designing with models

A Studio Guide to Making and Using Architectural Design Models

second edition

criss b. mills

Mack Scogin Merrill Elam Architects

(Formerly Scogin Elam and Bray)

This office makes extensive use of the model in the development of every project. A cross section of work reveals many of the strategies in Chapter 3 applied in response to a particular need or situation. Whereas the structure of one project may be difficult to understand without the aid of a detailed model, another may require a scaled-up section to study the spatial experience.

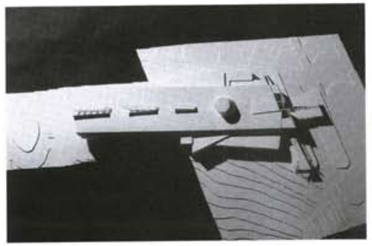
The role of the model is also seen to vary depending on the design evolved. In some cases, a combination of models and drawings has been used, and in others, multiple alternates or exclusive reliance on the model formed the rule.

Examples drawn from six different projects are used to illustrate the diverse role of the model in the daily course of this firm's practice.

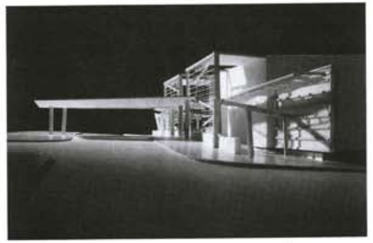
Buckhead Library

Atlanta, Georgia

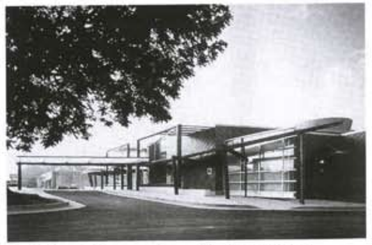
The models from the project demonstrate two primary ways they are treated. First, because the project was initially developed with the drawings, a small ⅛″ = 1′0″ scale model was built to confirm decisions. In the second instance, in order to develop the entry sequence and canopy elements, the front section was increased in size to a ¼″ to 1′0″ scale. At this scale, the model was large enough to convey the experience of the space. The image of the completed building confirms the ability of the scaled-up model to predict a reality.



Buckhead Library–1/8″ scale
This small development/finish model was made after the overall design relationships were established. It depicts a three-dimensional sketch of the entry canopies at the front of the building.



Buckhead Library–1/4″ = 1′0″ Elevation
The front section of the building has been doubled in scale in order to develop the design of the entry canopies. The model and elevation drawings were used in concert to compose its elements.



Buckhead Library–Completed Building
The completed building, in a view similar to that taken of the ¼″ scale model, reflects the quality of space projected in the design studies.

BIS Competition

Berne, Switzerland

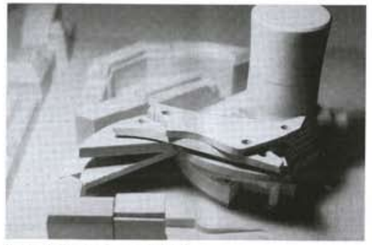
Laban Dance Centre Competition

Deptfrod Creek, London, England

Reston Museum

Reston, Virginia

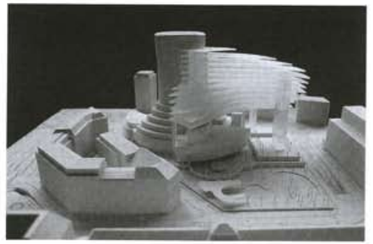
Models played a central role in the development of these three projects. The models used for the Reston Museum demonstrate a strong reliance on alternatives. In the BIS competition, the idea of alternatives was expanded to the production of numerous parts, combined to create dozens of schemes. The Laban Dance Centre models were generated in an extensive progression.



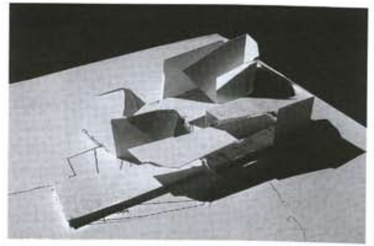
BIS Addition–Scheme 1
This project required three schemes for an addition to the central conical tower. A small context model of the urban area was used to test relationships with the urban context.

Laban Dance Centre–Full Model Array
The full evolutionary array of models used to develop the Laban Dance Centre design is shown, including every possible stage of development with many alternative explorations.

Reston Museum–Alternative Schemes
Five alternatives were developed for this project. After using drawings to help develop the program on the first model, small two-dimensional sketches were used to initiate the other schemes.



BIS Addition–Scheme 2
In the course of the developing schemes, numbers of alternative variations were generated. In this view, the addition takes the form of a series of shifted layers rotating off the tower's axis.



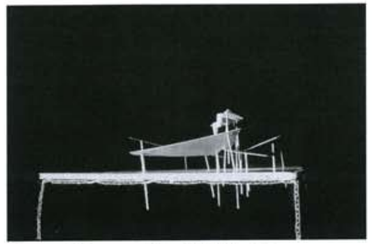
Laban Dance Centre–Sketch Model
A small sketch model extracted from the model progression above at the point where early conceptual models were translated into program space.

Morrow Library

Morrow, Georgia

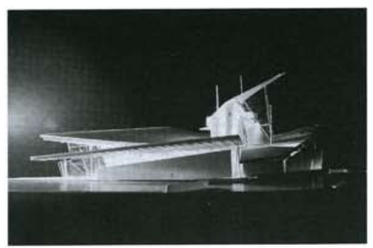
Beginning with a small concept drawing, the majority of design work was carried out directly in model form. Three clear stages of model progression were used, along with a scaled-up model of the central tower.

Unique to the project was the construction of an adjustable model to test roof relationships, as well as the production of construction drawings from measurements taken from the models. To produce drawings of the tower shown below, the model was not only measured but photocopied and traced to create elevations; see "Transferring Model Data" in Chapter 8.

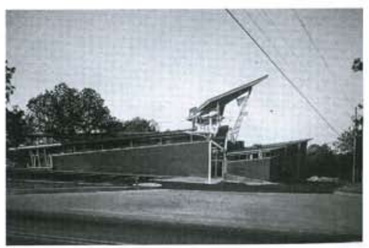


Morrow Library–Adjustable Model
The model was constructed to operate like a puppet and used to adjust relationships between the roof planes. The corner points of each roof could be moved by pulling sticks protruding below the baseline.

Morrow Library–Development Model
Once basic relationships were established, a small study model was made to refine the general relationships. The tower model shown on the bottom left was made to develop its components.



Morrow Library–Finish Model
At this point, the design was generally complete and drawings were made to refine the elevations. Exposed structure was used in the building, and the final model included all of it to study its visual effect.

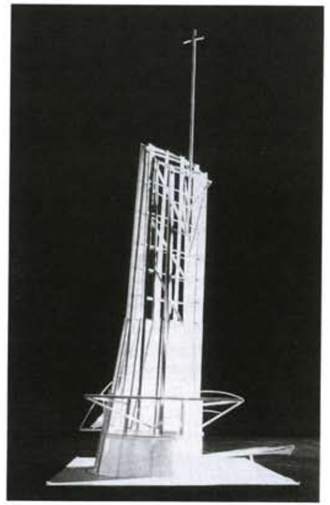


Morrow Library–Completed Building
When implemented, the building confirmed many of the decisions the model helped resolve.

Turner Center Chapel

Atlanta, Georgia

Although several of the previous examples included scaled-up sections used to work out ideas, the Turner Chapel project approached the need for closer study by employing a combination detailing/framing model. Owing to the close proximity of interwoven truss members, the lower half of the finish model was scaled up to a ½″ = 1′0″ model and used to work out (or resolve) the detailing relationships for the glazing connections.



Turner Chapel–Finish Model
This model was preceded by several small studies, and the entire structural system was drawn on the computer to locate dimensions and angles. Although the 80-ft steel building to the left attests to the eventual success of the design, what could not be understood at this point was the three-dimensional interaction between steel members in the lower half of the building.

Turner Chapel–½″ = 1′0″ Model
The lower section of the tower was glazed and a framing system that would ensure against warped surfaces was required. To work out the detailing, the lower section was scaled up and each member modeled within the inch. Although computer modeling may have been a viable alternative, two-dimensional computer drawings did not provide enough information to control the complexity of relationships.

Mack Scogin Merrill Elam Architects

Mack Scogin and Merrill Elam have a long tradition of designing and developing projects through physical study models. Some of these can be seen in Chapter 6. Like many firms, the way they work has evolved to include computer modeling. It is probably accurate to say that most of their projects are currently developed on parallel tracks. One track uses physical models to develop the project and the other track uses computer modeling images to communicate and study aspects of the project. This has not led to the kind of reliance many have come to place on the computer model as the primary generator of form. Rather, the computer is used to control and generate those things that it is best suited for, such as complex organic forms, while physical models are used extensively for all other studies. Large-scale physical interior models are felt to be particularly valuable in understanding space.

The firm uses Form Z and AutoCAD as their primary digital programs. Rapid prototyping has played a role in their model making as well, but like computer modeling, it is generally limited to organic forms. This typically results in a hybrid construction, with the majority of the model made in-house and special parts being sent out to be made with stereolithography.

Illustration

The following examples are from two projects that illustrate both ends of the spectrum. The Children's Museum is modeled almost entirely with rapid prototyping; however, it is instructive to see that the generative and explorative studies are made with traditional sketches and physical models.

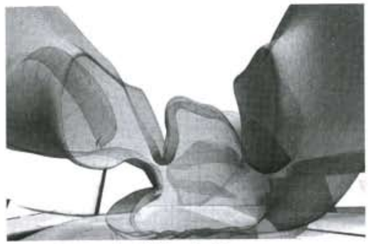
Conversely, the Fine Arts Center has been made mostly by hand with special sections made as rapid prototype components.

The Children's Museum

This project uses a combination of methods to explore and develop the design. The initial move is started with a hand drawing; then a foam model is made to capture the dimensional suggestions of the drawing. Computer models are drawn to give precise definition to the space. Finally, an RP stereolithography model is output to produce physical confirmation of the space.

The Pittsburgh Children's Museum
The hand sketch of the project is ambiguous and suggestive in the way clearly defined computer drawings typically are not.

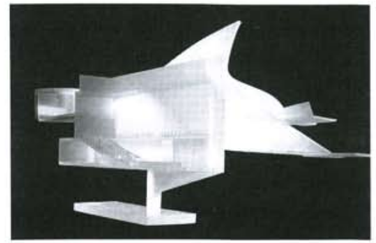
The Pittsburgh Children's Museum
A foam sketch model attempts to interpret the space implied by the drawing.



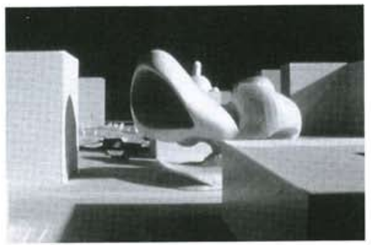
The Pittsburgh Children's Museum
A computer model of the space is made to refine the space and program fit.

Fine Arts Center–University of Connecticut at Storrs

This project uses a hybrid approach. Stereolithography models are made only of parts that are thought to be too complex for hand-modeling techniques. These parts are first assembled with each other (to overcome size limitations of the modeling equipment) and then assembled with the hand-cut components of the entire building model.

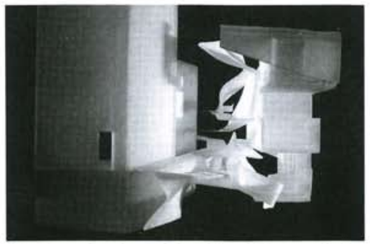


Fine Arts Center–University of Connecticut at Storrs
The flowing curvilinear parts on the rear section of the building have been RP-modeled as a collection of several parts and attached to the hand-cut parts.



The Pittsburgh Children's Museum
A stereolithography model output from computer modeling information.

Fine Arts Center–University of Connecticut at Storrs
A computer rendering of the building shows the section of the building where rapid prototyping has been employed.



Fine Arts Center–University of Connecticut at Storrs
The stair components are made from several RP pieces and incorporated into the hand-built model.