Cultural. Structure 3 (Gerstle 1989) is the largest building yet excavated at the site, and apparently was for community use rather than being a part of a single household.

Another building has been detected near to Structure 4, just to the northwest. The edge of a subplatform was found in the northwest corner of the Operation 4 excavations, and many fragments of

broken bajareque wall were found in that area, probably blown in from the structure. Because the domicile (living-dining-sleeping) structures of Households 1 and 2 were located north of the *bodegas*, it is possible that this is the domicile of Household 4. Future excavations will determine its nature and function.

The excavations of Operation 4 began in mid-July and continued until mid-December of 1990. They began with three 2 x 2 m test pits which successfully located and determined the orientation of Str. 4. A duralite roofing module was constructed above the area to protect the structure from rain, sun, dust, and wind. Early in the excavations a Postclassic midden was found in tephra layers deposited well after the Laguna Caldera eruption. Although the Boqueron tephra was not intact over large areas, it was in situ in a few places, and the artifacts apparently were from the soil developed on top of it. A considerable amount of ceramics and obsidian was recovered. The obsidian was from a small core-blade workshop.

By mid-August three bajareque wall tops and four adobe column tops were discovered. It was immediately clear that this bajareque structure was in better condition than most bajareque structures at the site. Most bajareque walls became vulnerable to collapse when their roofs burned and collapsed, and most bajareque structures had many of their walls collapse. All walls and all columns of Str. 7 collapsed. Only the south wall of Str. 4 had collapsed, so the excellent architectural preservation provided an opportunity for conservation of walls prior to their being excavated. This may be a first in archaeology, doing architectural conservation of walls prior to excavating them. While the tephra layers were still in place on both sides of the walls, Victor Manuel Murcia and the architectural conservation team investigated each vertical hole where a pole had been placed in the wall. Most penetrated some 20 cm into the platform, and some went more than 30 cm. The hole where the rod had been was measured for diameter and length and a match in diameter and length was obtained. The contemporary varas were placed in the holes and solidified prior to excavations continuing. The walls thus are reinforced as they were reinforced prior to the Laguna Caldera eruption, and they can now sustain wind stress and earthquakes. They would be very fragile without this reinforcement.

Structure 4 probably was constructed over a substructure mound, but little of that mound is presently visible. The platform measures 3.20 by 3.25 m, and averages 70 cm in height. The top surfaces slopes slightly down from the northeast corner, probably reflecting the slope of the general topography. The platform top and edges were resurfaced by a fine clay mixture, generally less than 1 cm in thickness.

Four columns were mounted at the structure's corners, inset a few centimeters. Each column was 35 cm in length and width, and 1.4 to 1.45 m in height. All tops were modified to support north-to-south horizontal roof beams; clay was packed around the beams to structurally affix them to the columns and perhaps to the varas de castilla exiting the bajareque walls. The beams run adjacent to, and inside of, the top of the bajareque walls. The beams were daubed with mud, forming a kind of internal rounded cornice. This extra reinforcement contributed to the building's strength and resistance to the buffeting from the eruption.

The bajareque walls are 10 to 13 cm thick, with 2 cm diameter varas de castilla every 15 to 20 cm extending up above the clay-daubed portions of the walls to assist in roof support. Only the south wall collapsed, during the beginnings of Unit 3 emplacement. There is no evidence of it having additional reinforcement by a horizontal beam at the top. The internal dividing wall did have a horizontal beam at its top, and it survived the eruption's turbulence. It has a doorway 60 cm wide that is offset to the west. The clay packed around the beam formed a squared cornice along the wall's north face.

The internal wall divides the north from the south room. The north room is small, about 1 by 2.7 meters. Most of its artifacts were on a high shelf made of horizontal poles tied together with 2-ply string. The shelf was surfaced with a thin layer of clay mixed with grass to create the top surface. The shelf evidently ran from the west to the east horizontal roof beam; one would have to duck under it and the wooden lintel of the doorway to enter the back room. The internal doorway had a wooden door consisting of two rows of vertical poles tied together with 2 ply twine in pairs. The door almost certainly was tied to the vessel handles that were embedded into the south side of the doorjamb. This door also was closed at the time of the eruption.

The south room measures 2.6 by 1.8 meters. It had at least six jar handles mounted into its walls, four for tying the door and others for other purposes.

The most prominent internal feature of the south room is a circular corn crib with a maximum diameter of 1 meter. It was made of small (1 cm diameter) poles extending upward over a half meter, probably tied in pairs, and full of corn on the cob that had been husked. Leaves were placed in the bottom, probably to form a moisture barrier between the corn and the moist clay floor. A rodent skeleton was found inside with the corn. The crib held at least 1/2 cubic meter of corn.

The roof of the building was supported by a series of vertical, horizontal, and sloping members, with grass thatch on top. It is estimated to have covered some 26 square meters in total (4.5 by 5.8 m), of which 7.4 square meters are inside the walls. The preponderance of roofed area was outside the walls.

A step was located on the north side, which was later incorporated into a raised floor area just outside the north pole wall. That elevated extramural surface extends around the northeast corner. A metate elevated on the *horquetas* was found at the northwest corner, under the eaves. The grinding surface was about 60 cm above the floor, notably higher than the mounted metates of Operation 1.

The artifacts, portable features, and organic items preserved in Structure 4 clearly indicate its function as a *bodega*. Some of the artifacts in the north room were found on the floor, but most were stored high on the elevated shelf. Three pots were found on the floor, on the west side, one of which had an organic material yet to be identified. The east side floor was kept free of artifacts; a red paint splotch on the floor may have been a paint spill.

The bulk of the north room artifacts were associated with the shelf; most were on top of the shelf but some may have been suspended below it, some could have been suspended above it, and some were in the thatch roof above it. Ten pots were with the shelf, including a ladle incensario, 2 polychrome bowls, 2 polychrome tripod bowls, 4 scraped slip jars, and an open mouthed bowl. One jar was full of cacao seeds and another held a yet-to-be identified organic material. The shelf also held a piece of a finely-woven cloth, a bone needle, a possible bone awl, and some pigment. A few pieces of *laja* that were thermally fractured during the roofing fire ignited by Unit 2 may have functioned as caps to vessels. Many chiles, stored dried apparently in hanging bunches, were found widespread in the north room. They probably were tied to rafters. One obsidian blade was stored in the roofing thatch. It broke during the eruption and roof collapse and the two pieces were 50 cm from each other, indicating the turbulence and item displacement.

A few items fell just north of the north room but probably were inside it before the eruption. They include a scraped slip jar that was on the shelf or suspended from the roofing, and two obsidian prismatic blades that were in the thatch. A total of 14 hemispheres of wood ash were found in the north room, just beyond the room, or around the northeast corner of the building. They are spherical to hemispherical, as if they were collected in an organic container like a gourd, leather, or fine net bag. Most are about 8 to 14 cm in diameter.

The south room contained numerous floor contact and elevated items. A total of 12 ceramic vessels were on the floor, of which 9 were Guazapa scraped slip utility vessels. Six of them had no identifiable contents, but a rodent did get into one. Of the three with contents deliberately placed inside, two contained cacao seeds, as identified in the field. One of them had a mixture of cacao and another small round seed and nut shells, and the pot apparently was covered with a layer of fine cotton cloth resembling cheesecloth or gauze. A rodent found inside is unfortunate evidence that it was not sufficient to keep intruders out. The two cacao-containing vessels were together. The other vessel with something placed inside had a pointed antler tool that could have served well as a corn husker and grain remover, as still is done in rural Central America.

Another floor contact vessel was a polychrome cylinder vessel that apparently held a liquid, indicated by the yellowish stain at the bottom that leaked between the sherds and onto the floor when the vessel broke during the eruption. It had two identical nested polychrome bowls on top of it, with the bowls inverted to cap it. The bowl in contact with the vase still retained the finger swipes of food from the last person to use it as a serving vessel. The eruption intervened between the serving of the food and the washing of the two vessels. This clearly is a set of food and drink serving vessels.

Much of the floor area of the room is covered by a woven mat, measuring some 1.3 by 1.5 meters, with five jars placed around its margins. Although rather dark in the daytime, this would have been a comfortable area to sit and do various things.

Quite a few items were stored high, and they include a polychrome bowl, 4 *lajas* (including a shaped but unground one), bunches of chile seeds, a celt (unhafted), a bone needle (in thatch), and two organic containers. Both the organic containers apparently were gourds. One was not painted and contained seeds, and the other was a small gourd disk that was painted red but had no contents.

The prepared floor to the east of Str. 4 was loaded with delicate and complicated organic features. The only ceramic vessel was at the north end. It is a polychrome cylinder vase right at the northeast corner of the building. Just south of it was a 35 cm diameter basket containing beans. The basket was resting on two *lajas*, likely to retard capillary water from affecting seed storage. The basket was coiled on the bottom and supported by small-diameter vertical poles around the periphery.

An adjustable fence was found on the structure's east side. It was made of small poles, perhaps *vara bofa*, that were tied together by two-ply string in pairs. The height of the fence is unknown, as only the bottom portion was preserved. It was 2.9 meters long, but at the time of the eruption only 2.1 meters was being used. The remainder was coiled up. The coil is around a pair of larger sticks that leaned against the edge of the building. Another fence roll was carefully wrapped up in a bundle of leaves and tied with a string in a loop knot to form a tidy bundle, and left near the other fence.

A few things had been stored above the floor in this area. Already mentioned are the three hemispheres of wood ash that were found near the northeast corner of the building. A few sherds and some twigs from trees were found in tephra; both may have been blown in during the emplacements of Units 1 and 3. Many carbonized beans were found above the basket and its contents. They were covered with roof thatch, and had come down with the roof. Some string was found below the beans, and may have been part of a net bag that was suspending them before the eruption.

Only a small area was excavated to the west of the structure. Some sherds were associated with some seeds that were field identified as pipian. The sherds probably were from a jar that was resting on the west wall or hanging from the roof just outside the structure, and the seeds probably were inside it. There were no floor contact complete artifacts; this area apparently was kept clean as a walkway.

A zone to the south of the structure was kept clear of artifacts and plants. About 2.5 meters south of the building was an agave garden consisting of some 18 individual plants. They continue into the unexcavated area to the west. All have tall central stalks or inflorescences, long leaves and places where leaves are missing. It is likely that leaves were cut off and processed into fiber for string, twine, and rope. One plant close to the structure had two pieces of two-ply twine draped over a leaf; it could have been thrown out as trash or blown against the plant during the early stages of the eruption. If made of agave fiber, it represents the full cycle of growing the plant, removing the leaves, de-pulping, making twine, and then ending its use.

Other plants were growing in the garden. One is field identified as guayaba, and some probable guayaba seeds were found nearby. About two dozen sherds, clearly trash, were found in the garden area. One was lodged in the juncture between two agave leaves. Some large branches had been blown off trees to the west of the structure by the eruption and had landed in the garden. Many probably came from the large tree growing just to the west of the structure. This tree would have provided shade for the structure from mid-day throughout the afternoon.

In summary, Structure 4 clearly was a *bodega*. An impressive range of grain storage techniques were employed, including drying and hanging, storage in pottery vessels, storage in a permanent crib, possible storage in adjustable features, and storage in suspended and floor-contact organic containers such as baskets. The garden of agave plants evidently was supplying raw material for cordage on a regular basis. The excavated evidence shows a great demand for cordage to fasten roofing members, to make wood pole walls and doors, to suspend pots and hang a variety of seeds and organic containers, and to make grain storage facilities. A wide variety of grains were being stored, including maize, beans, cacao, guayaba, pipian, and chiles. Future work needs to be done to set the structure into a functioning household complex, as the domicile, kitchen, and other buildings remain unexcavated.

OPERATION 5: STRUCTURE 12

Structure 12 was excavated during December of 1990 and January of 1991. It does have features found at many other structures at Cerén, including solid columns, bajareque walls, a large fired clay platform, a thatch roof, and many artifacts that were "up", i.e. on wall/column tops. However, the differences outweigh the similarities. It is the only building excavated to date that was surfaced or "painted" white inside and out. It is the only bajareque structure with no artifacts stored in roofing thatch. It is the only building with red paint on walls. It is the only one to have a window. It is the only one to have vertical niches, and it has six of them. Vertical niches are spaces that are enclosed on three sides; as most are associated with columns, the space is vertical. It is the only one to have a roofed, broad spreading enclosure in front, what we call the north room. It is the only one where access to the inner room was made very complex by barrier walls, a low beam, and changes in floor level. It is the only one with an orientation 15 degrees clockwise from our magnetic directions. It has more columns than any other structure; most structures have four columns, yet it has ten (assuming symmetry). It is the only one with round cornices. It is the only one with Ilopango tephra in the core of a wall. The artifacts in it do not represent a functional assemblage in the way that the *bodega* assemblages from Structures 4, 6, and 7 indicate storage, or the household domestic assemblages indicate living areas as in Structures 1 and 2. Rather, they may have been brought individually and left, as offerings or payment for services rendered. Many had seen considerable use, and seem to have been curated for long times. The term heirloom might apply to some. Others are quite functional, such as the "chicha" pots and the deer antler tine. And some were pretty well used up, as the obsidian blade. The artifacts are not elegant. Many were carefully placed, such as the pot on the olivella shells, and the mano on the wood ash. This might have been the structure where a shaman practiced. If so, it could be considered a religious structure, but not one of an organized religion. The artifacts are relatively humble, functional, and had been curated and/or used for an appreciable time. Hence, I get the impression of someone receiving artifacts from local households rather than being some major pilgrimage shrine that would draw people from significant distances. Had people come from long distances, stylistic or technological differences could have been detected in their artifacts when compared to local Cerén artifacts. The building is smaller than would be necessary for a major regional shrine.

Structure 12 was built on top of an informal clay mound. Formal construction began with the half-meter high platform that measures 3.2 by 3.7 meters. Rounded cornices decorate all edges of the platform. Four columns were inset slightly from the platform corners, and bajareque walls were constructed to link them. However, not all walls were straight. The north wall was inset to the south, creating two vertical niches to the south of columns 3 and 4. All surfaces of the walls, columns, and platforms were painted white, apparently with a mixture of white tephra from the Ilopango eruption and a binder. Tephra from Ilopango was used as a core for bajareque wall construction, but that probably resulted in a weaker wall than one with good quality clay-laden adobe.

A large broad room was added onto the north end, called the north room, by the addition of columns anchoring the corners of bajareque walls. One part has yet to be excavated, due to complexities in negotiations regarding property boundaries. However, if the building is symmetrical, there are six columns in addition to the four associated with the structure and platform proper, for a total of ten columns. Those columns of the north room are set at corners; four have been excavated and the other two are hypothesized, assuming bilateral symmetry. Excavations could not continue to the north because the northern part of Structure 12 extends beyond our property boundary.

The west wall has a window 34 cm below the top of the wall. The window is 39 cm high and 86 cm long, made apparently of five sticks slanting right-to-left and five slanting the other direction, in a frame. The sticks and the frame were covered with adobe and painted white, resulting in a lattice window and a rounded molding. It probably was placed there for ventilation and light, although other functions are quite possible.

Internal dividing walls within household buildings excavated at the Cerén site are oriented east-west. Structure 3, a special purpose public building, has a north-south dividing wall. Str. 12 has a north-south internal wall, creating a long and narrow east room and a square west room. Access is difficult to the innermost (west) room. One needs to pass through the north room, step up onto the platform and turn right, and then left ducking through the low doorway under the north wall. The east room is long and narrow, and apparently there is a doorway through the interior wall and a step up some

20 cm into the west room. It probably is a low doorway, and one would also have to duck under the low wooden beam that connected the north and south walls.

Because of their fragility, most walls in the north room remain unexcavated. However, in a test to determine wall location a broad band of red paint was discovered. Some tiny fragments of red painted wall were found in tephra in various parts of the north room, dislodged by the turbulence of the eruption, and thus it is possible that there was extensive wall painting in the north room. Excavations of the painted walls must await adjustment of property boundaries and the arrival of a specialist qualified to conserve such fragile painted surfaces.

The artifacts are unusual in a number of aspects. A high proportion are in floor contact or were on tops of walls. Very few were connected with the roofing members or roofing thatch. They are not a household assemblage, as known from the excavated domiciles, kitchen, or *bodegas*. Many are very used. Often they seem to be carefully placed, or cached. Five artifacts were placed in the horizontal niche in the bench of the north room. They are some fragments of shell, a pottery figurine painted red and black, half of a ceramic double ring, a deer antler, and a ceramic animal head. All were quite worn, and the ceramic items showed considerable smoothing on old breaks. The antler tine's proximal end includes the skull bone of the deer. Five ceramic vessels were on the adobe surface above the niche. One large bowl was upside down capping a large jar. The other three were badly damaged by a direct hit from a lava bomb, and were recovered as small scattered sherds. The lava bomb also destroyed the east end of the roof of the niche. Fortunately, most of the niche roof was supported by a large *laja* that withstood the impact of the lava bomb. The areas in and above the niche, and the east room, held the greatest concentration of artifacts. The east room has a vertical niche south of column 4, and the bottom of the niche was covered with a layer of wood ash. On top of the ash was a one-hand *mano* and an isolated polychrome sherd. On the floor and just inside the doorway was a medium size pottery vessel, with no discernable contents. Against the middle part of the east wall someone placed a small pile of beans that was not inside any kind of container. Two pots were placed toward the southern end of the room, side by side. They are small jars that are very similar to the "chicha jars" that are still made and used in rural El Salvador today. The southernmost jar was carefully placed on top of four *olivela* shells. That vessel had a human face modelled on its neck.

The west room had only one artifact, a large open-mouthed bowl in the southwest corner, in direct floor contact. It is possible that the room contains some other floor-contact small artifacts, as a baulk of volcanic ash had to be left in contact with three standing walls for reinforcement, and it may contain some artifacts.

Elsewhere, around the structure a few artifacts were encountered that likely had been in contact with the structure but were dislodged by the eruption. Small pieces of shell were found in the north room and to the south of the structure, in tephra, but not associated with thatching or roofing members. A small miniature paint pot was found at the juncture of Units 1 and 2, 75 cm southwest of column 3. It likely was on top of column 5 or the nearby wall, and was pushed off by the turbulence. A well-formed long *mano* was found at the juncture of tephra units 3 and 4, 1.20 m south of column 8. It likely was on top of that column or the adjoining wall and may have been dislodged by the final gasp of Unit 3's emplacement.

In summary, Structure 12 is highly unusual architecturally and artifactually. Most buildings at Cerén have large numbers of artifacts suspended from the ceilings or on elevated shelves, but Str. 12 has none. All walls and columns were painted white, and some were then painted red. The building does not follow the standard 30 degree east of north orientation of the site. The two inner rooms are difficult to access. The floor levels are quite variable. There are numerous vertical niches associated with columns. The artifacts are individually placed, and some seem to have been in someone's possession for some time. It is the only building excavated to date with a window, a lattice window inside a rectangular moulding. The structure may have been the location where a *curandero* or shaman practiced.

CERAMICS

Marilyn Beaudry-Corbett continued her research on the ceramics of Cerén. She was able to further refine the ceramic classification, and 1990 excavations did not find ceramics that required defining new major types or wares. Also, she was able to begin a study of patterning and variation in the ceramics by structure and by household. She is investigating intracommunity economic organization

by exploring where pottery was manufactured, and by identifying source groupings with instrumental neutron activation analysis, with the assistance of the Conservation Analytical Laboratory, Smithsonian Institution. Miniscule samples of each vessel are chemically characterized to form the data base.

Work on patterning and variation in household inventories is just beginning. The storerooms (*bodegas*) share many characteristics yet each has its own unique aspects. The Household 1 *bodega* has more jars without handles and has more open bowls of varying sizes than the *bodegas* of Household 2 or 4. The Household 4 *bodega* has a lot of copador serving vessels and a predominance of medium sized jars. Household 2's *bodega* is characterized by variability, but it lacks the variety of jars with handles found in the other 2 *bodegas*. The *bodegas* of Households 2 and 4 had at least a dozen wood ash hemispheres, probably collected in gourd vessels, yet the Household 1 *bodega* had none.

The five miniature vessels from Str. 7 that contained red paint were notable, with their highly standardized rims. They perhaps were made on the same mold. These often are referred to as perfume pots, but the evidence of their being paint pots is irrefutable. One similar miniature paint pot was found in Structure 11 and one in Structure 12. The five paint pots in Household 2 may indicate craft activity, such as painting gourds. Harriet Beaubien has analyzed the pigment in them by x-ray diffraction and found all to be cinnabar (mercuric sulfide). The cinnabar is very pure, indicating that some refining may have taken place. The hues vary slightly, and may have been deliberately achieved.

The domiciles, i.e. the principal area for families to sleep, eat, and engage in communal activities, also share many characteristics yet they have their differences. Household 1's domicile had three times the pottery of Household 2's domicile. They both had pottery for food serving and household ritual, but only Household 1's domicile also included storage and craft activities. Household 2 segregated activities by structures more completely than Household 1, according to our evidence.

Not surprisingly, households had very different distributions of ceramics among their structures, related to the activities that took place within them. Within Household 1, Structure 5 (men's workshop) had the fewest ceramics of all, zero. That was followed by the domicile (Str. 1), the kitchen, and then the *bodega*. It was not surprising that the *bodega* had the most. However, it was a surprise to find the largest jars with handles in the domicile, as they would be expected in the *bodega*, or perhaps in the kitchen. The kitchen had a preponderance of medium sized jars with handles, presumably for short-term food storage and ease of moving or suspension. Open-mouthed utility bowls, presumably used for food preparation and cooking, were as common in the kitchen as the *bodega*. The *bodega* bowls probably were the backups when the kitchen bowls broke. The *bodega* had more jars lacking handles than other structures, probably indicating relatively permanent storage vessels whose contents are poured in from some vessels and removed by others. Polychrome serving vessels were located in all but the men's workshop, indicating greater mobility of these ceramics from food preparation to food consumption areas. In general, this household owned and used a very large number of complete vessels, a total of 66. That total does not include the large vessel sherds that were kept and used for storage, as pot rests, and for other functions.

Both Households 1 and 2 kept polychrome serving vessels in the *bodega* and the domicile. Household 2's domicile did not have storage vessels. Household 2 is similar to 1 in the number and type of polychrome vessels. Each household had at least one incensario, which might represent family ritual. However, the incensarios did not show evidence of burning. Household 1 had a much greater number and variability of necked jars with handles and of open bowls than did Household 2. As Beaudry-Corbitt further refines the ceramic analysis, significant insights into family activities will ensue.

CHIPPED STONE

To view the chipped stone artifacts from a functional perspective, they are here considered by structure, and occasionally into activity areas within those structures, and then related to other artifacts and features inside and outside those structures.

Since 1989 we had hoped to find a kitchen, in order to study and understand the food processing that was closely associated with cooking. Fortunately, we encountered Structure 11, the kitchen of Household 1. Compared to *bodegas*, the kitchen had relatively few chipped stone artifacts. Along with some sherds, a thin scatter of discarded prismatic blade fragments was found outside Structure 11. They were small pieces, generally between 2 and 4 cm in length. Even if they were sharp, they would have been difficult to use because of their shortness. All were extensively used before discard, as evidenced

by the edge abrasion and microflaking on both edges. All showed evidence of trampling after discard as well. These were found in lower traffic areas, and not outside the front porch or directly toward the entrances of other structures. The high traffic areas were kept clear of discarded fragments of ceramic and lithic implements. A scraper was kept in the thatch roof over the porch, on the east side. Its edges were extensively used, and someone had begun to resharpen its distal end but had not completed it. It looks like a novice tried to resharpen it but misjudged some percussion blows; it is possible it was in the thatch awaiting someone more skilled in lithic resharpening. Only one prismatic blade was found in the structure, and that was kept close to the scraper, in the thatch roofing just inside of the porch and inside the structure, in the northeast part of the roof. It was a very new pristine blade.

It is highly probable that one of the principal uses of scrapers at Cerén was in de-pulping agave leaves to free the fibers in order to make rope and twine. Hester and Hezier (1972) note the ethnographic cases of scraper use in agave processing as well as the kind of use-wear that often results. An agave garden has been found at Cerén. In addition, cordage was used in architecture, suspending artifacts, making pole walls, and for other things. It is likely that obsidian scrapers were used for agave processing.

Structure 7, the *bodega* of Household 2, had seven relatively new prismatic blades stored up in the roofing thatch in the back right corner, at least three of which were stored in a group or cache. Most were relatively long, in the 5-12 cm range, but two were short. Edges generally were in very good, sharp condition. Two macroblades were also stored in the thatch, and both probably were scrapers, but the intensity of roof burning thermally fractured the distal ends of both. The heavy abrasion of their lateral edges may have come from processing agave into fibers.

Structure 4, the *bodega* for Household 4, had three good useable prismatic blades stored up in the roof thatch. All were relatively long, 8-10 cm, and had cutting edges in excellent condition. One macroblade was found in the roof thatch; it was thermally fractured into two pieces that were found 30 cm from each other. Both pieces also have internal thermal fractures that did not completely sever them into smaller pieces. The distal end is missing, but this likely is a scraper. The lateral edges show only slight use wear.

The two abovementioned *bodegas* have similar obsidian assemblages to that of Structure 6, the *bodega* of Household 1 excavated in 1989 (Sheets 1989). Structure 6 had six prismatic blades in excellent working condition up in thatch, four of which were stored clumped together in a cache. It had two obsidian scrapers, both of which had notably strong use wear on their lateral edges. One was stored up in roofing thatch and one was stored on the floor in a corner behind a roof support post.

Structure 12 (Operation 5) had a single prismatic blade that evidently had been placed on top of the northwesternmost wall, and was dislodged during the early phases of the Laguna Caldera eruption. Of all the curated blades found at the site to date, this one shows the most use wear. Based on the usual state of use wear when blades are abandoned, this was not far from discard and abandonment. It was largely used up when placed on the walltop.

Obsidian is not uniformly distributed in the structures so far excavated at Cerén. The differences are striking, and are evidence of different activities occurring in specialized structures. At one end of the spectrum is Structure 3, the largest building yet excavated. In spite of the fact that its roof covered almost 100 square meters, no obsidian has been found in its roof. Other structures have roofs that cover some 25 to 30 meters, and they often have quite a lot of obsidian in them. Placing obsidian implements in the thatch roofing not only helps maintain the sharp edges when they are not in actual use, it protects infants and young children from cutting themselves. Allen Johnson (personal communication 1989) notes that tropical South American natives frequently stick their machetes up in roofing thatch as they enter their homes, as exemplified by the Machiguenga in southeastern Peru.

I had hoped that length alone could be used as a characteristic to distinguish prismatic blade segments that were discarded from those that were still in use. However, occasionally, a very short piece of obsidian with sharp edges was curated in thatch. Most blades that still are in use are longer than 5 cm, but not all. Blades that are discarded tend to be short, shorter than 3 or 4 cm, and have considerable use wear. Blades discarded near structures usually have incurred considerable post-discard edge damage, presumably by trampling, field tillage, and other activities. Length of prismatic blades does help distinguish between blades still in use from discarded blades, but it should be used with other factors such as edge condition.

* The roof of Str. 11 collapsed during the emplacement of Unit 1, and thus it did not catch fire from the arrival of hot clasts from Unit 2: Its obsidian does not show the effects of high heat like that in the roof of Str. 7. The obsidian in Str. 7 exhibits a lot of thermal fracturing, particularly the macroblades. Macroblades suffered more thermal damage than did the prismatic blades presumably because they have a higher mass:surface area ratio. Pieces of *laja* also suffered thermal damage.

Laja, the naturally-occurring flat-fractured andesite stone, was useful to Cerén residents in a number of ways. Sometimes it was shaped by a rough percussion flaking. It was used for portable grinding stones as informal metates, and it often served as a vessel cap. It also occasionally capped an adobe column, probably to serve as a base for a vertical post to support the roof. *Laja* sometimes was used to stabilize round-bottomed vessels on flat floors, by wedging from the side. And, for reasons that are not clear, *lajas* were placed up in the roofing supports or even on top of the thatch roofs.

GROUND STONE

Groundstone artifacts recovered during the 1990 excavations were very differentially distributed, both within and among households. Structure 11, the kitchen for Household 1, was loaded with groundstone artifacts. In or near it were three metates, three manos (although only one was used significantly), two donut stones, and a celt. Like Str. 11, Strs. 6 and 1 contained many groundstone artifacts, probably because they were a part of the same household. In contrast to Str. 11, the *bodegas* of Households 2 and 4 contained only a few groundstone artifacts. Structure 7 had two manos along the west wall and a celt just inside the south wall. Structure 4 had a celt just inside the south wall, and a metate mounted on top of the *horquetas* just outside the northwest corner of the building, under the eaves. It was under the eaves of Structure 4, associating it more with the *bodega* than any other building, although it would have been quite accessible from the building northwest of Str. 4. Although the *bodegas* of Households 2 and 4 contained only a few groundstone artifacts, that does not hold for all *bodegas*. Structure 6 had four donut stones, two metates, four broken metates, two manos, *lajas*, potrests, and hammerstones (Sheets 1989).

The number of hammerstones found in Household 1 excavations is far greater than needed for chipped stone manufacture or resharpening. Excavations during 1978 around Str. 5 encountered evidence of chipped stone work, but it was relatively slight. Apparently, the principal use of hammerstones was in manufacturing or re-roughening groundstone implements, probably within the household. The only groundstone artifact found in Household 1 that probably was beyond their abilities to manufacture internally was the celt. The groundstone assemblage from Household 1 indicates that they were craft-oriented, manufacturing many groundstone items for internal use, and likely producing items for exchange. Household 1 had an unusual number of artifacts that were not completely manufactured, or artifacts that had been only partially resharpened.

In terms of groundstone, *bodegas* do not contain a standard inventory, in contrast to chipped stone. There is not a single type of groundstone artifact found in all three *bodegas*. That probably is an indication of occupational differences among households. Household 1 may have been producing and possibly exchanging groundstone implements. Evidently, the households at Cerén were specialized in certain activities within a framework of a complex economy. The groundstone differences also probably indicate variations in social status; groundstone implements are utilitarian, basic items, generally made from abundant locally-available materials, and the household making and exchanging them probably would be relatively low on the social hierarchy.

ETHNICITY

One of the more difficult tasks in archaeology is the determination of the ethnicity of a site in a frontier or multicultural setting. The finding of a few portable objects characteristic of a given ethnic group in a site is not a reliable indicator of local ethnicity, particularly when those items are relatively rare items found within a different technological-artistic tradition. However, artifacts that are locally made, are abundant, and are sensitive to cultural variation can provide useful evidence of ethnicity.

The use of space is an important indicator of ethnicity, particularly in the household. One of the most striking characteristics of the built environment at Cerén is the construction, by each household group, of a number of functionally-specific structures. That is in contrast to so many Middle American cultures which build a single structure, and functionally-specific areas are achieved by internal walls and

partitions. Two nearby cultures provide ethnographic comparisons and contrasts. The Lenca (Stone 1948), who have considerable time depth in El Salvador, were known ethnographically to construct a single rectangular building, and then internally subdivide it. The Chorti Maya (Wisdom 1940) construct a number of functionally-specific buildings per household.

Marilyn Beaudry-Corbett has noted that the ceramics at Cerén contain a lot of Copador type pottery, a ceramic sphere that extends to Copan, Honduras, and may have originated at that site. However, a close look at style and motifs indicate that it is far from a homogeneous ceramic sphere. Cerén ceramics maintain a decidedly local flavor in how often they employed the melon-stripe decoration on the bottoms of bowls and in the use of "swimming figures" on cylinder vessels.

The issue of the ethnic or cultural affiliation of the prehistoric residents of Cerén is not one resolved by the excavation of a few artifacts or structures. Rather, it is explored best by re-evaluation of new evidence in a comparative framework. Unfortunately, we do not have equivalent ethnographic and ethnohistoric information on local peoples. The Maya are quite well known, but the Lenca are very poorly known, and other groups such as the Xinca are virtually unknown. The architecture of Cerén appears to be more Maya than Lenca, but it may be a considerable oversimplification to expect the Cerén residents to be one or the other. Given the volume of trade, the documented population movements, and the intensity of acculturation that characterized the southern Mesoamerican frontier zone during the Formative, Classic, and Postclassic periods, some hybrid communities are to be expected in what is now El Salvador.

SUMMARY

Two *bodegas*, a kitchen, an oven or sauna, what may be the building where a shaman practiced were excavated at the Cerén site during the 1990 season. Also, areas outside of buildings were excavated, and gardens with agave and other plants were found, along with some maize milpas. The built space at Cerén follows a pattern from formal structure to open patio. Clearly demarcated are areas inside the walls and atop the formal platforms of structures, the porches, and the extensive areas under eaves of buildings. Often the area under the eaves, outside the walls, is larger than the area inside the walls of individual structures. The extramural roofed areas are frequently used for elevated storage of things high, and storage down on the floor. Areas under the eaves also served for various activities. Walkways are frequently maintained under the eaves, probably for circulation during the rainy season. The driplines of structures were found, and those often are bounded by a 1-2 meter wide walkway outside the eaves. That then abruptly changes into agricultural areas of gardens or milpas. Those gardens and milpas are strictly ordered, with plants growing on tops of ridges that follow the dominant azimuth of the site.

Other external features were excavated, including enigmatic *laja* "seats" near Structure 9. Indications of other structures were found and recorded, particularly in Operations 2 and 5. Those structures will be excavated in the future only when extensive conservation funding and expertise are available.

Multidisciplinary research continued during 1990, integrated into the overall research strategy. Important refinements to the volcanological sequence of deposits and their effects on structures were accomplished. Given present geophysical technology, the zone from the present site to about 1/2 km south, and extending east and west an unknown distance, is judged the best in which to continue explorations. Abundant new geophysical data were collected from the lot south of the excavated structures. A very large geophysical anomaly was detected, and it was investigated with two test pits. The pits did not divulge a clear feature that caused the anomaly.

Sufficient archaeological data have been added to allow for some comparative work between structures and households. On one hand, we have learned much about family life in one village on the southeastern Mesoamerican frontier 1400 years ago. On the other hand, the sheer complexity of that life, the need for very cautious excavation and constant conservation, and the extensive landscape buried by the Laguna Caldera tephra all indicate that many more years or decades of research are necessary.

ACKNOWLEDGEMENTS

The first people I wish to acknowledge are the Salvadoran workers who labored with us under the intense sun and high humidity of the Zapotitan Valley day after day. They deserve much credit for the

great increase in our knowledge of family life in the valley as it was practiced some 14 centuries ago. They are Victor Manuel Murcia (foreman), Salvador Quintanilla, Salvador Ramirez Rojas, Marco Tulio Chinchilla, Jose Humberto Portillo, Pedro Ismael Giron, Jose Antonio Menjivar, Antonio Rivera Espinoza, Jose Mario Quintanilla, Lazaro Amaya Lopez, Hector Armando Guevara, Jaime Arturo Moron, Jose Cesar Cordova, Elias de Jesus Rivera, Francisco Alberto Escamilla, Carlos Nelson Leiva, Rodrigo Bautista Canton, Osmin Elisandro Granados, Pedro Ramirez Galdamez, Reyes Nelson Alvares, Rodrigo Hernandez Leon, Jose Guadalupe Funes Canton, Rene Antonio Quintanilla Carabantes, Salvador Antonio Quintanilla, Rene Antonio Coca de Paz, and Juan Rivera Rodas.

The project scientific staff worked long and hard, under less-than-ideal circumstances. I want to express my appreciation to Dan Miller, Hartmut Spetzler, Marilyn Beaudry-Corbett, Dan Wolfman, Andrea Gerstle, Brian McKee, Harriet Beaubien, David Tucker, Fran Mandel Sheets, and Jeannie Mobley-Tanaka.

Many people in the Ministry of Education facilitated our research, from our first day in the country to the final touches on writing the present preliminary report. An immense debt of gratitude I owe to Lic. Zulma Ricord de Mendoza, Directora del Patrimonio Nacional. Arq. Maria Isaura Arauz de Rodriguez, Directora del Patrimonio Cultural, has been of assistance throughout the project. The assistance of Evelyn Sanchez and Gloria de Gutierrez is appreciated. The staff in Restauracion and other sections of the museum have helped many times.

Manuel Arrieta of IBM again loaned us a computer and printer, which assisted in data analysis and writing of this report. Our friend Peter got us access to the Bayer Pharmaceutical's airplane, from which we obtained good aerial photographs of the site and the nearby volcanos. Coronel Ochoa of CEL graciously loaned us his helicopter to take additional airphotos of volcanos and sites. We appreciate the fact that owners of surface-to-air missiles did not dispatch one in our direction while we were taking the airphotos. Peter Doty was his usual enthusiastic and helpful self. Ricardo Recinos continued to be the best friend an archaeological site could have. ABANSA assisted by donating money that was used to expand the number of Salvadoran workers. TACA assisted the project with airline tickets to bring specialists into the country. Bob Dance, Pamela Corey-Archer, and the USIS staff helped the project in manifold ways. David and Beverly Kitson, AID, were instrumental in setting up donations by many people in the US community in El Salvador. The Hotel Presidente, particularly Alicia de Landaverde, was gracious and beneficent to us on a number of occasions.

The Patronato Pro-Patrimonio Cultural has been instrumental in the success of the research. This non-profit organization has backed the project in many ways. I particularly wish to thank Mario Cristiani, Ana Vilma de Choussy, Juan Carlos Choussy, Neto Raubusch, and Ricardo Recinos.

Principal funding for the research was awarded by the US National Science Foundation, #9006482. Their financial support is heartily appreciated. The University of Colorado made a large contribution by awarding me a Faculty Fellowship so that I could be in El Salvador from August 1990 through January 1991, and April 1991, conducting the research.

Fran Mandel Sheets and Brian McKee critiqued an earlier version of this manuscript. They cannot be held responsible for any of its shortcomings, but they deserve recognition for improvements in readability, order, and logic.

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