Of course there are exceptions to these points and the results with cross-institution application may be much greater than what I have listed here. It is the majority of students, not the exception, who have provided the points above and the group for whom I have to plan most of my time.

In the current VDS at Cal Poly (Winter 2000), I have attempted to re-address the issues listed above. Students are designing a Chapel of the Sublime- a non-denominational place of worship and introspection. They have the option of designing a project for a sublime setting of their choice or, they may elect to design a chapel existing entirely in cyberspace. This is an upper division studio for which as pre-requisites, I required students to fulfill a lengthy reading list and complete our animation/simulation course (form•Z, 3dsMax). All students, regardless of the site they select (real or virtual) are:

1. Digitizing a series of their own subliminally derived sketches, water colors and collages.
2. Systematically applying a series of filters to all of the images, searching primarily for aesthetically pleasing results. However, concurrent with the visual study, class discussion has been undertaken on the etymology of "sublime" and, lectures are being conducted on the history of religious architecture. This is meant to cultivate ideas in the students minds about their chapel.
3. The results from the photoshop study are then being used to create displacement maps, bump maps, and space warps to be used with simulation tools to generate a series of forms. A selected result becomes an initial massing model of the chapel. (The specific application of simulation tools varies by student and fits within a set of rules and principals established by each student for their chapel design.)
4. Students will find a site with sublime qualities on which to place physical solutions, virtual solutions will be built as a web site.
5. All students are using either three axis milled foam output and/or laser cut models to study designs.
6. 3d output is being used as a study model, by physically cutting, adding to and modifying forms.
7. All designs are being developed with both digital and manual skills regardless of the chosen site.
8. All designs are being posted onto student VDS Desks, Blue-line Online is being used for sharing data and maintaining correspondence.
9. All students will have the option of producing stereo lithography output of a completed design piece.

To see the status/results of the current and some previous Cal Poly Pomona digital studios, see www.csupomona.edu/~env/vds/

George Proctor is Professor of Architecture at the College of Environmental Design at California State Polytechnic University, Pomona. His role as Cal Poly Architecture faculty has been to increase the use and awareness of digital media application in design and practice. The VDS is an extension of that role. The 1999 VDS is the fourth such studio at CSU Pomona. He can be reached at GRPROCTOR@CSUPomona.edu.

EXPO 2000 PAVILION AND EXPOSITION: PRECEDENT STUDIES
Edgar Stach

Included in this article are two second year architecture graduate student precedent studies to understand the complexity of a built project and its functional, structural and spatial design concept. Students were instructed to 'disassemble' the building according to Form & Function, Structure & Construction, Materials, and Display Methods. Through the use of computer-generated models the students were able to understand the relationship between space and structure without having to physically travel to the pavilion sites. The computer offered the unique ability to explore a spatial study of buildings and places that no longer exist (such as the IBM Pavilion by Renzo Piano), as well as to anticipate the spatial qualities of spaces that are not yet built (similar to the Swiss Pavilion by Peter Zumthor).

Final analysis drawings were created through manipulating the computer models to explain the Space & Form (spatial hierarchies), Spatial Sequence (circulation, path & place, and exhibition sequencing), and Space & Order (structure, proportion, and systems).

Swiss Pavilion for Expo 2000 in Hannover
Angela Tirri

The Architecture
The Swiss Pavilion in hannover is designed as "an integral happening of a direct sensual kind." The architecture is a labyrinth structure, open on all sides and connected through a series of corridors, atriums, and covered spaces. The walls of the pavilion are made of identically cut wood logs, stacked seven meters high. The wood is native to Switzerland. The pavilion contains no images, instead visitors will be immersed in the sensual experience of text, sound, and smell.

Each wall of lumber contributes to a larger stack or 'stapel'. There are twelve stapels in all. The technical rooms are elliptical shapes while the stapels are rectangular. The space between the staples forms the circulation in the pavilion.

The exhibit is broken down into three parts: text, sound, and cuisine. The text exhibit fills the long rectangular volumes, while the sound and cuisine exhibits are located in the voids formed by the text exhibits.

Special acoustics are provided in each of the large sound rooms. Text is projected on all flat surfaces in the pavilion including the buffet areas, encouraging visitors to read and enjoy the cuisine.

The Words
The walls inside the pavilion are covered in projected text gathered from various literary works from various regions of Switzerland, Swiss authors, and statements from Swiss nationals traveling abroad. Circulation through the pavilion is dictated by the length and size of the text: long strips of text create light paths through the pavilion, while large blocks of words encourage visitors to stop and linger as they read.
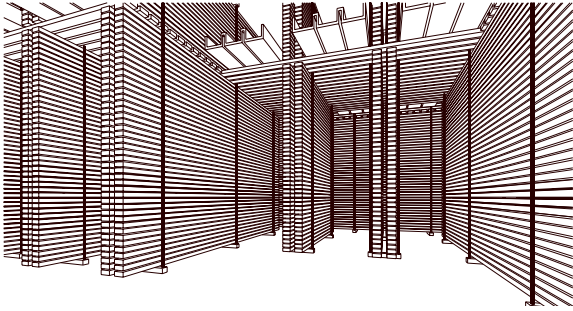
form•Z model of entry to pavilion illustrating stacking of lumber
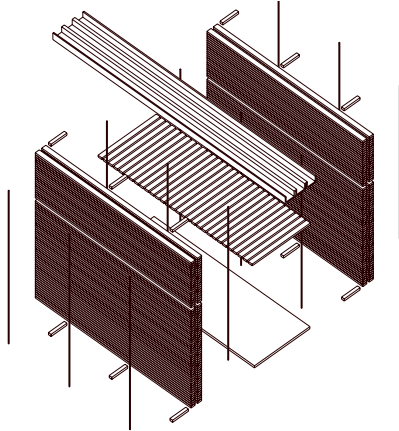
Exploded axonometric of typical bay.
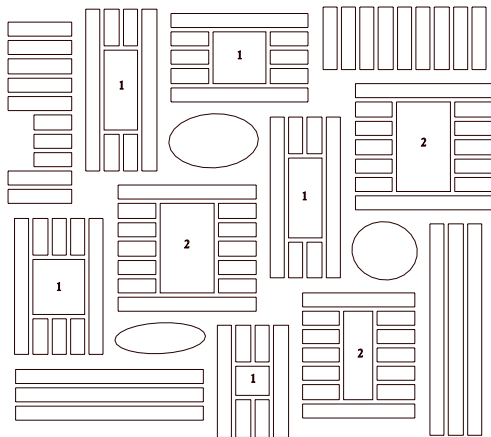
☐ Text exhibit ① Sound exhibit ② Cuisine exhibit ⬭ Technical room

Exhibit space layout

The Sounds

Visitors to the pavilion will also experience many regional sounds of Switzerland. Musicians will be placed throughout the pavilion playing accordions and dulcimers in five separate areas. In addition to the sounds of these instruments, there will be singers and other musicians performing throughout the space.

The Cuisine

Swiss cuisine will also be featured in the pavilion. Different menus will be available in three areas of the pavilion served buffet style. All the food will be ready made, Swiss "convenience food."

Circulation

Sound and Cuisine

Text

Base
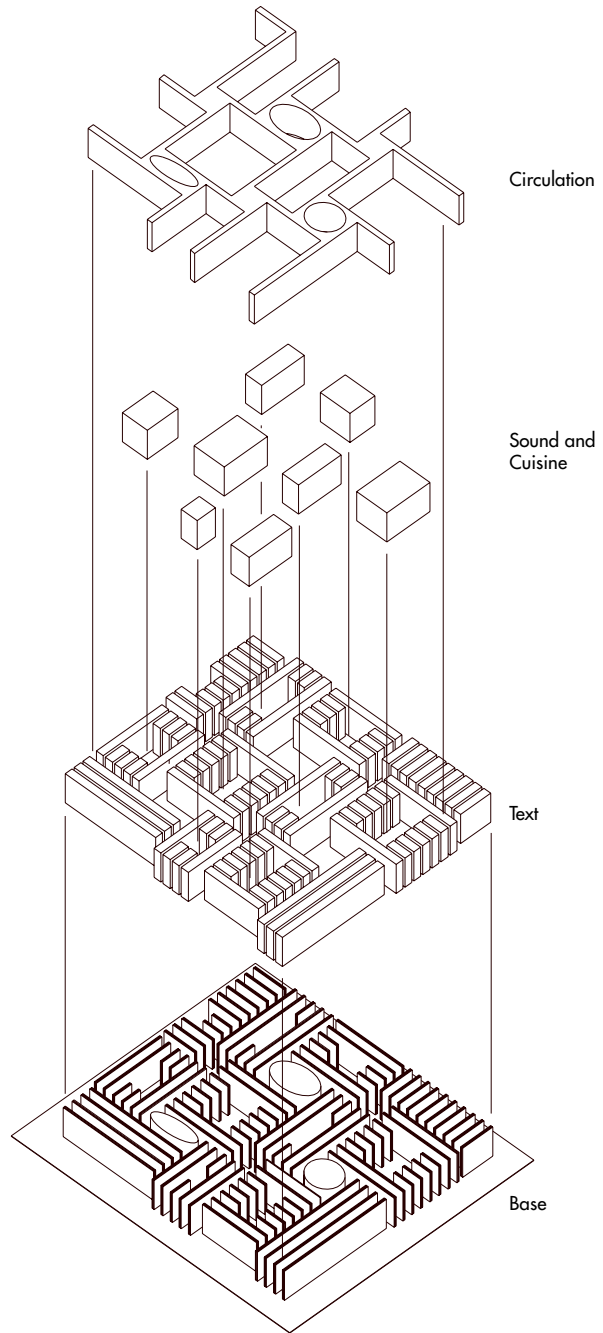
Edgar Stach is Assistant Professor of Architecture at the University of Tennessee's College of Architecture and Design. He received his Diploma Engineer in Architecture from RWTH, Aachen Germany in 1991. He is currently pursuing his Ph.D. in light weight structures with regards to new materials and construction methods. He can be reached via email at stach@utk.edu.

Angela Tirri is a 2nd. year graduate student at the University of Tennessee's College of Architecture and Design.

Clayton Rogers (next page) is a year graduate student at the University of Tennessee's College of Architecture and Design.

IBM Travelling Pavilion by Renzo Piano
Clayton Rogers

For the European division of IBM Renzo Piano designed a demountable exhibition structure to be set up in a variety of urban park settings. Built in 1982 the IBM Travelling Pavilion visited 20 cities in 14 European countries in three years. Piano continued with themes in previous projects creating a lightweight, transparent structure composed of the repetition of highly precise, identical components.

In this case the repeated unit is a barrel vault made from polycarbonate plastic pyramids. The pyramids act not only as the transparent enclosing system but also as the web members in a three-dimension arched truss that supports the assembly. The top and bottom chords are wood/aluminum composite pieces.

By using wood as much as possible in the building, Piano was emphasizing a major theme of the Pavilion: technology embedded in nature. The latest computer technology was displayed inside a work of advanced technology, but the extensive use of repetitive wood members inside reflected the natural park setting of the building. The use of wood also underscores the high degree of unique craftsmanship that went into designing the components the building.

The Pavilion consists of a 34 bay barrel vault supported on a raised structural platform. The structure is 48 meters long, 12 meters wide and 6 meters high. Each bay is composed of a pair of half-arches pinned together at the top. Components, though crafted uniquely for this project, are standardized to facilitate the repeated disassembly and reassembly of the pavilion.

Structurally, the base consists of conventional steel trusses cross-braced at three points. The floor is constructed of corrugated steel deck panels with hardwood flooring. Each bay stands separately; the small gap between each bay is filled with a flexible transparent film.

The chords of the truss/arch are wood members finger-jointed and glued to aluminum connectors. Aside from the naturalness of the wood, this configuration takes advantage of the lightness, strength, and low longitudinal thermal expansion of wood. Metal is only used where the concentrated forces require the greater strength.

In order to control solar heat gain and thermal heat loss in a transparent and poorly insulated structure removable opaque pyramidal shades were installed in accordance with the determination of computer simulations of solar conditions for individual sites. An air supply duct runs down the center of the space with supply arms between each bay and additional air is supplied through the base.

The polycarbonate pyramids, which serve as both the building envelope and the webs of the truss, are combined into sections of three for ease of transport and assembly. Six pyramids form one half-arch assembly. Two of these are connected to the floor and at the top with flexible pin connections. This three-pin arrangement eases assembly as well as eliminates the need for moment connections that would make the structure heavier and more difficult to disassemble and reassemble.

Removable sun screens

Mechanical space

Air supply ducts

Return air units

Floor

Air supply plenum with central and edge vents

Polycarbonate arches

Wood floor on corrugated steel decking

Steel trusses

Adjustable steel feet