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FROM CODEX TO CALABASH: RECOVERY OF A PAINTED ORGANIC ARTIFACT FROM THE ARCHAEOLOGICAL SITE OF CERÉN, EL SALVADOR

HARRIET F. BEAUBIEN

ABSTRACT—During the 1989 field season, a layered deposit of paint fragments was excavated at the site of Cerén, El Salvador, and thought to be the remains of a classic Maya period codex. Information gained from materials analysis and conservation treatment now suggests that it once was a painted calabash (or gourd), with the strongest evidence provided by the reconstructed decorative scheme and impressions of the disintegrated substrate preserved on the fragments' reverses. Supporting archaeological and literary evidence for this interpretation is presented, and treatment procedures and mount design are discussed.

1. OVERVIEW OF THE SITE

The archaeological site of Cerén, located approximately 25 km northwest of San Salvador, El Salvador, was once a small village located in a fertile valley not far from a modest ceremonial center, now called San Andrés. In ca. A.D. 600, a nearby volcano erupted explosively with little warning, enveloping adobe structures, artifacts, plants, animals, and probably people in warm moist clouds of volcanic ash, and rapidly burying an approximately 20 sq km area under 4 to 6 m of tephra (the material ejected from the volcano) (Zier 1983).

The site, discovered during a Salvadoran agricultural project in 1976, has been under-

going systematic excavation since 1989 under the aegis of the University of Colorado and is providing an unprecedented opportunity to study southern Mesoamerican households from the classic Maya period (Sheets et al. 1990). Due to the circumstances of its burial, the site can be dated securely to A.D. 590 ± 90 on the basis of radiocarbon and archaeomagnetic analysis (Zier 1983; Wolfman 1992). Because it was catastrophically abandoned (i.e., valuables were not taken by the departing inhabitants and the site was not "mined" subsequently for useful materials), it offers a relatively comprehensive and undisturbed picture of daily life. In addition, the depth of the volcanic ash and the rapidity of its deposition have tempered the effects of some physical agents of deterioration, permitting the recovery of information that is ordinarily undetectable in the archaeological record. This information includes evidence of the cultivation and use of organic materials, such as seeds, garden plants, baskets, household furnishings, and structural elements (de Aguilar 1991a; Gerstle 1989). Some of these materials survive directly or in carbonized form. Others, now completely decomposed, are documented by molds or impressions retained in adjacent materials. The painted artifact that is the subject of this article falls into this last category.

2. DISCOVERY OF A POSSIBLE CODEX

During the 1989 field season, a layered deposit of paint fragments was found in a niche located inside an adobe domestic building (Structure 2) (McKee 1989) (fig. 1). It occupied a rectangular area measuring 18 x 15 cm and approximately 3 cm deep. Found in the niche with the deposit were three polychrome ceramic vessels, one with food remains, and a partial marine bivalve shell. Roof thatch collapsing into the building had blocked the niche opening, preventing complete inundation of the niche by subsequent surges of tephra. The deposit was relatively undisturbed, except for a superficial accumulation of ash, charred thatch, and some fallen adobe bits from the niche's ceiling. It was, however, extraordinarily fragile and in poor condition due to the complete deterioration of the organic material on which the paint was originally applied.

At the time of their discovery and during the early stages of treatment, the paint fragments were thought to constitute the remains of a codex because of the deposit's layered structure (visible along the edges) and its flattened and rectangular format. "Codex" is a term commonly used to describe the indigenous Mesoamerican form of book. This identification prompted considerable interest among Mesoamericanists for a number of reasons.

Although representations of codices appear throughout the classic Maya period in wall and pottery decoration, fewer than 15 examples have survived from Maya and neighboring cultures (Coe 1980). None of these has an archaeological provenance; all are thought to be later than the 12th century and were acquired at early dates by various



Fig. 1. Structure 2 niche, looking east, with paint deposit *in situ* (lower left corner)

library collections. Typically they are constructed of a long sheet of felted *amate* (a fig bark) or *maguay* (agave cactus) fibers, folded like an accordion (von Hagen 1977). One or both sides are painted with a white sizing or ground layer followed by figural and glyph decoration using various mineral or organic pigments. The elite context of the codices is evidenced by their royal genealogical and astronomical content (Coe 1980). Given the scarcity of these objects, the rare occurrence of layered paint deposits in archaeological contexts has occasioned reports of codex remains, although none has been successfully recovered or confirmed (Kidder et al. 1946; Angulo V. 1970; Agurcia Fasquelle and Fash 1989). If Cerén's paint remains were of a codex, its early date, secure provenance, and non-elite context would make its recovery extraordinary.

3. LIFTING AND TRANSPORT

The archaeologists removed the deposit from the niche by sliding a metal sheet along the adobe floor (fig. 2). No subsidiary support was provided around its fragile edges either during the lift or subsequently during

storage in a plastic bag. Although the deposit maintained a general cohesiveness during the lifting process, attributable to adsorbed moisture from burial, some damage resulted from the technique. A partial layer of paint fragments remained attached to the niche floor in the area once occupied by the deposit, and the adjacent floor surface was considerably disturbed. Several anomalous chunks of adobe with adherent layered paint fragments, included with the deposit on the metal sheet, probably were dislodged from this area. The author was contacted at this point to provide assistance with stabilization of the deposit and removal of the remnant layer. These tasks were undertaken approximately one week later.

The paint layer was removed using a block-lifting technique. Allowing a margin of at least 2 cm on all sides, a shallow trench was cut into the floor so that a metal sheet could be slid 3 cm below the floor surface. While necessarily damaging the niche floor, this method resulted in no disruption of the remnant paint layer. The lifted section was set into an aluminum foil-lined cardboard box, and plaster of Paris was poured around the perimeter to prevent any subsequent movement of the adobe block. The paint fragments were then cleaned with a soft paintbrush and, once tested for sensitivity to water and organic solvents, retained in position with small strips of *tengujo* Japanese tissue and Dow Methocel A15C methyl cellulose in water.

Given the rarity of the find and the lack of instrumentation and expertise in El Salvador to carry out a thorough investigation, a cooperative agreement for temporary transfer to the United States was signed, and the two components were packed and hand carried to the Smithsonian Institution's Con-



Fig. 2. Multilayer component, before treatment

servation Analytical Laboratory (CAL). In time, the artifact would be safely mounted for return to the Museo Nacional David J. Guzmán in San Salvador.

Protection in transit was provided as follows. The "multilayer component" (lifted by the archaeologists) was transferred from its plastic bag to a fitted foil-lined cardboard box. Small pillows of Saran Wrap covered cotton wool and Ethafoam blocks were used along the sides to pad the deposit in position, and the surface was protected with a layer of Pellon overlaid with cotton wool. The box was then enclosed in a plastic bag to maintain its high humidity. The "single-layer component" (lifted by the author) was similarly padded on its surface but did not require bagging, as it had been allowed to air-dry. Each component was cushioned within a wooden carrying box using blocks of Ethafoam and rolled bubble wrap. The boxes were maintained in their horizontal orientation during their transport to CAL.

4. MATERIALS ANALYSIS

Preliminary analysis was carried out to identify the paint fragment materials for guidance they might provide in attributing fragments to various paint layers and in treatment material choices. This analysis also was an opportunity to contribute to the inventory of pigments found in Mesoamerican contexts, the identifications of which often have not been confirmed analytically. Each fragment, no more than 0.5 mm thick, was composed of a white ground layer with one or more thinly applied pigmented layers. The results of analysis by polarized light microscopy, scanning electron microscopy (SEM) with energy dispersive x-ray analysis, and x-ray diffraction analysis methods are presented in table 1. The fragments did not disaggregate in water or organic solvents, suggesting the presence of an insoluble binder in both ground and pigmented layers. However, this finding was not confirmed with either Fourier transform infrared spectrophotometry or ultraviolet fluorescence microscopy, perhaps because of undetectably low concentration. Preserved in the white ground on the reverse of the fragments were minute impressions, the only

remaining evidence of the organic material that once served as the substrate for the paint layers. They were examined using SEM, along with comparative materials; the results are interpreted in section 6.

5. TREATMENT

The goals of the treatment were to identify the artifact through an investigation of structure and decoration and to reconstruct its remains as completely as possible. For each of the two components, the process featured the painstaking reassembly of fragments into individual paint layers using methods that would allow both sides to be accessible for examination whenever possible. Evidence for interpretation thus could be gathered from the reconstructed design scheme as well as from the overall pattern of impressions on the reverse.

The process (described more fully below) revealed that the artifact consisted of four distinct paint layers (fig. 3), all of which were present in the component lifted by the archaeologists (the "multilayer component"). The uppermost layer (layer 1), polychromatic and oriented paint side up, was paired with a paint-side-down

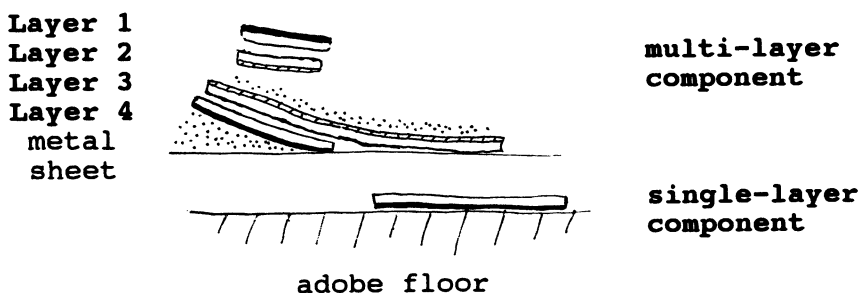


Fig. 3. Diagram of the paint layer structure

TABLE 1
ANALYSES OF MATERIALS
Principal constituents are indicated in boldface, followed by
identification method and results.

	WHITE GROUND	PALE GREEN	RED	YELLOW	OTHER
LAYER 1	Kaolinite Kaolinite (a) Si, Al (K, Ti, Fe, S) (c)	Unidentified clay mineral(s) Related to "green earth" Major peaks: 10.5, 7.2, 4.5, 3.6 (a) Si, Al, Mg, Fe (Ca, K, Ti, S, Cu) (c)	Cinnabar* Cinnabar (a) (b) Hg, S (c) Hematite (only at periphery) Hematite (a)	Yellow ochre + Siliceous material Goethite (a) Halloysite Yellow ochre (b) Si, Al, Fe (Ca, K, Cu) (c)	Black: not identified (a)
LAYER 2	Kaolinite Kaolinite (a)	Clay mineral(s) Peaks as above (a) Inconclusive (d)			
LAYER 3	Kaolinite Kaolinite (a)	Clay mineral(s) Peaks as above (a) Inconclusive (d)			
LAYER 4	Kaolinite Kaolinite (a)	Clay mineral(s) Peaks as above (a)	Hematite Hematite (a)	Siliceous material Halloysite (a)	Brown: not identified (a)

*Cinnabar was identified as the primary constituent in purple and salmon-pink as well as red paints.

- (a) X-ray diffraction of powdered sample, using a Gandolfi camera with a Philips PW 1720 XRD unit
- (b) Polarized light microscopy of sample dispersed in Aroclor 5442, examined with a Leitz microscope
- (c) Scanning electron microscopy/energy dispersive x-ray analysis of carbon-coated sample mounted in cross-section, using a JEOL JXA-840A Electron Probe Microanalyzer and Tracor Northern SEM/EDX in backscatter mode
- (d) Fourier transform infrared spectrophotometry, using a Mattson Cygnus 100 FTIR with a Spectratech IR-plan microscope

monochromatic green layer (layer 2). Their contiguous white grounds suggested that the two paint layers had originally been applied to the upper and lower sides, respectively, of a single organic substrate. These uppermost layers were cluttered with charred roof debris and disrupted by small intrusive adobe chunks from the roof of the niche. Beneath this fragmentary pair of layers and separated by a thin homogeneous deposit of fine volcanic ash was a second set: a paint-side-up monochromatic green layer (layer 3) and, on the bottom, a paint-side-down polychromatic layer (layer 4). This pair likely represented the two painted sides of a second organic substrate. The "single layer" adhering to the adobe floor (the component lifted by the author) proved to be part of the bottommost layer 4, cleaved by the action of the metal sheet at the time of excavation.

The single-layer component was treated first because the fragments constituted only one layer and their configuration was relatively intact. Although oriented paint side down, they presented the most straightforward opportunity to recover an expanse of design. The backing strips applied on site were reinforced with additional Japanese tissue, secured to the irregular surface with methyl cellulose adhesive. It was overlaid with a layer of Saran Wrap, and a conforming support was cast in plaster of Paris. The block-lifted segment was then inverted, the plaster collar removed, and the adobe floor carefully excavated away. As fragments were revealed, their surfaces were cleaned, and they were consolidated thoroughly to the backing tissue with 5–10% w/v Acryloid B-72 (Rohm & Haas) in acetone.

The multilayer component was then excavated with careful documentation after it was determined that imaging techniques

were unlikely to provide usable information. Fragments were removed one by one using a dampened paint brush, delicately cleaned using deionized water or acetone, and edge-joined to reconstruct the individual layers. Jumbled fragments were collected in discrete groups for possible reintegration with the help of the documentation. Methyl cellulose was used whenever possible as the initial adhesive for edge-joining fragments. It provided a sufficiently strong temporary bond. At the same time, because fragments were manipulated frequently during this phase of treatment, it offered advantageous working properties, being both readily reversible and nonadhesive to glass or plastic work surfaces. The dilute Acryloid B-72 solution was found to function less flexibly and, for the purpose of initial reconstruction, to produce too effective an adhesive bond; in particular, joins were difficult to reverse without damaging the fragments. For final presentation, the layers were each secured in paint-side-up orientation to a tissue backing. Japanese tissue was used as the initial layer because of its exceptional ability to conform closely to fragment irregularities when adhered first with methyl cellulose. The fragments were then consolidated thoroughly to the backing tissue using Acryloid B-72 for strength and to reduce the risk of biodeterioration problems. Finally, leftover fragments whose original positions could not be ascertained were stored by location in polycarbonate boxes, available as untreated samples for future analysis if needed.

Because of their disturbed condition, layers 1 and 2 could be reconstructed only in small islands. By contrast, the monochromatic layer 3 proved to be the most uninterrupted paint layer of the deposit and was of greatest interest for the extensive

impressions of the disintegrated substrate preserved on its reverse. The fragments were first lifted one by one onto a sheet of silicone-release Mylar and edge-joined where possible with methyl cellulose adhesive. The reconstructed layer (still paint side up) was then faced using Japanese tissue and methyl cellulose. With the sandwiched layer inverted, the Mylar could be peeled off easily, thus exposing the impression side for examination and documentation. The paint layer was eventually returned to its paint-side-up orientation for display by applying a tissue backing with methyl cellulose adhesive, inverting the sandwiched layer once again, and removing the facing tissue with a water-dampened brush. The fragments were then thoroughly consolidated to the tissue backing with Acryloid B-72.

Since all other paint layers had been removed, the paint-side-down fragments comprising the bottom-most polychromatic layer (layer 4) were lifted in a single operation rather than one by one. This procedure permitted the noticeable concave curvature at the periphery of the layer to be maintained. The fragments were first backed with Japanese tissue and methyl cellulose adhesive. With a Saran Wrap separating layer, a conforming support was cast in plaster, the block inverted, and the metal sheet removed. Thatch and ash that had collected at the periphery were cleared from the fragments' paint surfaces, and these were consolidated to the tissue backing with Acryloid B-72. These fragments and those comprising the single-layer component were subsequently reunited on a single Japanese-tissue backing.

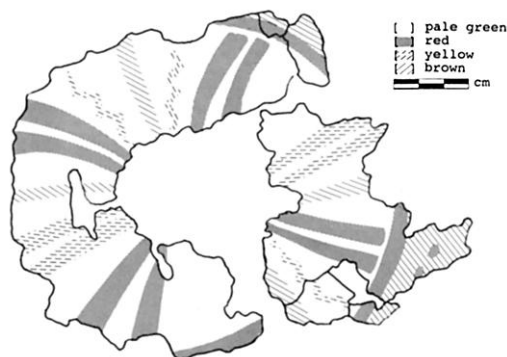


Fig. 4. Reconstruction drawing of decorative scheme, layer 4

6. INTERPRETATION OF THE ARTIFACT REMAINS

Unlike any known codex, the overall application of color and radiating design scheme of layer 4 suggest instead a rounded container with a decorated exterior, painted monochromatically on the interior (layer 3) (fig. 4). A comparable decorative approach can be found in contemporaneous Copador-style ceramics, which mimic the radiating segments of gourds or melons in their design (Beaudry 1989; SARCAR). The concave curvature around the edge of layer 4 likely reflects the original form of the artifact rather than distortion from the lifting process, ash and debris having lodged around the base prior to its collapse.

The impressions on the reverse of layer 3 offer the most persuasive argument for a gourd as the now-disintegrated organic substrate (fig. 5). They record an interlocking fibrous mesh with a coarse texture and radiating ribs, characteristic of a gourd's interior morphology (Heiser 1979; Florian et al. 1990), also seen on the reverses of layer 2



Fig. 5. Reverse side of layer 3, showing impressions

fragments. The flat reverses of layers 1 and 4 fragments would correspond to the smooth exterior of the gourd's fruit shell. Silicone rubber molds taken from modern gourd specimens compared favorably with the paint fragment impressions, examined using SEM. While the latter were not sufficient to permit a definitive classification (Heiser 1992), the artifact's organic substrate was most probably a calabash, or tree gourd (*Crescentia cujete* or *alata*, known locally as *morro* or *jícara*), whose seeds have been tentatively identified among those stored at Cerén (de Aguilar 1991b).

Convincing comparisons can be made with several other artifacts excavated during the 1990 field season in a structure identified as a kitchen (Structure 11) (Mobley-Tanaka 1990). Because of the relative openness of the building, these items were accessible to and engulfed by the first fine surge of tephra, which preserved the paint layers in their original configuration. In a lifting method devised by the archaeologists, the interior ash was removed, and the concavity was filled with dental plaster to provide support for the fragile paint layer that articulated the outside surface. While the plaster

filling made subsequent identification of the substrate impossible, the hemispherical form of the containers was preserved. Despite their differences in preservation, these artifacts were otherwise comparable to the niche artifact in paint application technique, decorative schemes, and pigments employed. Based upon their association with either food preparation areas or ceramic serving vessels, they are all likely to have been food serving containers, although no residues were detected in any of the objects.

It is quite possible that unidentified deposits of paint reported in excavations of other Maya sites once decorated organic substrates such as calabashes. One artifact from the ceremonial site of Tikál, Guatemala, lifted in 1965 using plaster of Paris and on display in the site museum, may well be an example (Greene 1992). Even more direct evidence comes from the Sacred Cenote at the site of Chichén Itzá, in the Yucatán Peninsula, an important Maya ritual center (Coggins and Shane 1984; Ediger 1983). Archaeological dredgings in 1904 and more systematic underwater explorations in 1967 of this natural limestone sinkhole yielded fragments of ornately painted gourds. Edward Herbert Thompson described the findings of the earlier effort as including "gourds coated with the same whitish enamel used on terracotta vessels and painted or hieroglyphed. The gourds were undoubtedly used not only for containers for liquids but for other things such as corn and beans, as they are used by the modern Mayas" (quoted in Wilson 1947, 4).

Further evidence of the use of calabashes in the daily life of the Maya is detailed in an account written in 1566 by the Spanish prelate Diego de Landa. In *Relación de las Cosas de Yucatán*, he writes in the section on food

and drink of a type of "vessel or gourd formed by the rind of a fruit that grows on a tree, whereby God has provided them with vessels"(de Landa 1937, 34). In the section on plants, flowers, and trees, he describes a tree "with a fruit like round gourds, out of which the Indians make their vessels; they are very handsome, and they paint them elaborately and beautifully" (de Landa 1937, 103). Calabashes are used widely in Central America today as household containers and as tourist items, painted ornately as their ancient counterparts once were (de Aguilar 1991b).

7. MOUNTING FOR TRANSPORT, DISPLAY, AND STORAGE

Considerations for mounting the fragmentary remains of Cerén's painted calabash included the need to provide ample physical protection with a simple yet flexible design utilizing stable and reversible materials. These factors were of particular importance given staff limitations and lack of environmental controls in El Salvador's museums.

Rather than presenting the remains in an interpretive reassembly of the object, the mount was designed more neutrally to reproduce the as-found, collapsed state of the object, as some questions still remained about its exact dimensions, curvature, and the full reconstruction of the upper two layers (fig. 6). An assumption was made that the viewer would want to see the painted side of the layers, even if they were originally oriented paint side down (such as layer 4). Information gleaned from the treatment could be presented using photographs, diagrams, and painted facsimiles, which would provide a more coherent interpretation than could the remains themselves.

The mount consists of a series of equal-sized Plexiglas acrylic sheets, each of which supports an individual paint layer. The paint layers were prepared by reinforcing the Japanese tissue backings with additional layers of Pellon 6800 polyester web, adhered with Acryloid B-72 (20% w/v in acetone). The backing was then trimmed to a uniform

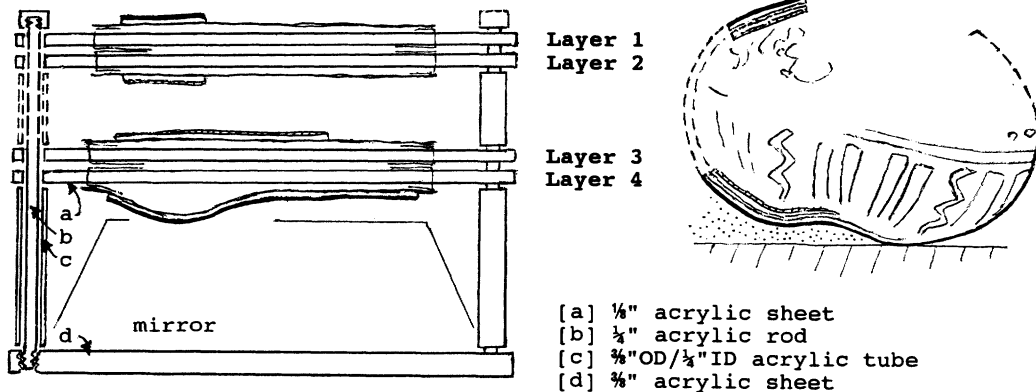


Fig. 6. Diagram of the mounting scheme, shown with a possible reconstruction of the painted artifact (not drawn to scale)

oval shape to suggest the original limits of the artifact and was selectively toned with Maimeri colors to integrate the fragments. Pellon tabs were attached to the reverse of the backing with Acryloid B-72; these tabs were fed through slots cut in the Plexiglas sheet and glued to the underside. Layers 3 and 4 after backing weighed only 7.2 and 18.7 g respectively. They are expected to remain stable in environmentally uncontrolled circumstances due to the inertness of the paint fragment materials themselves and their thorough consolidation and backing in the final stages with stable synthetic materials.

For display, the sheets can be stacked with the decorated layer (layer 4) in its inverted, as-found orientation (fig. 7); a mirror mounted below allows the layer to be viewed. Varied spacing and arrangement of sheets may be accommodated by altering the length of acrylic rods and tubes, which act as spacers as well as supports for the individual layers; alternatively, the sheets may be disassembled and displayed side by side. To minimize handling and provide maximum protection in storage and during transport, each paint layer is held securely in a sturdy Fome-Cor mat with a deep well. These mats stack into a clamshell box made of acid-free cardboard along with a box containing the display mount components.

8. CONCLUSIONS

With deceptive archaeological deposits such as these, careful lifting techniques are necessary to preserve the evidence properly, as are considerable conservation efforts in order to confirm an identification. The treatment of this painted calabash demonstrates the amount of information that is retrievable from poorly preserved evidence and suggests

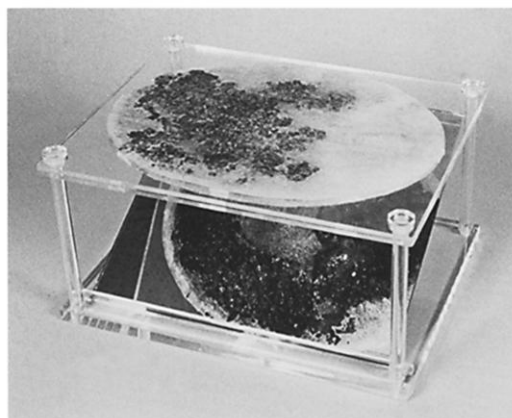


Fig. 7. Mount with layers 3 and 4 displayed in their as-found configuration (layer 4 is visible in the mirror from this perspective)

some techniques that can be used effectively. In Mesoamerican studies, it is hoped that this work will sound a cautionary note regarding artifact interpretation. In doing so, however, it also provides a step toward elucidating what we can assume is a much broader inventory of painted organic materials, not limited to highly specialized codices, which only a few sites such as Cerén give us the opportunity to recover.

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This treatment reflects the input of specialists in many disciplines. I would especially like to acknowledge my co-workers at the Conservation Analytical Laboratory, with many thanks to Mark Fenn for his assistance with the mount. The collaboration of conservation and archaeology that this work initiated has been well fostered by Payson D. Sheets and the Cerén Project team members. None of this work would have been possible without the support of CONCULTURA in El Salvador's Ministry of Education and the staff of the Museo Nacional David J. Guzmán, who have been

exceedingly disappointed that the object was not a codex but who nonetheless graciously welcomed the return of the painted calabash on June 10, 1992.

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