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The Temple 22 Façade Reconstruction Project, Copán, Honduras

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Research Year: 2001

Culture: Maya

Chronology: Classic

Location: Copán, Honduras

Site: Copán

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Abstract

In 2001, the Temple 22 Reconstruction Project completed its third field season of analysis and reconstruction of the collapsed stone façade sculpture of an 8th century Maya temple at the UNESCO World Heritage site of Copán, in Western Honduras. Temple 22 (or Structure 10L-22) was commissioned by the 13th ruler of Copán—and famous patron of the arts—Waxaklajuun Ub'aah K'awil, in A.D. 715. An elegant and complex work of stone carving and architectural composition, this building marks the beginning of a flourishing period of artistic creativity at Copán and its façades influenced the forms of Maya architecture for centuries to come. Since the late 19th century, archaeologists have excavated over 4,000 pieces of sculpture from around this building; the Temple 22 Reconstruction Project is the first to identify, catalogue, conserve, analyze, and restore the full sample of this sculpture. This project is conducted under the aegis of the Honduran Institute of Anthropology and History (IHAH) and the Copán Mosaics Project (CMP), co-directed by Barbara and William Fash of Harvard University.

In 2001, a grant from the Foundation for the Advancement of Mesoamerican Studies, Inc. (FAMSI) funded four months of sculpture analysis at the Regional Center for Archaeological Investigations at Copán (CRIA). This has resulted in an ongoing digital database of Structure 10L-22 sculpture, drawings of sculpture motifs, restoration and conservation of individual sculptures, and a preliminary three-dimensionally rendered, CAD reconstruction of the structure. Results this year confirmed the existence of a now-ruined second story, evidence for a sculpture workshop, and intriguing connections between the iconographic programs of Structure 10L-22 and Waxaklajuun Ub'aah K'awil's stelae program in Copán's Great Plaza. Preliminary research identifies Structure 10L-22 as a distinct class of architecture, erected by contemporaneous Maya polities as they asserted their legitimacy in response to the volatile political landscape of the 8th century. Structure 10L-22 was a framework for the 13th ruler's display of legitimacy, and a locus for the construction of polity identity on historical, mythical, and cosmic levels. Additional funding from FAMSI and Columbia University allows this project research to continue in 2002.

Resumen

En el 2001, el Proyecto de la Reconstrucción del Templo 22 (Temple 22 Reconstruction Project) completó su tercera estación de campo de análisis y reconstrucción de la piedra derrumbada de la escultura de la fachada de un templo Maya del siglo 8th en la

UNESCO Herencia Mundial sitio de Copán, en el Oeste de Honduras. El Templo 22 (o Estructura 10L-22) fue comisionada por el gobernador 13th de Copán y famoso patrón del arte—Waxaklajuun Ub'aah K'awiil, en el 715 d.C. Un trabajo elegante y complejo de tallado de piedra y composición arquitectónica, este edificio marca el comienzo del florecimiento de un período de creatividad artística en Copán y sus fachadas influenciaron las formas de la arquitectura maya por siglos venideros. Desde el siglo 19 tardío, los arqueólogos han excavado más de 4,000 piezas de escultura alrededor de este edificio; el Proyecto de la Reconstrucción del Templo 22 es el primero para identificar, catalogar, conservar, analizar y restaurar el ejemplo completo de esta escultura. Este proyecto se dirigió bajo el amparo del Instituto Hondureño de Antropología e Historia (IHAAH) y el Proyecto de Mosaicos de Copán (CMP, en Inglés), co-dirigido por Barbara y William Fash de la Universidad de Harvard.

La Fundación para el Avance de los Estudios Mesoamericanos, Inc. (FAMSI) en el 2001, financió una beca de cuatro meses de análisis de la escultura del Centro Regional de Investigaciones Arqueológicas (CRIA) en Copán. Esto ha resultado en una base de datos digital continuados de la escultura de la Estructura 10L-22, dibujos de los motivos de la escultura, restauración y conservación de las esculturas individuales, y un interpretación tridimensional preliminar, CAD (diseño asistido por computadora) reconstrucción de la estructura. Los resultados de este año confirmaron la existencia de un segundo piso ahora-aruinado, evidencias para un taller de trabajo de esculturas, y conexiones intrigantes entre los programas iconográficos de la Estructuras 10L-22 y el programa de la estela Waxaklajuun Ub'aah K'awiil en la Gran Plaza de Copán. La investigación preliminar identifica la Estructura 10L-22 como una clase distinta de arquitectura, erguida por un sistema de gobierno contemporáneo maya cuando ellos afirmaron su legitimidad en respuesta al escenario político volátil del siglo 8th. La Estructura 10L-22 fue un marco de trabajo para el despliegue de legitimidad del gobernador 13th, y un sitio para la construcción de una identidad política sobre niveles históricos, míticos y cósmicos. El fondo adicional de FAMSI y la Universidad de Columbia permite este proyecto de investigación para continuar en el 2002.

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Figure 1. Structure 10L-22 on the East Court of Copán. (Author photo)

Introduction

When the 13th ruler of Copán, Waxaklajuun Ub'aah K'awiil ascended to the throne in A.D. 695, he began a building campaign to renovate its urban center. Temple 22 (or Structure 10L-22) appears to be one of the first buildings he built, and the inscription indicates that he dedicated it on the 20th anniversary of his accession to the throne (Larios, Fash, Stuart 1989; Stuart 1986; Stuart 1989) ([Figure 1](#), shown above). Perhaps the highest building on the acropolis in its time, Structure 10L-22 was also the most secluded ([Figure 2](#), shown below); however, its façades boasted one of the most complex and elegant programs of architectural stone sculpture at any Maya city. The building is best known for its high relief sculpture of the corner 'witz' masks that mark it as a symbolic (and literal) stone mountain (Stuart 1997) ([Figure 3](#), shown below), as well as the interior doorway with bacab/pawahtun statues holding up a sky-serpent ([Figure 4](#), shown below).

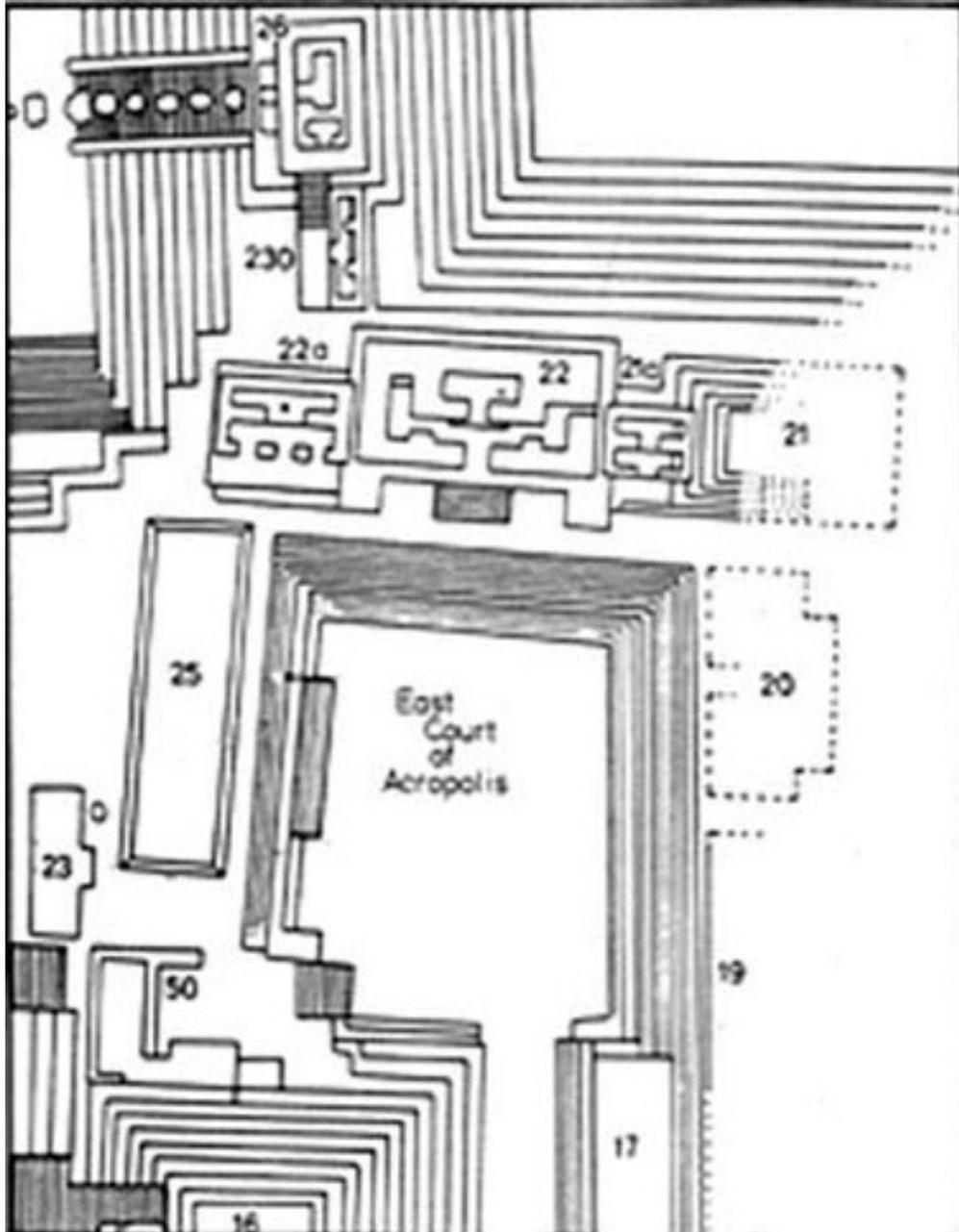


Figure 2. Plan view of East Court (after FAsh 1991).



Figure 3. Corner "Witz" Sculptures (Photoe by Barbara Fash).



Figure 4. Interior door-frame now in Copán Sculpture Museum. (Author photo)

Although it is well known that the graceful Maize God sculptures also hail from this building, few know that there were actually 20 such figures on the building's façades ([Figure 5](#), shown below). I believe these are metaphors for the twenty agricultural cycles over which Ruler 13 presided during his first katun as ruler. Sensual and seductive in their deep relief and curvilinear forms, this high quality of stone carving and figural composition has led scholars to consider Structure 10L-22 a 'masterpiece' of Classic Maya artistic achievement.



Figure 5. "Maize God" in the British Museum.

Subsequent rulers also found this structure significant, for they chose not to build over it and even quoted its forms in later buildings. Structure 10L-22 must have been deserted by the 11th century, as small sculpture pieces were found in later Copán settlements, apparently having been reused in building construction (see [Kam Manahan's FAMSI report, 1999](#)). Then, sometime over the last millennium Structure 10L-22's vaults gave way and the structure collapsed.

Maya archaeologists and art historians have long interpreted the form, functions and meanings of the temple. While scholars agree that it was built during the reign of Waxaklajuun Ub'aah K'awiil (Ruler 13), who dedicated the building in A.D. 715 to mark the anniversary of his accession to the throne (Stuart 1997; Larios, Fash, Stuart 1989), current hypotheses as to its function vary between temple (Schele and Miller 1986; Fash 1991; Taube 1994), observatory (Aveni 1977; Closs 1984; Šprajc 1987), and royal residence (Sanders 1986). These hypotheses take into account the stone façades,

architectural features, interpretations of the hieroglyphic bench as well as associated artifacts. However, these hypotheses are largely based on façade reconstruction drawings that have employed less than one percent of the actual sculpture sample.

In fact, close to 4,000 pieces of sculpture attributed to Structure 10L-22 have been recovered in archaeological survey and excavation over the last century (Maudslay 1885; Gordon 1895; Trik 1939; Fash 1989) and are in the process of being analyzed by this project. Given this vast corpus of unsorted, unanalyzed sculpture material, as well as recent advances in archaeology and epigraphy at Copán and throughout the Maya area, the current reinvestigation of Structure 10L-22 allows us to test previous hypotheses and to gain detailed insight into the form, function and meanings of this 'temple.'

In processing this Structure 10L-22 sculpture sample, new challenges are constantly appearing. The sheer size of the sample—now at almost 4,000 pieces of sculpture—amounts to an intimidating jigsaw puzzle. Moreover, about 10 percent of this sample is scattered in museums and private collections throughout the world.

The sculpture is also heavy and highly unwieldy; some pieces require four men to carry and each has a long projecting tenon that once secured the stone into the building. Reconstructions are tested in a large sandbox, but it is possible to work with only a few pieces at a time ([Figure 6](#), shown below). Over 100 fragments have been reunited and restored, however many sculptures group together to form extremely large figures. Obviously these cannot be rejoined, nor even stored together due to a shortage of warehouse space. Finally, many pieces are extremely fragile and are not suited for constant handling. Fortunately, computer technology surmounts many of these obstacles and the 2001 field season has demonstrated the utility of new methods that address these challenges.



Figure 6. Author and project members working in the sandbox. (Author photo)

The 2001 field season successfully met its objectives: the completion of a digital database of 10L-22 sculpture, technical drawings of selected motifs that adorned the building, and a preliminary digital reconstruction of the structure. Two exciting developments resulted from research this year. First, we were able to determine how exactly the roofing system of 10L-22's first story was constructed, and second, that the temple did indeed have a second story. To date, twelve months of field research have been completed on this project since its inception in 1998. To adequately complete the analysis of the sculpture and offer a scientifically informed reconstruction of 10L-22, it is estimated that at least another 18 months of fieldwork will be required, with a team of about six people. Funding for this portion of the project is currently being sought.

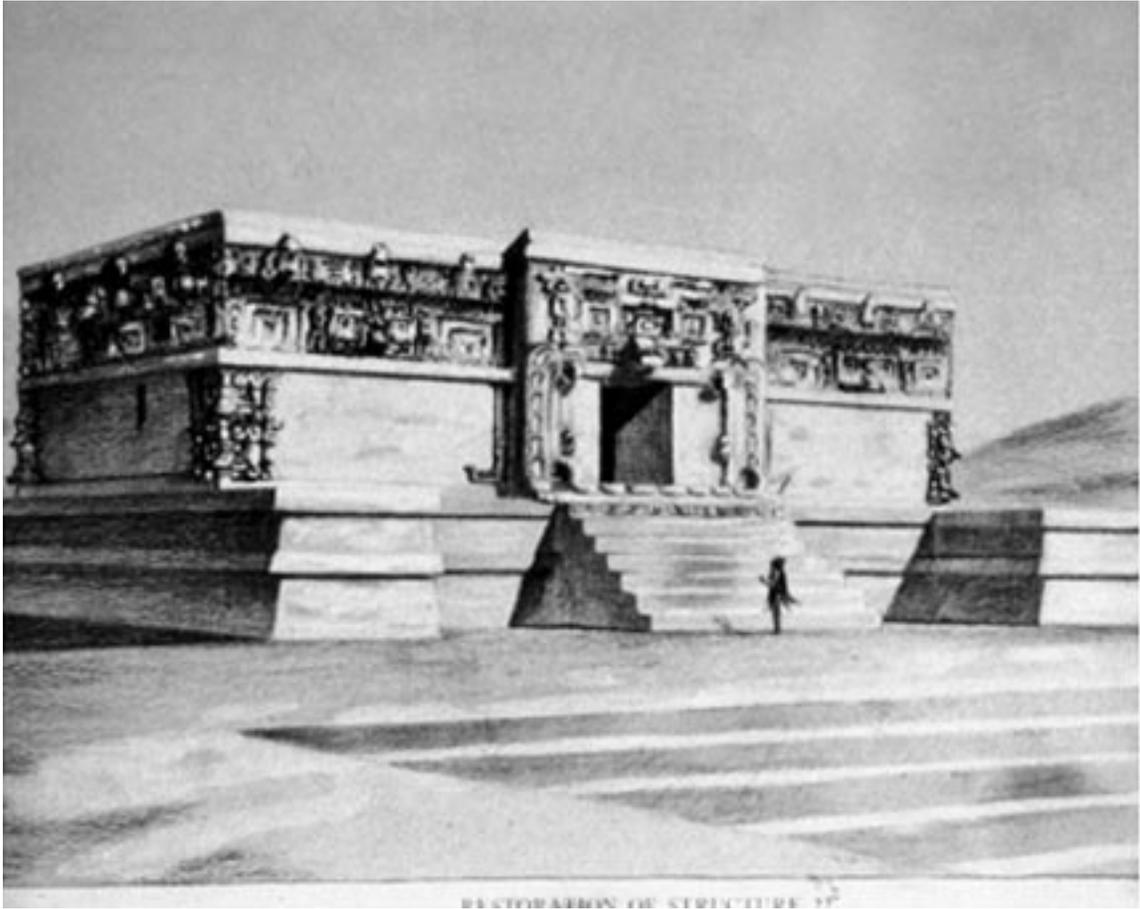


Figure 7. Reconstruction drawing of Structure 10L-22 (after Proskouriakoff 1946).

Project Origins and Past Reconstructions

The Temple 22 Sculpture Reconstruction Project is actually an ongoing effort that may be traced back to the beginnings of Maya archaeology. Since 1886, this ruined structure has seen four episodes of excavation. The temple was first discovered by Alfred Maudslay in 1886, who uncovered the famous sculpted doorway and under agreement with the Honduran government, removed sculpture to the British Museum. In the late 1890s, excavations by the Peabody Museum of Harvard University again shipped hundreds of the most beautiful pieces to museums abroad, this time to the Peabody Museum of Ethnography and Anthropology, Harvard University; The American Museum of Natural History; and Dumbarton Oaks Research Library and Collection. Then, in the 1930s, the Carnegie Institution of Washington excavated and consolidated three-quarters of Structure 10L-22, uncovering a symmetrical floor plan with rooms to the North, South, East, and West and a massive serpent-mouth doorway. They restored the

corner witz mask motif and the sculpted interior proscenium *in-situ* and created this hypothetical reconstruction of the first story of the structure ([Figure 7](#), shown above). Note how the sculpted façades on the building are conveniently blurry; although the Carnegie encountered hundreds of pieces of sculpture, they did not attempt to reconstruct the façades beyond the three motifs mentioned above. Instead they stacked the remaining sculpture in large piles around the building, roughly according to the side of the building on which they were found ([Figure 8](#), shown below). Over time these have become mixed up with sculpture from adjacent collapsed buildings.



Figure 8. 1999 Photograph of Sculpture Pile 10 on the East Court. This is all 10L-22 Sculpture from Carnegie Excavations in 1939. (Author photo)

So, in 1989, encouraged by the success of the Copán Mosaics Project in reconstructing and interpreting other building façades at Copán (B. Fash 1992a; B. Fash 1992b; W. Fash 1992; W. Fash 1994), William Fash, Director of the Copán Acropolis Project, led excavations of the relatively untouched north side of the structure (W. Fash 1989) ([Figure 9](#), shown below).



Figure 9. Excavations of the North side of 10L-22 in the 1980s. (Photo by William Fash)

The hope was that a façade fall pattern would be found that might serve as a template for a reconstruction. Indeed, they encountered several thousand stone mosaic fragments. The PAAC project catalogued and organized all of these in warehouses the project constructed at the Center for Regional Investigations at Copán. They identified several new motifs, restored several more corner masks on the building and in the Copán Sculpture Museum, and were able to recontextualize unprovenanced sculpture from earlier excavations around Structure 10L-22 (Schele 1986; Schele in Freidel, Schele and Parker 1993; B. Fash 1992; Morales 1997).

The Temple 22 Reconstruction Project began in 1998 when William and Barbara Fash, Co-Directors of the Copán Mosaics Project, invited me to analyze the sculpture encountered during PAAC excavations of the north side of the structure—known as Operation 39 (Fash 1989)—as well as those pieces catalogued from earlier excavations and museum collections. After a month long feasibility study, it was confirmed that a

project to analyze and reconstruct the façades of Structure 10L-22 would indeed yield valuable information on the original appearance, function, and meaning of the structure.

Phase I: Background Research

The first phase of the project ran between January and August of 1999 and was funded by Columbia University. At the time the project began, twenty different sculpture motifs had already been identified by Barbara Fash, William Fash, Linda Schele, Alfonso Morales, and Julia Miller. However, before analysis of these motifs could continue, it was necessary to complete some background research. In 1999, I spent seven months in Copán building a database, taking photographs, making maps, and compiling a history of excavations of the structure from 1885 to the present (Ahlfeldt 1999).

Phase II: Motif Analysis

This phase began in 2000 and continues today. In July of 2000, with continued funding from Columbia University, I began the motif analysis by refining one motif already identified by Barbara Fash (B. Fash 1992b). I identified new components including a headdress, serpent lance, and anthropomorphic bloodletter ([Figure 10a and 10b](#)). This short season gave us a good indication of the amount of time and funding necessary to complete the analysis of just one motif from the temple. Also during this month we retagged a large sample of sculpture from Pile 10 in the Main Group and prepared it for relocation to the warehouses at CRIA where shelving and space were now made available through efforts of the PAAC/Harvard projects for better conservation and protection (Ahlfeldt 2000).



Figure 10a and 10b. Sculpture of a ruler (1 of 8 statues). Reconstruction by Barbara Fash and the author. Note throne and serpent lance.

2001 Field Season Objectives

The goal of the 2001 season was to continue Phase II of the project. This is the first year the project has had a staff beyond myself. New project members were Laura Ackley, 3D Model Designer, University of California at Berkeley; Evelyn Karina Ponce, Secretary; Edgar Jhair Zelaya, artist; and sculpture masons and assistants Santos Vasquez Rosa, and Francisco Canan ([Figure 11](#)). The 2001 season carried the following objectives:

- (1) refine the *digital catalogue* of 10L-22 sculpture in Honduras and foreign collections.
- (2) *conserve unprotected sculpture* still remaining at the archaeological site.
- (3) continue with *motif analysis*.
- (4) *identify unions* of broken sculpture fragments and restore them when possible.

- (5) create a *preliminary digital two-dimensional reconstruction* of the façades of 10L-22.
- (6) create a *preliminary three dimensional digital reconstruction* of the entire structure, including the sculpted façades.



Figure 11. Project members from left to right. Seated: Barbara Fash, Jennifer Ahlfeldt (author). Standing: Edgar Zelaya, Karina Ponce, Santos Vasquez, Francisco Canan. Not present: Laura Ackley.

Project Results

Sculpture Database of pieces in Honduran and Foreign Collections

To date we have identified 3,744 pieces and fragments of sculpture as being from Structure 10L-22. These identifications are based on location excavated, depth of relief,

and matches to known pieces from the building. Surely more pieces will be identified as sculpture analysis continues.

Each piece is being recorded in a database that will eventually be reintegrated with the master digital catalogue of Copán sculpture at CRIA, designed by Barbara Fash (see her [FAMSI Report, 2001](#) for a detailed description of this catalogue). This database replicates the original catalogue sheet and contains searchable fields with vital statistics on each piece such as dimensions, condition, location found, current location, photographs, and drawings. In 2001, Karina Ponce scanned over 4,000 images (photos and drawings for 2,000 sculpture fragments) to add to the 10L-22 sculpture database ([Figure 12](#)). This work is not nearly complete however, and this photo scanning will need to continue in future field seasons.



Figure 12. Each figure is photographed with its catalogue number and scale. (Author photo)

The digital catalogue of 10L-22 sculpture includes sculpture located in the warehouses at Copán, in piles at the archaeological park, and in collections outside of Honduras. Pieces in the Peabody Museum, Harvard University; and the American Museum of Natural History, New York, and Dumbarton Oaks Research Library and Collection, Washington D.C., have been added to the Structure 10L-22 catalogue. Additional

pieces from Structure 10L-22 are located at the British Museum, Tulane University, and various private collections; these remain to be identified and catalogued.



Figure 13. Pile 10 in 2000. (Author photo)

Sculpture Conservation

In 2000, the smaller, more transportable pieces from Pile 10 ([Figure 13](#), shown above)—left by the Carnegie Institution in 1939—were brought down from the East Court to a more protected location near Pile 5 where they were placed inside a tall fence, and were re-identified and retagged ([Figure 14](#), shown below). In early 2001, Barbara Fash oversaw the relocation and storage of these pieces to new shelving in Bodega V in CRIA. In summer 2001, I was able to match many of these pieces to known motifs from 10L-22 sculpture excavated by PAAC in the 1980s. I reorganized these pieces into motif groups on the shelves, and recorded the new shelf location of the sculpture.



Figure 14. Cataloguing Pile 10 in 2001. (Author photo)



Figure 15. Remaining Pile 10 sculpture up by 10L-22. (Author photo)

However there are many large pieces from Pile 10 that still remain up at the East Court, exposed to weather and park visitors ([Figure 15](#), shown above). Moreover, Pile 5 also contains hundreds of pieces of sculpture, at least 100 of which belong to Structure 10L-22 and many of which are quite high quality pieces such as the maize-god head in the middle left ([Figure 16](#), shown below).



Figure 16. Pile 5. (Author photo)

In addition, many pieces remain scattered about the building ([Figure 17](#), shown below). Most all of these sculptures have not yet been catalogued. Funding is currently needed to catalog and move these sculptures to a more environmentally protected location from which we may analyze and reintegrate them into the reconstruction project.



Figure 17. Uncatalogued sculpture in piles around 10L-22. (Author photo, 2002)

Motif Analysis and Drawings

Until this project began, just five different motifs had been published as belonging to 10L-22. Two were made famous by Maudslay: the maize god, which has become the icon for the Peabody Museum, and smaller 'witz monsters' (Maudslay 1947 (1903)). Others include the serpent-mouth doorway, corner masks that name the building a 'stone mountain', first reconstructed by the Carnegie Institution of Washington, and an over-life-size figure that was published in an exhibition at The Metropolitan Museum and in article by Barbara Fash (Easby and Scott 1970; Fash 1992).

To date, the project has identified 39 motifs: the twenty identified by Barbara Fash and others plus 19 more identified by myself. MNI (Minimum number of individual) counts are being taken of each of the identified motifs and photograph records are being taken of these in the sandbox at CRIA. This is difficult as pieces are scattered in collections throughout the world: for example, at least 20 maize god busts are known to exist, however only 11 are in Copán ([Figure 18](#)).



Figure 18. Maize god busts in sand box at CRIA. (Author photo)

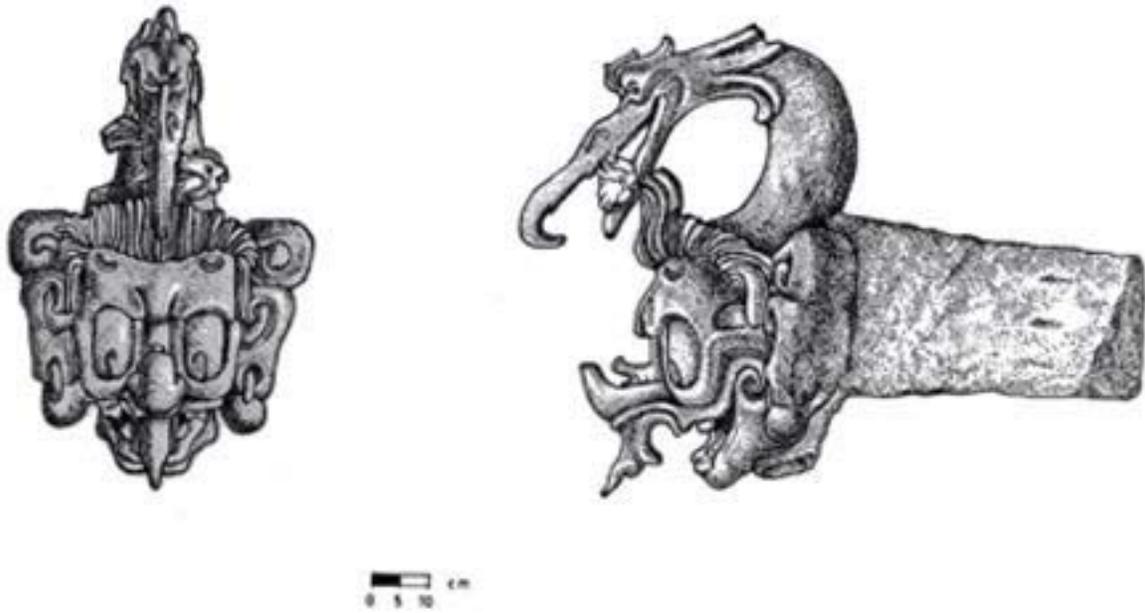


Figure 19. Drawing of water bird sculpture by E. Zelaya.

Once the MNI count of a motif is determined, the pieces are then plotted on a grid plan according to the excavation grid of PAAC Operation 39 to determine the fall pattern of the pieces. This was done using Adobe Illustrator and is useful as one can make several layers, assigning different sub-motifs to different layers. This way, for instance, one can view the fall pattern of just the maize-god heads, or all the maize god pieces (busts, heads, arm fragments, hair decorations) at once.

In 2001, we began to make technical drawings of the sculpture motifs. Drawings surpass the utility of photographs in many respects, as biological growth and weather damage make it difficult to recognize the carving on the actual stone. The Honduran artist, Edgar Zelaya executed these drawings using a 1:10 cm scale. Zelaya continues to draw sculpture motifs in 2002 ([Figure 19](#)). The catalogue of motif drawings from 10L-22 is not yet complete; therefore Edgar continues to work in my absence. A complete catalogue of these drawings will be published in my dissertation.

Sculpture Restoration

In 2001, we discovered and reunited 32 larger sculptures with smaller fragments that had broken off and scattered around the building over the centuries, for example an arm was found that fit to a bust. The Honduran Institute's conservator, Rufino Membreño, expertly restored these, using epoxy and—when necessary—steel pins to secure the pieces together. For example, the Carnegie discovered this maize-god head in 1937. In 2001 I recognized a fragment that had been excavated by PAAC in the 1980s as belonging to this piece and Membreño restored it with the main sculpture ([Figure 20a](#) and [Figure 20b](#)).



Figure 20a. Maize-god head, before restoration.



Figure 20b. Maize-god head, after restoration.

Hypothetically reconstructed pieces on the façade

Fortunately, computer technology surmounts many of the challenges we face in reconstructing the sculpted façades of 10L-22 (as mentioned above these are: sample size, global distribution of sculpture, unwieldy nature of pieces and lack of area to reconstruct the building). In addition to working with the actual sculpture, I use the computer software program Adobe Photoshop to hypothetically reconstruct digital scale photos of sculpture pieces on a digital scale elevation of the building. I scanned Hasso Hohmann's scale drawings of the south façade of 10L-22 (Hohmann and Vogrin 1982). I then took the scanned black and white scale photographs of individual sculpture pieces and pasted these on to the digital elevation to determine the arrangement of the pieces of the façade. I base this preliminary reconstruction on fall patterns of sculpture as described in excavation reports and maps, patterns of iconography at Copán and in the Maya area, and features of the actual stones such as depth of relief, angle and length of tenon. This method of pasting digital photos onto a digital scale elevation of the structure enables me to try out various reconstructions without lifting heavy pieces of sculpture or having to consistently redraw the building's dimensions.

Out of a total of 3,744 pieces belonging to 10L-22, to date I have reconstructed about 190 pieces on the lower façade, and 225 on the upper façade. Needless to say, much more analysis remains to be done. However, using this approach I was able to quickly determine that there was most definitely a second story to 10L-22, perhaps even a third; the sheer amount of sculpture attributed to the building simply would not have fit on the lower level of the temple (despite the fact that Hohmann's drawing renders the area above the vault spring shorter than it would have actually been). There had to be at least one additional level of the building. However no evidence on Structure 10L-22 exists to indicate the dimensions of these other stories. Whether these were in the form

of a roof comb such as that found intact on the Rosalila structure or a combination of second story and roof-comb remains to be determined. Fortunately other buildings at Copán have intact second stories and suggest likely proportions and features. The reconstruction process continues.

Digital Reconstruction: The 3D Model of the Temple

From the onset of the project, I anticipated that digital technology would facilitate the reconstruction of the building in its entirety and was eager to try out the possibilities of this medium. In 2001, FAMSI funds supported Laura Ackley, an architectural historian and 3D modeler—to come to Copán to determine the possibilities of such a model. Using 3D Studio Max software, she prepared two versions of a preliminary model of the building in six weeks. The following abbreviated presentation of the model and the methods of its construction offer 2D stills from the 3D model. An interactive version of this preliminary model will soon be available on the Columbia University Media Center for Art History website.

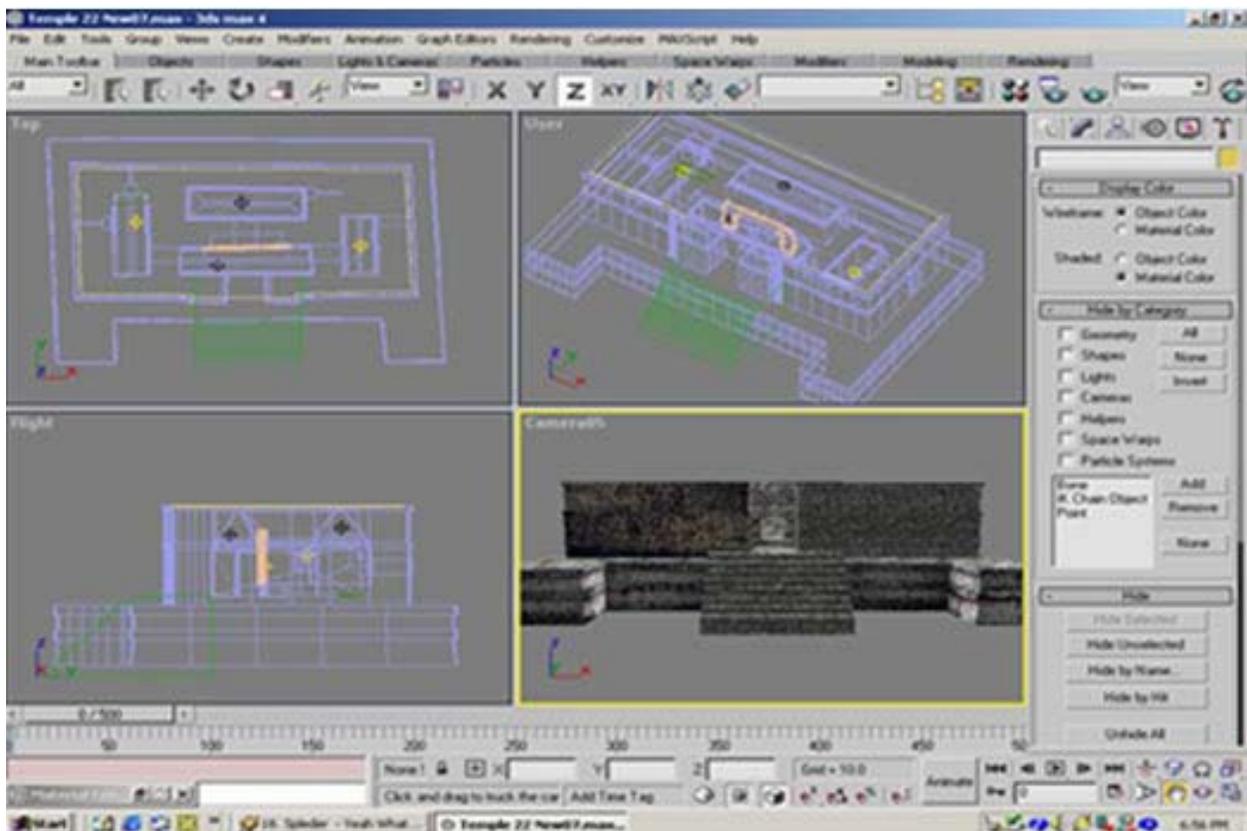


Figure 21. Preliminary wire-frame rendering (by Laura Ackley).

Construction Methods

Laura began by constructing a three-dimensional wire-frame model of the structure, by scanning measured photogrammetric drawings made by Hasso Hohmann in 1982 ([Figure 21](#), shown above). We chose not to re-measure the building because of the constraints of a pilot project, and because the building that he measured was a reconsolidated version of the original anyway. In several cases, Hohmann's two-dimensional drawings did not agree precisely when rendered in three dimensions. We corrected these anomalies by referring to the actual building; so now, any 2D rendering that we take from this 3D model will be accurate to within approximately 5 cm. We then reconstructed the vault system based on three factors: the angle of the corbelled stones remaining at the vault spring, the arrangement of the coursing, and the vault systems of the ballcourt buildings which were also built in the reign of Waxaklajuun Ub'aah K'awiil (10L-9 and 10L-10). This was one of the most exciting results of this preliminary model, for we were able to reconstruct the interior spaces of the structure, confirm that the passageways from the south room to the east and west rooms were spanned with lintels, and allow people to virtually feel the spaces and lighting of the building, something that has not been possible for over 1,000 years.

After constructing the wire-frame model, Laura mapped digital photographs of each wall of the actual stone building onto the corresponding wall in the model ([Figure 22](#)). We chose to show stonework in this version of the model to highlight the structural features of the building such as the corbel vaults and the post and lintel construction. Where the walls had collapsed, she used photographs of the existing parts of the walls as textures, so every surface depicts ashlar blocks from that particular wall.



Figure 22. Comparison of the west room as it stands today and with the digital reconstruction.

Exterior Views

To determine how this building related to its broader architectural context and to gain a feeling for the spaces it created, we inserted the 3D model into a photograph of the building on the East Court. You can see how the temple would have visually and physically dominated this part of the acropolis, majestically towering over viewers standing in the court below ([Figure 23](#), shown below).



Figure 23. Still view of the Preliminary 3D Model of Structure 10L-22 compared to 10L-22 as it appears today. (Model by Laura Ackley)

This 2D image is taken from a preliminary version of the 3D model, which is intended to recreate how the building might have appeared in its finished state ([Figure 24](#), shown below). We added second and third levels based on the proportions of the 6th century structure, Rosalila, the only standing building at Copán with upper stories. We simulated stucco and red paint on the building's exterior because this is the color of the majority of the remaining stucco. The fangs on either side of the front doorway exist on the actual structure. The niches, however—rendered with maize gods sitting on earth masks—are based on my façade reconstruction, patterns of architectural sculpture at Copán, and the ideas of Mary Miller (1986) and Tatiana Proskouriakoff (1946). This follows structures of symbolism in Maya iconography in which maize gods and rulers dressed as maize gods are often emerging from earth masks, or turtles that represent the surface of the earth. We chose to color them a shade of "Maya Blue" that was found on excavated maize god earflare fragment, however it has recently come to my attention that other Maize Gods' heads from Temple 22 are painted red. Perhaps just the jade ear flares were painted blue. I am still in the process of determining the remaining exterior sculpture arrangement, so this model is far from complete, as it is still missing over 3,700 pieces of sculpture.

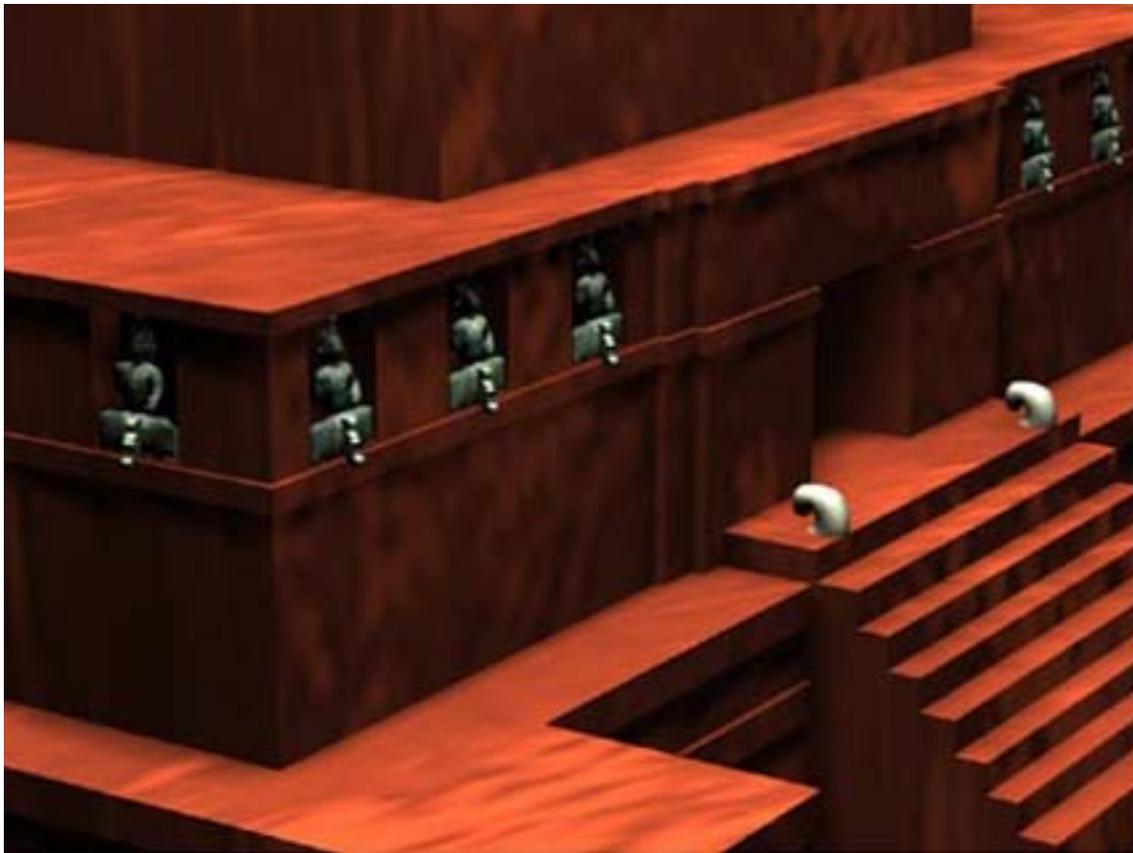


Figure 24. Detail of the model during the process of reconstructing the façades.

Interior Views

Moving to the interior of the building, one exciting advantage of the digital model is that we were able to reconstruct the interior spaces of the structure and determine the nature of the vaulting system ([Figure 25](#), shown below). Until now, no one has seen the vaulting system of this structure since it collapsed over a 1,000 years ago and scholars have been uncertain as to whether the entrances to the west and east rooms were vaulted or were post and lintel. Based on the remaining standing masonry of 10L-22 and other structures built by the 13th ruler (Ballcourt Structures 10L-9 and 10L-10) we have determined that the passageways were covered by lintels, and not cross vaulting.



Figure 25. A preliminary rendering of the South room from the digital model of Structure 10L-22, designed by Laura Ackley. Note the reconstructed vaulting.

We then added a red stucco texture to the interior as well as images of wooden vault beams that once provided structural support ([Figure 26](#), shown below). With help of this model, a distant viewer can experience perspectives of the architecture, and the dramatic sensations that the building must have created. The model is particularly useful for testing Maya aesthetics: to see how natural or artificial light would have illuminated the forms and spaces, and to consider the building as a performance space, which it most certainly was.



Figure 26. View of North room with stucco texture mapping and wooden vault beams.

Advantages and Possibilities of a 3D Virtual Model

While this reconstruction is a preliminary version, the results of this pilot project add to the growing body of evidence that demonstrates the utility of using 3D software to reconstruct and analyze ancient architecture (Forte and Siliotti 1997).

- This model allows a level of sculpture analysis that is not possible in the physical world due to the amount and size of sculpture, dispersion of the sample, and the fragile nature of the pieces.
- This software also allows repeated iterations of hypothetical reconstructions. If a database of models of other structures were made, one could execute comparative quantitative and qualitative analysis.
- 3D modeling also allows for the unprecedented study of Maya aesthetics, in terms of space and lighting.
- This is an ideal educational tool, a great way to make the past come alive for a broader audience.

- As archaeological sites face increasing challenges of conservation, tourism, pollution, and competition for resources, virtual reality offers a viable parallel option for the preservation and analysis of ancient built environments.

Facilities Improvements

With the permission of IHAH, the project set up in a working space in a large open area of Bodega V of CRIA, close to the Structure 10L-22 sculpture. A few improvements had to be made to the facilities to make it usable as an office space, including installation of two fluorescent lights on the ceiling, and purchase of office equipment: two desks, three chairs, and two fans. This equipment will be used in future fieldwork. In the courtyard of CRIA, we attached wheels on the base supports of the sandbox roof so that the roof could be moved to allow for photographing sculpture in raking sunlight.

Conclusion

To date, I have completed twelve months of fieldwork on the reconstruction of the façades of Structure 10L-22. It is estimated that between 12-18 more months more of fieldwork (with a staff of four to six people) would be required in order to offer a complete hypothetical reconstruction of 10L-22's façades based on the entire sculpture sample. Continued support by FAMSI and Columbia University in 2002 should assist towards this end.

As for the meanings and particular functions of Structure 10L-22 during its historical context, this discussion will appear in my dissertation. However, preliminary results indicate that Structure 10L-22 should be considered within the context of the consolidation of rulership and the continued reinvention of the Copán state, as this building was a locus wherein the government, persona, and mythology of the ruler gained a place and identity. Varied classes of evidence support the decades-old hypotheses that Structure 10L-22 functioned as a sacred mountain, a metaphorical cave in which the ruler performed rituals on behalf of the community. However, recent research confirms that Structure 10L-22 was not just a sacred mountain, but also the symbolic sacred cave of creation and place of emergence at Copán (Schele in Freidel, Schele, and Parker 1993). It was the symbolic mountain from which the lineage, the ruler, the sun, maize and the patron gods were born—a theme common to the high cultures of Mesoamerica. Moreover, the imagery of Structure 10L-22 draws upon a particular mythological narrative of creation and rulership that appears in the public art and architecture at many Maya polities around A.D. 700, particularly on a class of building that I call "origin structures." An analysis of Structure 10L-22's façade program promises insights not only into the nature of Ruler 13's reign, but into the ideology of rulership and the role architecture served in the construction of polity identity among the 8th century Maya.

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