

## PRO\_TECTURE: ARCHITECTONIC INSTRUMENTATION FOR THE UNCOVERED PAST



### Abstract

*Pro\_tecture is a neologism made up of "protection" und "architecture". Pro\_tecture thus stands for an architectonic instrumentation serving the protection of archeological finds required both on account of natural destruction and involvement of mankind endangering the present state of excavation. The immediate risk potential regarding excavated antiquity set the stage for thorough examination of protective architecture demonstrated at the excavation site "Ek Balam" (Yucatan, Mexico). Due to the prominent location in the middle of a tourist area and its both scientific and artistic importance a suited solution was to be developed making for means of protection as well as of adequate presentation of the design work. In the framework of this contribution the results of a corresponding design studio on "pro\_tecture" in the context of "Ek Balam" will be presented.*

### Introduction

Architecture as well as all other monuments of former Mayan ancient culture in the tropical regions of Middle America is increasingly being exposed to destruction, on the one hand due to the extreme climatic conditions, on the other hand also due to excavation work with subsequent dubious protective means. Therefore, new concepts are required furnishing new approaches utilizing specific constructional methods regarding meaningful treatment of places of interest and works of this exotic ancient American culture.

Whereas archeological finds in Europe are mostly discovered below the level of present-day terrain, the relicts of Mayan Architecture stand out as hilltops even prior to excavation. Some up to 60 m-elevations also hide previous buildings mostly covered and piled up in layers. Upon excavation these witnesses of the past are severely endangered by the

tropical climate lacking protective measures.



Typical situation in "Ek Balam" (Yukatan, Mexico / Photographs by Hasso Hohmann)

Furthermore, adequate presentation is not provided. In 1998, the Mexican Antiquity Authority landed a sensational find discovering the extremely well preserved main facade of a previous building under the front stairways of the main complex of "Ek Balam", Yucatan (building 1, width 155m, depth 75m and

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"Image of synthesis"

Photograph by Hasso Hohmann

height 32m) showing an enormous entrance in form of a monster mask. Ever since its excavation a temporary palm leaf roof and blue synthetic sheets are protecting the facade.

### Objectives for a Design Studio on Pro\_tecture

The participants of this Design-Studio were acquainted with above frame conditions. The topic "excavation" was not to be the major issue in this context, considerations, however, were to exceed mere development of a protective skin. Approaches considering suited solutions in line with spatial design criteria were required. What compounded matters was that none of the participants could investigate at the chosen planning area in situ. The composition and nature of the area had to be made available by other means achieved by a video documentation created specifically by Hermann

Hendrich to this end and a rudimentary geodetic record of the complex prior to its excavation.

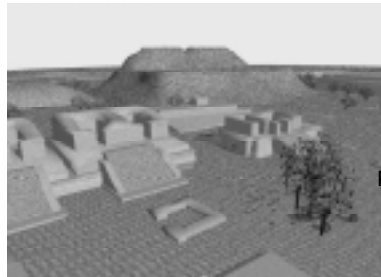
The following (“classical”) procedure integrated the step-by-step supervised and reviewed development stages finally building up into the topic based on an initially to be defined concept. Regular counseling accompanied work subjected to an intermediate guest review prior to submission. Individual work was encouraged leading to a vast range of variation to be of major interest considered as a whole.

### Creation of a Three-dimensional Computer Model

A three-dimensional computer model was generated on the basis of a horizontal projection draft with specified hypsometric contour lines. Even with the horizontal projection sketch many questions remained unsolved and thus photographs added more clearness concerning several “problematic areas”. In the course of modeling work subsequent refining was issued step-by-step. Due to continuing excavation work one is dealing with constantly changing conditions of the specific state, thus the purpose of present state reconstruction was not aimed at furnishing a particularly precise representation, e.g. resulting in constructional measures, but a rather data-economic insight into the present excavation topography.

The modeling work required was carried out prior to commencement of the Design Studio - Klaus Lengauer and Markus Piribauer being in charge of these activities. The program ArchiCAD was put to use; subsequent converting via the DXF-interface made for transport into other CAD programs. Questions as to “level of detail” were of major importance over and over again. Therefore it was agreed upon that too many details would considerably affect representation rate thus were not absolutely necessary, as e.g. dense vegetation (natural vegetation still always being a problematic issue).

Production of a 3D-basic model provided the possibility of making this model available to all participants. For quick investigation of the site a so-called QTVR-file was created.



At the beginning of design work the available three-dimensional data of the present state proved very useful for the following computer-assisted work, also issuing a uniform starting point for all participants. Estimating and recognizing the scales proved pretty problematic, the cultivated handling of scale matters, however, being of substantial importance regarding the didactic learning concept. In order to encourage information exchange a web portal was created and assisted by Jan Misek incorporating a comprehensive collection of links on the topic “Ek Balam” provided by Klaus Lengauer.

### Selected Results of the Design Studio Work

A total of approx. 40 participants attended the Design Studio. The presentation of all design work would exceed the framework of this contribution, therefore a selection structured into the following four concept categories is presented:

- A. Membrane Concept – minimizing the ground contact.
- B. Roof Concept – creation of a new (overlying) layer.
- C. Umbrella Concept – utilizing individual and/or grouped umbrella elements.
- D. Shield Concept – accentuating singular sites of finds.

The following contributions show the vast range of solutions in an abridged version. With regard to the accompanying model construction work

additions to the respectively complemented present-state data model were provided and based on these data, (physical) scale models of sections were produced.

#### A1. Membrane Concept: Klaus Lengauer / Markus Piribauer

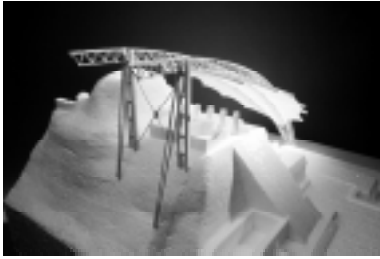
A fiber-reinforced membrane is stretched as HP-surface between two prestressed arches over the west part of “building 1”. The two tracing points of the arches are the only points of contact with “building 1”, the two bracing pedestals divert the tensile load into the ground on the north and south side of the pyramid. Thus no major interventions regarding the basic substance are required. The membrane construction makes a distinctive contrast to “building 1” resulting in a landmark to be made out as such over long distances thus emphasizing the significance of the excavated treasure. Moreover, the view of “building 1” is not obscured.



#### A2. Membrane Concept: Michaela Thron / Barbara Wiesner

The membrane roof in form of a leaf lends the roofing lightness and ease hardly affecting the excavation. The translucent membrane results in substantially antiglare light suited for the exposition of details at the find site “jaw area” without cast shadows. The “suspended” roof, moreover, does not impair any simultaneous excavation work. The alternatively developed instrumentation makes for a practically free view over the excavation due to the diagonal placement of the arches. The well-preserved side, however, is almost entirely covered. And also here the construction seems light and visibly contrasts well to the archeological finds. The construction measures required are

kept as insignificant as possible.



**A3. Membrane Concept: Gerald Sonnleitner**

Durability and resistance of materials and simple handling also applying to assembly of construction were a prerequisite as well as a high degree of prefabrication. A support system was put to use carrying itself due to its clasping connection without any further braces or anchorage or mass-intensive foundations braced into itself to provide sufficient solidity to stabilize the membrane also minding exposure to heavy wind attack. The arch elements are made up of prefabricated tubular steel profile sections connected with articulation points at their junctions braced by means of steel cable. The base bracing points of the arches make for wide-range distribution of loads and for gentle subsoil diversion.

**B1. Roof Concept: Manfred Mitterer**

This design idea results in the development of a large-scale roof: a “suspended” construction covering the complete structure consisting of a spatial trussed structure forming a pane rigidly connected to the clamped-in supports. Placement of supports was reduced to the absolute minimum in order to keep interventions as small as possible. Membranes covered the individual sections. The centric pull ring was braced along the upper chords. An additional ramp system is suspended from the bottom chords, which is to serve both as protection for the construction against wear and tear by visitors and lends itself to “strolling through the historical site”. At the observation points the ramps grow into platforms.



**B2. Roof Concept: Margit Piriwe / Claus Pröglhöf**

The main idea aims at creating a roof offering comprehensive protection but not affecting the view to the sky. Thus it does not only cover one structure but practically the entire excavation site. The development of systematics was attempted regarding variation of clear spans, in order to react accordingly to a given situation. The accessibility of the building issues the scientist and also the visitor unusual insights, outlooks and overviews. Destructive intrusions by tourists might be totally avoided with this kind of handling. This super-roof, also to be equipped with photovoltaic elements, undoubtedly represents an added tourist attraction.



**B3. Roof Concept: Christoph Schabel**

The challenge for the present project was the development of a lightweight construction contrasting from the excavation stock rather than blending in. By rotation out of the axes a permanent intervention affecting impact of the excavation is avoided. Location-independent implementation of the construction was to be provided as well as the subsequent adaptation specifically meeting the requirements of the very site. Several levels drawn up in horizontal echelons preserve the view to the outside. An inset gallery provides a view

from a distance over the excavation site. The elements used are modular and can be matched in differing variations.

**C1. Umbrella Concept: Sabine Kodatsch**

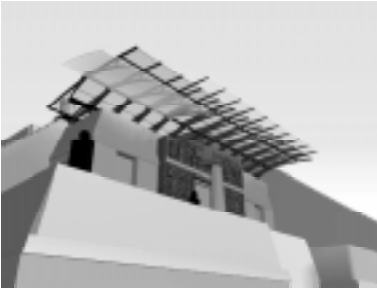
The finds to be protected are roofed-in by a number of individual and also combined and connected umbrella constructions. The umbrellas developed distinctively contrast from the existing roofing which hides the objects covered-in almost entirely. Different types of umbrellas can be made up from the units issued (umbrella with support, two connecting braces resp. stands and an intermediate member). In narrow areas this construction also lends itself to direct contact with the existing building structures whereas it is to be used freestanding in larger space. The umbrellas may be adapted according to weather conditions, the site as such and the finds to be protected. Additional overlapping of the umbrellas provides an increased protection for the finds.

**C2. Umbrella Concept: Christian Leppa**

An extremely simple modular construction system to be put together by the team of archeologists at the site without any specific skills or knowledge (merely according to the plain assembly instructions) was developed. Lightness and stability are granted by the combined use of concrete-filled tires, steel hollow sections and air-filled membrane chambers. Wire ropes brace the roofing-in in the ground. No additional intervention regarding the historic matter is necessary. The roof is collapsible when membrane chambers are deflated and thus is dismantled very quickly.

**D1. Shield Concept: Viktor Loeffler**

This project approach is based on the idea of a protective shield. Differentiating of individual spaces and their configurative integration in the course of detail work makes for a tightrope walk between design and pragmatic problem solving. The protecting gibbets emphasize the theatrical effect of the archeological site.



#### D2. Shield Concept: Franz Hager

An easy-to-produce instrumentation was to be developed which would also lend itself to adaptations in line with differing topographical circumstances. The shape in the form of an abstracted jaguar ("Ek Balam" meaning black jaguar) represents an additional eye-catcher acting as decorative element as an additional tourist attraction. Artificial lighting at the head replaces the sunlight whereby spot lamps aim at emphasizing the plasticity of the discovered relief.

#### Conclusions

A few years ago implementation of computer-assisted modeling in the course of a Design Studio still was considered a novelty, at present it is common practice. Nowadays students dispose of their very own efficient hardware and software and know how to handle it (intensively and extensively). The preceding creation of a 3D-stock-taking data model certainly turns out to be "hard graft". Therefore it does not seem meaningful to have every individual student go through this experience. Thus a 3D-model for common use was made available to the participants. The reconstruction and verification of three-dimensional data from two-dimensional (roughly sketched) ones is to be regarded a problematic issue. Complex spatial correlations often are only to be understood in their specific context by means of pictures and then realized as such. The lush vegetation also added difficulties regarding details of interrelations. The implemented program ArchiCAD, moreover, is associated with other fields of application not actually suggesting the reconstruction of archeological excavation sites.

The ArchiCAD-model data and their conversion proved useful for the design process and as it was made available to the participants no (additional) assignments within the team distracting from the actual design activities were required. Every participant was furnished with an existing reliable data set making up for the impossibility to actually visit the site. Moreover, this three-dimensional model issued view perspectives actually not to be experienced. The virtual experience, however, also had some shortcomings, scale being probably the most significant one: Getting the gist of spatial extension obviously does not automatically occur during a virtual walk-through. Many a student had to rely on photographic material and the videotape in order to grasp the actual size of the site. When considering the students' design work, the enormous variety of approaches regarding a topic not really inviting creativity is striking. A profound argument for tackling problem situations not really invented for the architectural community, but calling for "novel-type" solutions.

#### Acknowledgements

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#### References

- Bey, George W. and William M. Ringle; "The Myth of the Center. Political Integration at Ek Balam, Yucatan, Mexico". Paper presented for the 54<sup>th</sup> Annual Meeting of the Society for American Archaeology, Atlanta, April 1989.
- Vargas de la Pena, Leticia, Víctor Castillo Borges and Alfonso Lacadena García-Gallo; "Textos Glíficos de Ek' Balam (Yucatán, México): Hallazgos de las Temporadas de 1996-1998". Ponencia presentada en el *VIII Encuentro de Investigadores del Area Maya*, 10 -13 de noviembre de 1998, Universidad Autónoma de Campeche, México.
- Voß, Alexander and Markus Eberl; "Ek Balam: A New Emblem Glyph from the Northeastern Yucatan", *Mexicon*, Vol. XXI Nr. 6, Dezember 1999: 124-131, Berlin.

#### Links

- <http://128.130.109.132/> (Web Portal Design Studio Pro\_tecture)
- <http://archnet.uconn.edu> (ArchNet - WWW Virtual Library - Archaeology)
- <http://copan.bioz.unibas.ch/meso.html> (Mesoamerican Archaeology WWW page)
- <http://copan.bioz.unibas.ch/mesolinks.html> (Pre-Columbian Archaeology Related Links)
- <http://gonzo.millsaps.edu/hughebp/begin.htm> (EkBalam WebSite-Main Menu)
- <http://gonzo.millsaps.edu/hughebp/qtrv.htm> (EkBalam Web Site)
- <http://www.anthroarchart.org/ekbalam.htm> (Ek Balam, Digital Images)
- <http://www.cityview.com.mx/merida2/articulos/history1.htm> (History of Yucatan)
- <http://www.mayastudies.org/ekbalam> (Institute of Maya Studies Presents Ek Balam)
- [http://www.mexdesco.com/guias\\_md/maya02.htm](http://www.mexdesco.com/guias_md/maya02.htm) (Pre-Hispanic age)
- [http://www.mexdesco.com/guias\\_md/maya08.htm](http://www.mexdesco.com/guias_md/maya08.htm) (Archeological zones of Yucatán)
- <http://www.millsaps.edu/www/socio/story2.html> (Bey at Ek Balam)
- <http://www.saa.org/Exit/connections.html> (SAAweb - Archaeology)
- <http://www.sci.mus.mn.us/sIn/ma/teacher.html> (Archive - Science Museum of Minnesota)
- <http://www.tulane.edu/%7Emari/about.html> (Middle American Research Institute)
- <http://www.uady.mx/sitios/mayas/investigaciones/arqueo/ekbalam/ekbalam.html> (Investigaciones Recientes: Ek Balam)
- <http://www.wohlmutter.com/Maya/Ekbalam.htm> (Ek Balam Site)