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Save the Moore House

As an important landmark of architecture's recent past, Charles Moore's last home and studio must be preserved.

TIMOTHY HURSLEY PHOTOS

AIA Gold Medalist Charles Moore died one year ago on December 16, leaving a rich legacy of buildings, writings, drawings, and descendent practices. Nowhere is this legacy more manifest than in the house and studio Moore built for himself in Austin between 1984 and 1987, after accepting the O'Neil Ford Chair in Architecture at the University of Texas. Tucked within a residential neighborhood, the cluster of wooden sheds offers an intimate view of the architect—the way he worked and lived, and the way he saw and thought. In the living room of the house, which is cluttered with books, toys, and folk art, Moore's love of travel, innate curiosity, and appreciation of the ordinary and the fantastic are evident on every colorful surface.

Since the architect's death, however, the fate of the Austin compound has been thrown into uncertainty. Moore bequeathed his entire estate to his four nephews; a share of the Austin property is held by Moore's partner Arthur Andersson. Both the heirs and Andersson wish to keep the house and studio with their furnishings and collections intact. They had hoped that the University of Texas would take over the entire complex and its contents as a study center for its school of architecture. But in August, the university rejected that proposal, offering instead to house Moore's drawings, papers, and 85,000 slides in a specially designated room on campus. Other institutions have expressed a similar interest in acquiring the Moore archives, including Yale University, the University of Michigan, and the University of California, at Los Angeles and Berkeley. The Cedar Rapids Museum of Art, part of which is housed in a 1989 Moore building, is also eager to acquire these materials.

Meanwhile, AIA Austin has established a nonprofit foundation to save the Moore buildings. It would like to transform the compound into a house museum, studio for architecture students, offices for the foundation, and living quarters for visiting scholars. But accomplishing this goal is difficult: The foundation must first raise funds to retire a $350,000 mortgage on the property, and then secure an endowment of $2 million to maintain the center. And while Moore's nephews appreciate the AIA's good intentions, they must decide within the next few months whether to sell the property.

Like other houses designed by architects for their own use—Thomas Jefferson's Monticello and Frank Lloyd Wright's two Taliesins, the Moore house is an important landmark in American architecture. Because it represents a much more recent era, the 1980s, no benefactor has yet stepped up to rescue the property. All the more reason the Moore house and studio must be preserved: so that we may more fully understand the architecture of this Postmodern pioneer and revisit the world that shaped his vision.

Deborah K. Dietsch

News

National Museum of the American Indian Opens in New York

The United States Custom House, a 1907 Beaux-Arts masterwork designed by Cass Gilbert, commands a parcel on New York's Battery that once belonged to a small Indian tribe. It is ironic that this imperturbable symbol of capitalism now houses the first of two Smithsonian museums devoted to tribal artifacts. (The second will be built on the National Mall in Washington, D.C.) The transformation of an inexorable white man's institution into The National Museum of the American Indian has established a difficult truce between Beaux-Arts grandeur and Indian craft, a cultural clash that was all too evident at the museum's opening in October.

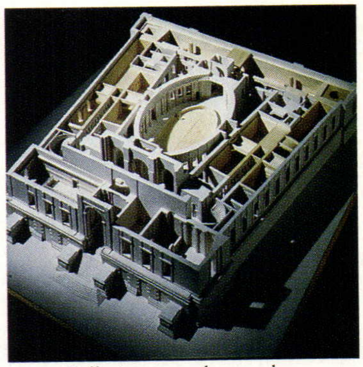
The Custom House stood vacant for nearly a decade until the late 1980s, when the U.S. General Services Administration hired New York City architects Ehrenkrantz & Eckstut to begin the building's painstaking restoration. The architects gingerly shoehorned a variety of programs into the 550,000-square-foot shell, including 83,000 square feet of galleries, offices, and storage for the museum; a basement auditorium that replaces an old boiler room; and courtrooms for the U.S. Federal Bankruptcy Court on the building's upper levels.

The status of the Custom House as a National Historic Landmark complicated the museum's construction. Ehrenkrantz & Eckstut conceived the project as a building within a building, creating a giant jewel box that could be disassembled and removed without altering the original structure. The architects developed this parti into an internalized enfilade of galleries with flexible lighting systems and stainless-steel coves. Their neutral palette of ash wall panels, wool carpeting, and travertine trim defers to the rich textures and brilliant colors of the 500-plus objects on display.

But the handcrafted intricacy of the tribal moccasins, bowls, masks, and other artifacts is overshadowed, both by the museum's crowded, kitschy installations and by the Custom House's newly restored murals, ornate finishes, and sculptures. The Smithsonian has responded to negative reviews of these installations by reorganizing some of the displays.—*M. Lindsay Bierman*

GSA / PETER MAUSS / ESTO

CUSTOM HOUSE: Landmark restored.

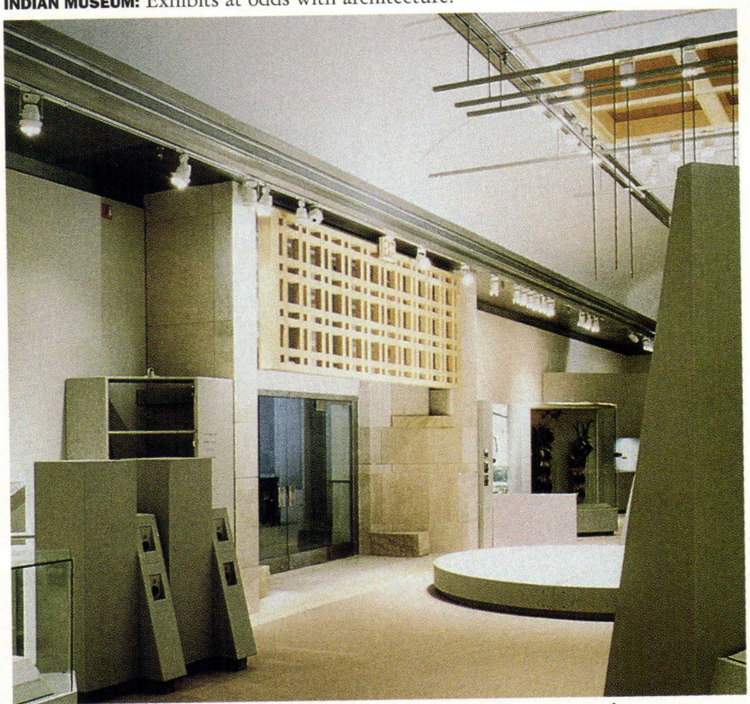


JOCK POTTLE

PLAN: Galleries around rotunda.

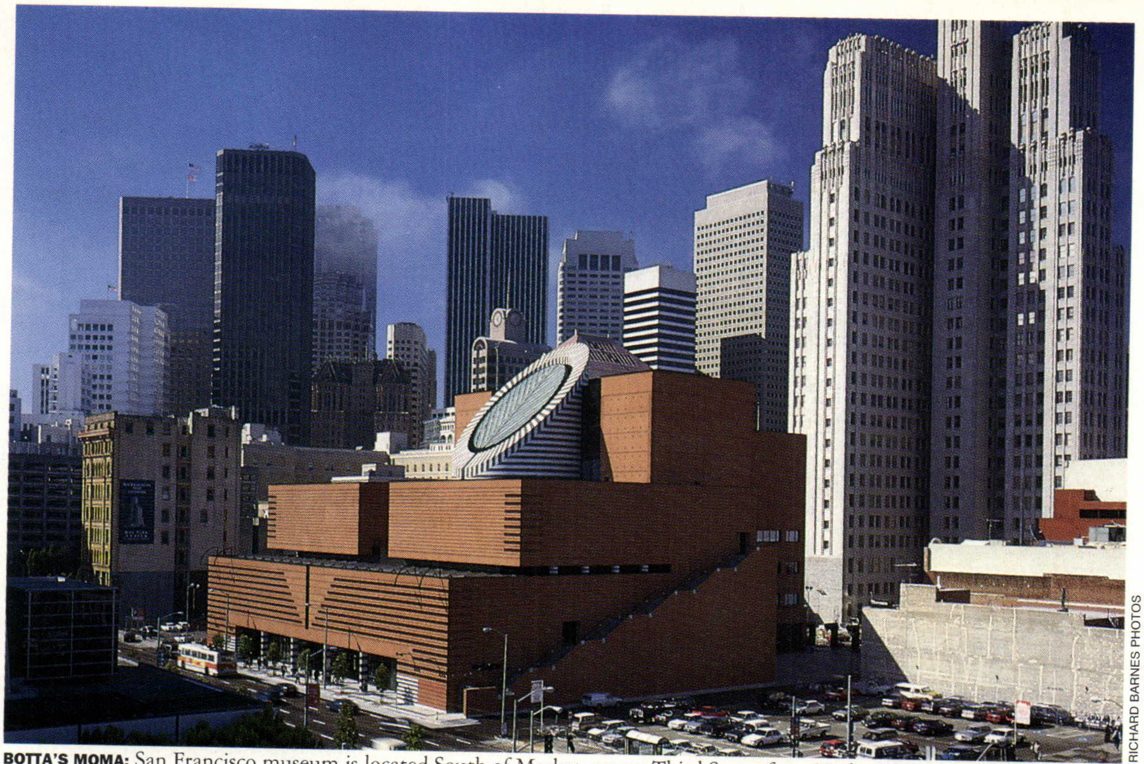
TED THAI / TIME MAGAZINE

INDIAN MUSEUM: Exhibits at odds with architecture.



WALTER DUFRESNE

MUSEUM ENTRANCE: Stainless-steel cove and waxed-ash screen span doorway.



BOTTA'S MOMA: San Francisco museum is located South of Market, across Third Street from Yerba Buena Gardens.

San Francisco Museum to Open Next Month

Swiss architect Mario Botta designs monumental buildings that exert powerful influences upon their sites, whether urban or Alpine. The San Francisco Museum of Modern Art (SFMOMA), Botta's first building in the United States, is no exception. The lusty, $60 million museum, the second-largest devoted to modern art in the country, will open next month to great fanfare.

Situated adjacent to Yerba Buena Gardens, the city's new cultural complex, Botta's 225,000-square-foot structure is the most prominent component of a grand scheme to develop the South of Market district. It is located across Third Street from Polshek and Partners' Center for the Arts Theater and Fumihiko Maki's Galleries and Forum, and will house more than 17,000 works, including contemporary paintings and photography, Mexican art, and design objects of the Pacific Rim.

The building's stepped, brick-clad facade is dominated by a cylindrical turret that culminates in a slanted skylight. Inside, the turret brings daylight into a vast atrium lobby, beautifully clad in striped granite that echoes the building's entrance. Surrounding the atrium are a museum shop, auditorium, studios, and a large room for private events.

At the center of the atrium, a dramatic staircase climbs the inside of the turret, leading visitors to four skylit gallery floors above. Stunning second-floor galleries are arranged in an enfilade around the turret core; third- and fourth-floor galleries are embraced by perimeter offices. Special exhibitions will occupy the fifth-floor gallery.

The turret, originally designed to be topped by a controversial circle of trees (eventually deemed too difficult to maintain), echoes Botta's Cathedral at Evry, France, and the building recalls the architect's scheme for a multimedia center in Palermo. Indeed, cylindrical forms topped with trees appear to have commandeered Botta's vision in the late 1980s when he was designing the museum: a telecommunications center for Bellinzona, Switzerland, is also organized around a tree-topped circle.

There is nothing wrong, of course, with an architect repeating a form that delights him, especially when, as in the case of Palermo, the form wasn't built. Other details of the San Francisco museum—its gray-and-white striped granite streetfront and its intricately detailed brick facade, are also signature Botta elements, as are the basic compositional tools of cubes and cylinders within.

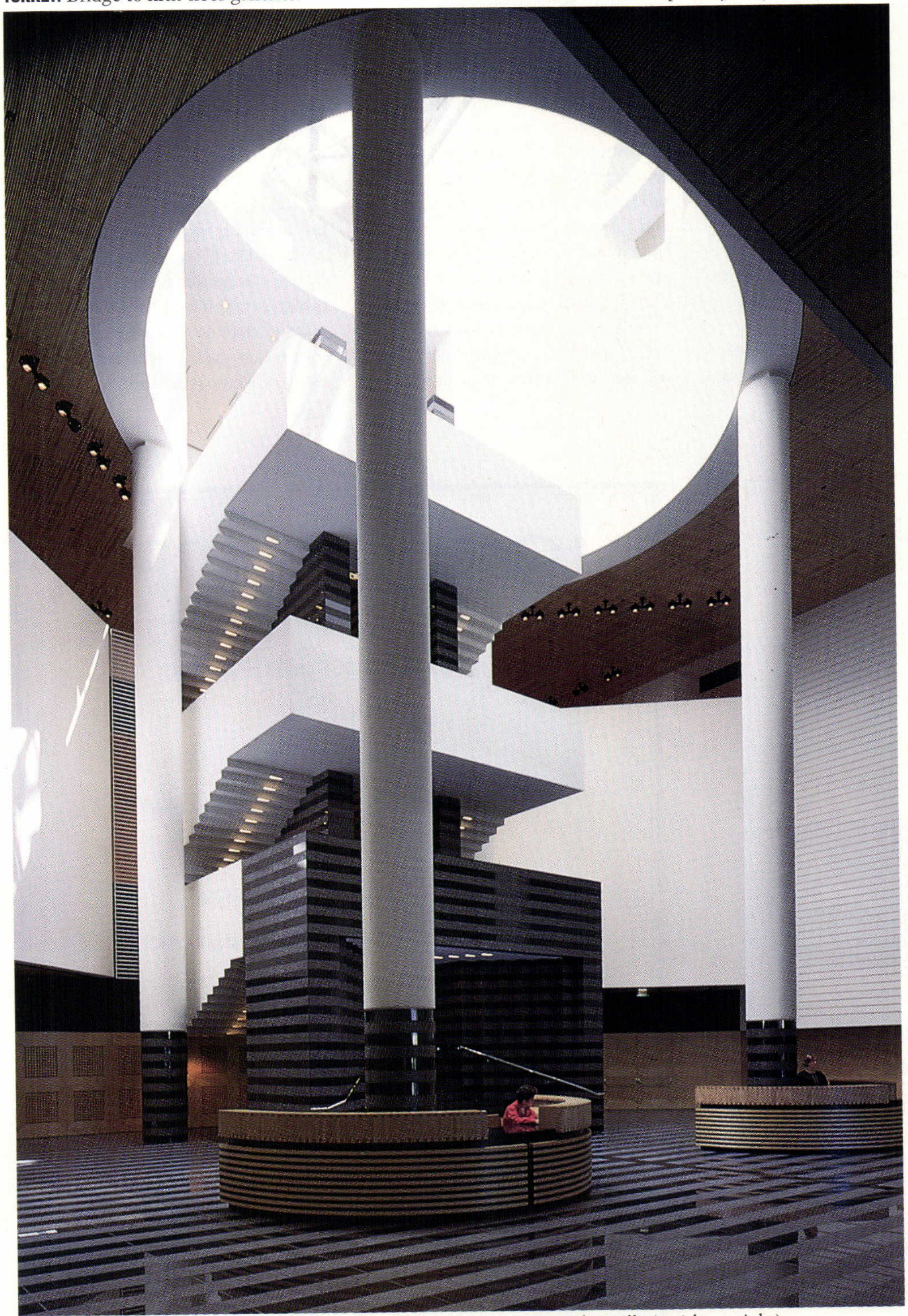
The problem with SFMOMA is that it lacks a sense of historical continuity and a respect for context. While San Francisco may have a brick tradition elsewhere, there are few brick structures in the South of Market area. SFMOMA's monumental massing interrupts both the suburban scale of Yerba Buena and the tall towers that surround the museum.

The absence of these qualities in Botta's first U.S. building is disappointing, especially considering the architect's success with contextual harmonies elsewhere. Botta's Tokyo Art Gallery, for example, is a striated, cylinder-topped tower, but it continues its neighborhood's urban rhythms. His 1988 library at Villeurbanne interrupts the streetwall with its brazen stripes, yet its massing continues existing rhythms. Even Botta's own, cylindrical office building in Lugano repeats the character and color of neighboring apartment towers. SFMOMA, however, could have been built anywhere, and its striking similarity to Botta's Palermo scheme makes one think that it almost was.

Mario Botta's genius has always been his ability to build upon both vernacular architecture and Classical principles, reinterpreting them in powerful forms that both challenge and invigorate their contexts. This uneasy balance has been Botta's contribution to the Modern legacy; what a pity that his first American building fails to strengthen his design portfolio.—*Heidi Landecker*

TURRET: Bridge to fifth-floor galleries.

GALLERY: Neutral backdrop is daylit by skylights.



TURRET: Monumental stair climbs cylinder, leading visitors to rectangular galleries (above right).

Details

Barton Myers is the recipient of the 1994 Royal Architectural Institute of Canada Gold Medal. **Leo A. Daly** and **Hardy Holzman Pfeiffer Associates** have been selected to design a federal courthouse in Tucson, Arizona. **Langdon Wilson Architects** and **Richard Meier & Partners** have been awarded the Phoenix, Arizona, federal courthouse commission; **Meier** is also designing a line of office furniture for Stow Davis. **William Rawn Associates** has been commissioned to design a campus center for Babson College, in Wellesley, Massachusetts. **Cesar Pelli & Associates** is designing a 369-acre master plan for the University of Texas at Austin. Philip Johnson and Alan Ritchie/David Fiore Architects have united; their new firm will be known as **Philip Johnson, Ritchie & Fiore Architects**. **Jane Merkel** has been named editor of *Oculus*, the publication of AIA New York Chapter. **Nancy Cameron Egan**, managing director of **Emery Roth & Sons**, has been inducted into the Academy of Women Achievers. **Samuel DeSanto**, adjunct professor in the School of Architecture at Pratt Institute, has been named acting dean of the school for the 1994-95 academic year. **James Cutler Architects** is designing a U.S. Customs gateway to Canada in Oroville, Washington; Seattle-based **Miller/Hull Partnership** is planning a similar gateway in Point Roberts, Washington; and **Thomas Hacker and Associates** with **Northwest Architectural Company** is developing a third in Blaine, Washington. The Irvine, California, office of **HOH Associates** is designing a master plan for the reuse of the El Toro Marine Corps Air Station in Orange County, California. The contract to develop a historic preservation plan for the Tyndall Air Force Base, located outside of Panama City, Florida, has been awarded to **Hardlines: Design & Delineation**, an architect-run cultural resource management firm. The city of Baltimore has announced that **Rafael Vinoly Architects** has been awarded first place in the city's performing arts center design competition. New York architect **Harry Simmons**, principal of Simmons Architects and associate architect for the AT&T Building in Manhattan, died October 23 in a plane crash in Massachusetts. Los Angeles architect **John Lautner** died on October 24 at the age of 83.

Conference Presents Aquarium Trends

Combine two of the hottest trends in architecture—virtual reality and civic aquariums—and what do you get? A "virtual" aquarium that can showcase exotic creatures with large-format films and simulations rather than actually holding animals in captivity. That's the concept behind Aquasphere, a proposed "aquarium of the 21st century" that is being planned for the 1998 World's Fair in Lisbon, Portugal, and other settings.

Intended for cities that want to build aquariums without running afoul of animal rights groups—or those looking to supplement the exhibits of existing aquariums—the futuristic project is being developed by Santandrea Productions of Ojai, California. According to principal Carmine Santandrea, the idea is to reverse the typical aquarium-going experience by making visitors believe they're underwater.

The increasing use of such entertainment technology represents one of several new design directions that will shape the next wave of aquariums in the U.S. and abroad, according to speakers at an October conference in New Orleans on aquarium planning and management. Sponsored by the Waterfront Center of Washington, D.C., the conference also presented for-profit aquariums built with private financing; aquarium attractions within commercial developments such as shopping malls and gambling casinos; small aquatic museums and environmental learning centers for mid-sized towns; and the introduction of specimens never before exhibited, from giant whale sharks to microscopic marine plankton.

Although some aquariums are foundering financially—most notably, those in Camden, New Jersey, and Corpus Christi, Texas—more than a dozen cities are planning to open aquariums over the next five years, capitalizing on an ecotrend that saw four built in early 1990s.

The next large aquarium to open will be the Florida Aquarium in Tampa, designed by Esherick Homsey Dodge & Davis and set to debut in the spring of 1995. It will be followed by the South Carolina Aquarium in Charleston, designed by Eskew Filson Architects of New Orleans and Clark and Menefee of Charlottesville, Virginia; and the Alaska Sea Life Center in Seward, by Cambridge Seven Associates. Others are in the planning stages for Toronto, Denver, Syracuse, and many other towns from Houston, Texas, to Portland, Maine.

The aquarium conference was followed by the Waterfront Center's 12th annual conference on waterfront development and waterfront awards program. This year's top honors recognized plans to reunite cities with their riverfronts: Dusseldorf, Germany, was honored for burying a highway that cut the city off from the Rhine River, and New Jersey was honored for the planned transformation of more than 12 miles of derelict waterfront into a continuous public walkway with views of Manhattan.—*Edward Gunts*

News

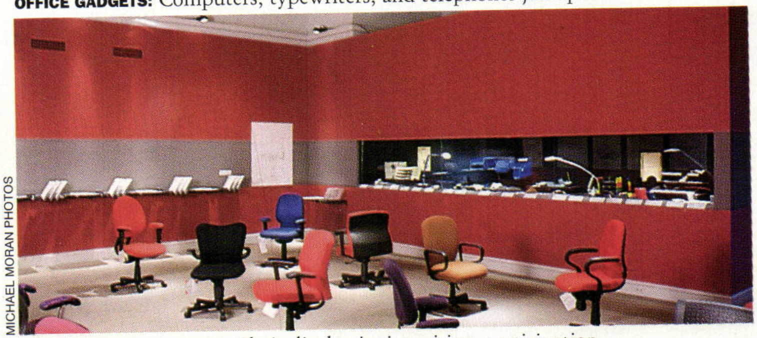
Cooper-Hewitt Displays Changing Office

The subtitle of the new exhibition at New York's Cooper-Hewitt Museum, "Good Offices and Beyond: The Evolution of the Workplace," is a misnomer. Rather than focusing on the place of work, this exhibition explores the management of time, numbers, paper, and information. Ironically, the shift of emphasis from the office container to what's contained in the office supports the show's most significant theme: Office machines and gadgets affect the workplace far more than the workplace shapes them.

On view through February 26, 1995, "Good Offices and Beyond" juxtaposes old and new examples of business interiors, machines, advertisements, and materials. These comparisons suggest that paper is the leading progenitor of office design, from wall-sized filing cabinets to ballpoint pens and a host of labels, markers, notebooks, and binders. In fact, the show could have been subtitled "The Evolution of the Paper Clip," because the changing shape of this humble tool mirrors the transformation of the 20th-century office. Within the exhibition, a heavy, brass-and-wood paper clip, circa 1900, exudes the same sense of heavy permanence as a nearby photograph of Frank Lloyd Wright's Larkin Building in Buffalo, New York. Despite its celebrated openness and flexibility, Larkin's central atrium is enclosed by masonry columns and spandrels. On the other hand, today's bent-metal paper clip—totally flexible, disposable, and transportable—matches one of the newest office designs in the exhibition, Lisa Krohn's 1993 Cyberdesk. A kind of wearable office, Krohn's prototype is fitted with video and aural access stems, and the pendant at the front of its necklace-like device features a tracking ball for computer manipulation and touch keys to activate software programs.

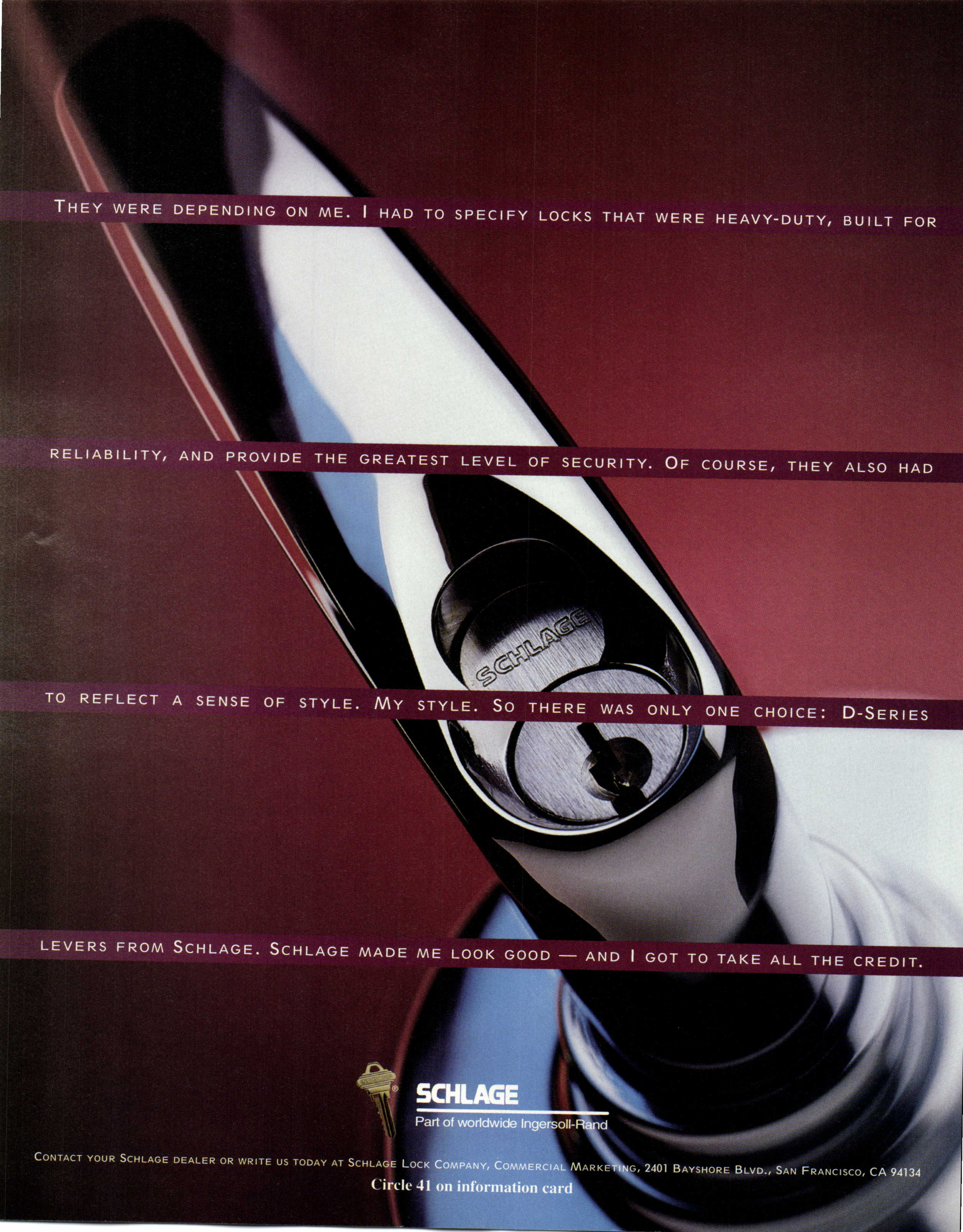
Another aspect of the mobile-office movement is the growth of home offices. In 1993, according to an exhibition time line, 7.6 million people worked at home during normal business hours. It's predicted that by the end of 1994, sales figures for personal computers used in the home will equal those used in offices for business. This domestic office will require new technologies, spaces, and furnishings to satisfy the very different natures of home and office. It will also demand the first psychological reconsideration of the office since the demise of medieval cottage industries. As this provocative exhibition reveals, the office isn't so much disappearing as it is expanding, resulting in a diaspora of workaholics.—*Donald Albrecht*

OFFICE GADGETS: Computers, typewriters, and telephones juxtaposed.



MICHAEL MORAN PHOTOS

LABORATORY OF SEATING: Chair display invites visitor participation.


They were depending on me. I had to specify locks that were heavy-duty, built for
reliability, and provide the greatest level of security. Of course, they also had
to reflect a sense of style. My style. So there was only one choice: D-Series
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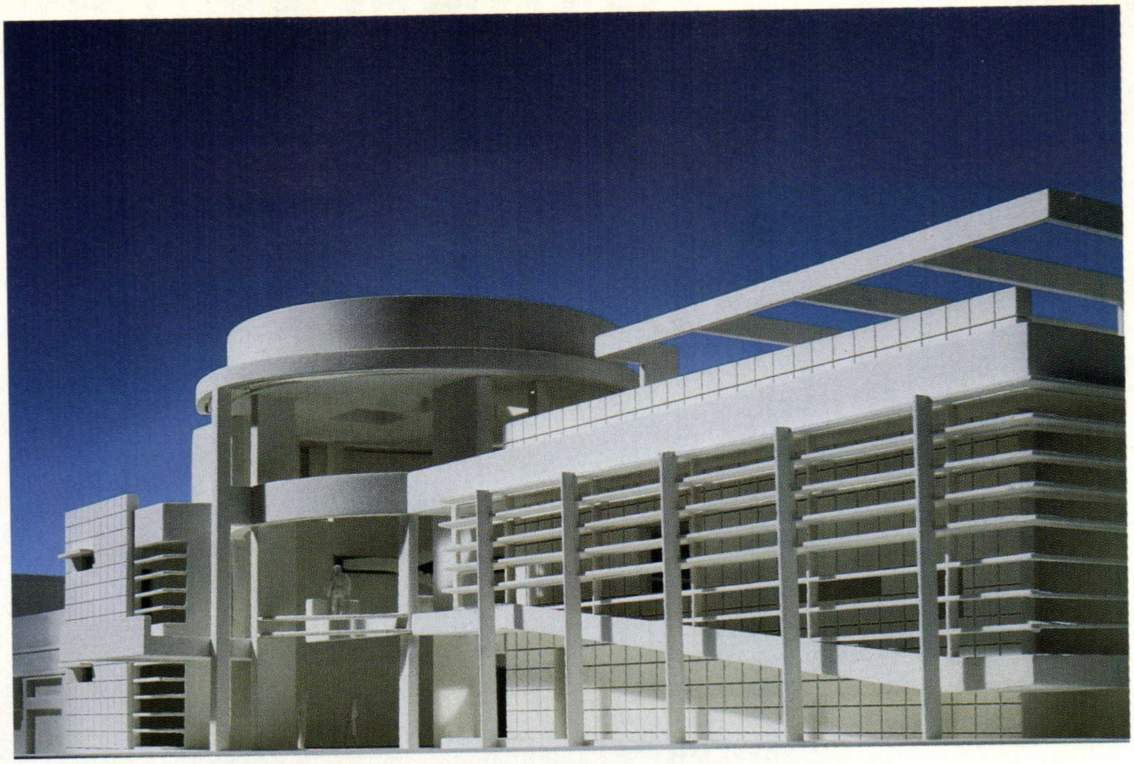
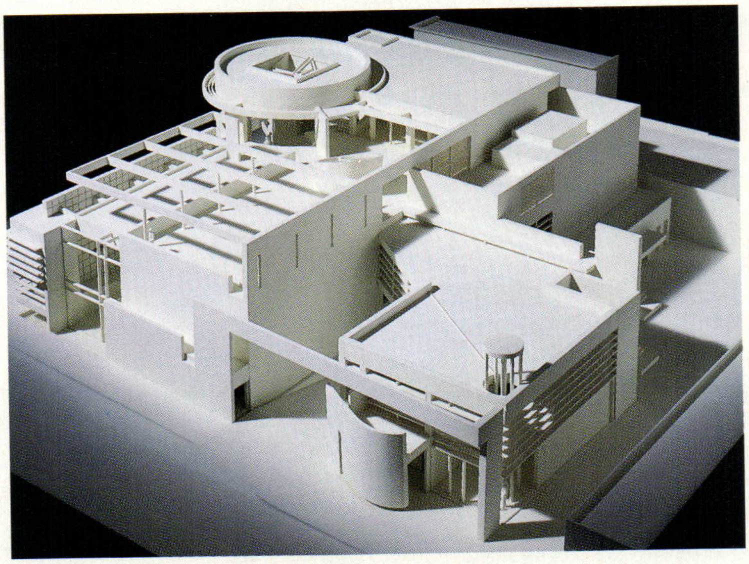
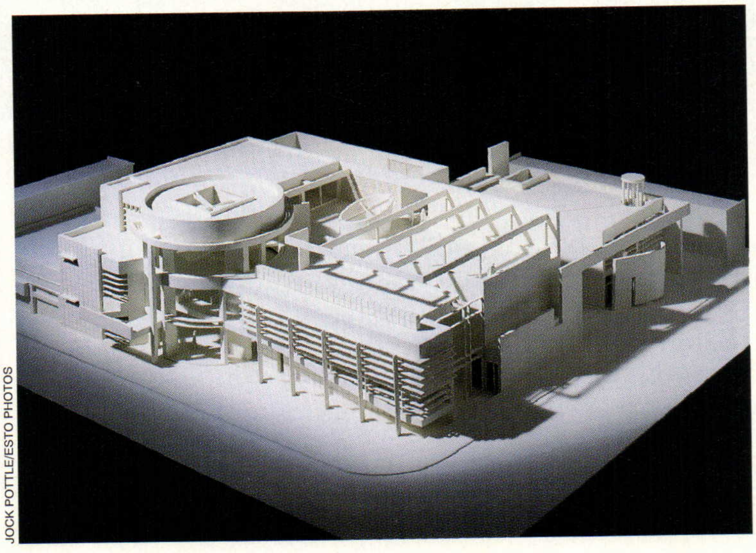
On the Boards

A Los Angeles museum will augment TV and radio programs with high-tech media.







JOCK POTTLE/ESTO PHOTOS

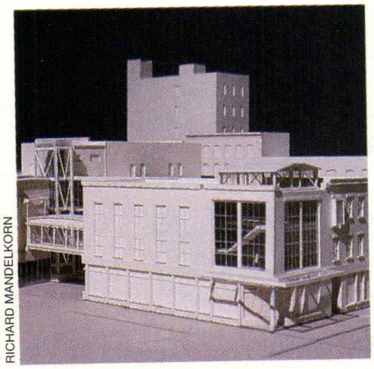
Museum of Television & Radio
Los Angeles, California
Richard Meier & Partners

Modern technology has enabled the Museum of Television & Radio in New York City to duplicate its 60,000-item collection of television and radio programs and commercials, and create a West Coast counterpart with identical holdings. Richard Meier & Partners will renovate an existing bank in downtown Beverly Hills to accommodate the 23,000-square-foot facility, which will be armed with interactive radio, television, and video equipment; satellite transmission capabilities; and stations for telecommunications.

Meier plans to explode the bank's existing envelope, adding projecting sunshades and wall planes constructed of light-colored stone and metal panels. A triple-height circular rotunda will adjoin a glass-enclosed ramp on the building's northeast facade, connecting a theater and ground-level galleries to a second-story library and console room. A circular stair in the atrium's top level will lead to a roof garden.

Exhibitions and screenings will run concurrently in both the Los Angeles museum and its 1991 New York predecessor, which is located in the Philip Johnson-designed William S. Paley Building. Construction is scheduled to begin next month; the renovation will be completed by the end of 1995.—*Ann C. Sullivan*

On the Boards

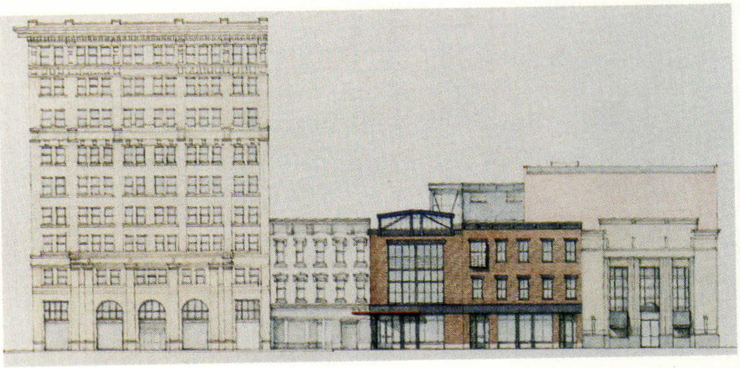


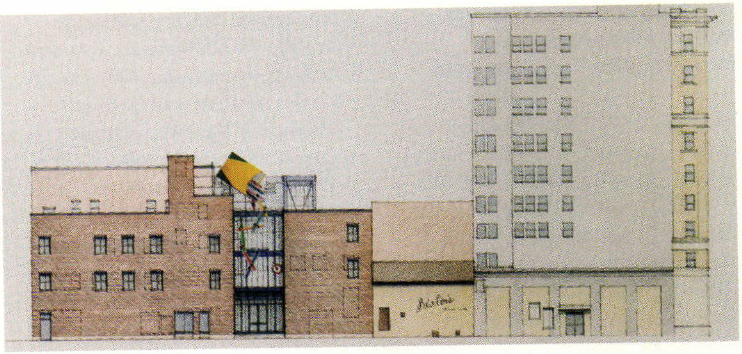
RICHARD MANDELKORN

Two Rivers Landing
Easton, Pennsylvania
Schwartz/Silver Architects
Wallace & Watson Associates

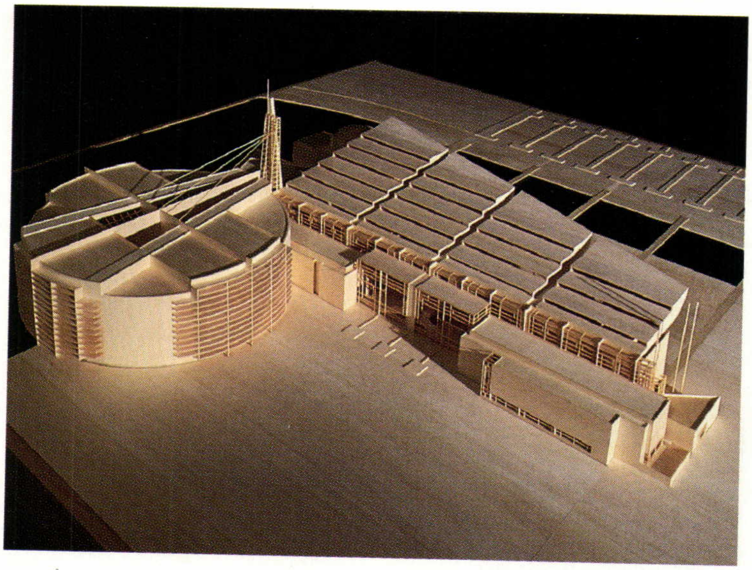
Five vacant buildings in Easton, Pennsylvania will be transformed into a Crayola Crayons children's museum, a national canal museum, and retail space. The site of the development, called Two Rivers Landing, is sandwiched between a 10-story office building and three-story jewelry store to the east, and three-story bank to the west.

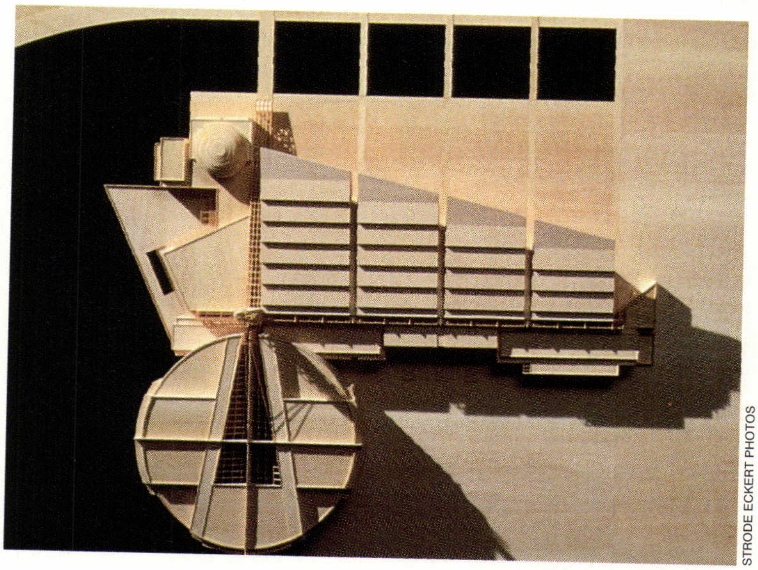
Schwartz/Silver designed the complex to reflect Easton's industrial roots and the making of crayons. Stucco facing and curtain walls added in the 1950s and 1960s will be removed to reveal the masonry facades of the original buildings. A steel-and-glass pedestrian bridge and glass-clad elevator will link the buildings. Construction is scheduled to begin early next year.—*A.C.S.*





On the Boards



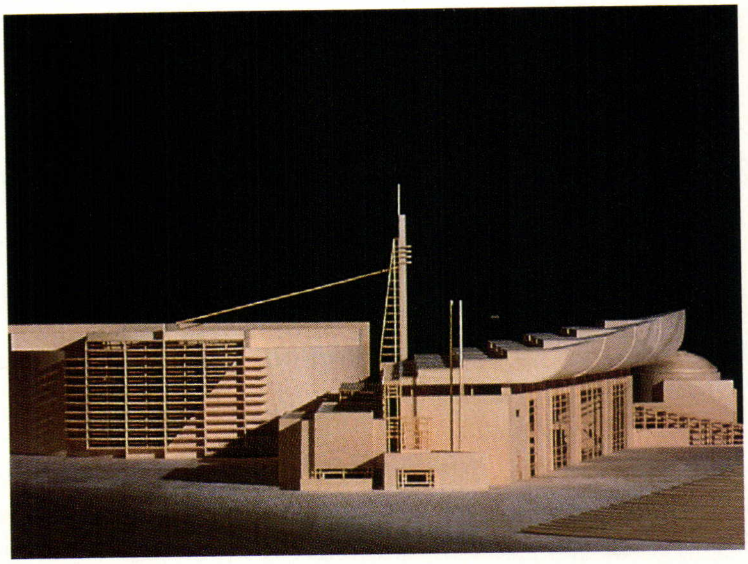


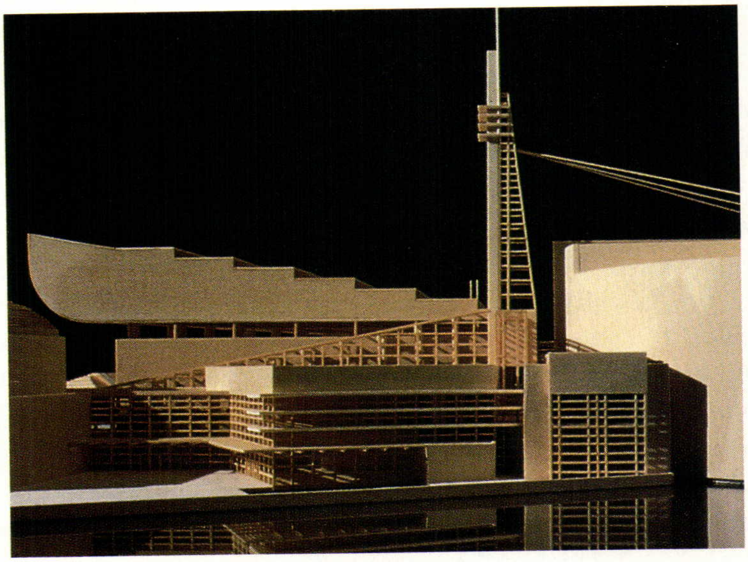
STRODE ECKERT PHOTOS

Evergreen AirVenture Museum
McMinnville, Oregon
Thompson Vaivoda & Associates

As early as 1997, the Evergreen collection of historic aircraft, including Howard Hughes' *Spruce Goose*, will be on display in the Evergreen AirVenture Museum, a $40.5 million museum and training facility designed by Portland, Oregon-based Thompson Vaivoda & Associates. Aeronautical imagery will distinguish the 240,000-square-foot structure from its pastoral, 200-acre site, 36 miles southwest of Portland.

Thompson Vaivoda organized the museum around a circular skylit gallery, which will house the museum's main attraction, the HK-1 Hughes Flying Boat—commonly known as the *Spruce Goose*. The 1947 wooden aircraft will be suspended above a reflecting pool drawn from





the adjacent manmade lake. Tension cables will extend from a central control tower and bisect the structural steel members that span the 350-foot-diameter space.

The architects designed a spine of rectangular exhibit spaces and offices that run north-south along the perimeter of a 78,000-square-foot, wedge-shaped airplane hangar, distinguished by a sweeping, curved roof. The observation tower will mark the intersection of this corridor with the east-west entrance axis.

The Oregon Center for Aviation Technology and Training will occupy the hangar at the eastern end of the museum, where dozens of historic aircraft will be exhibited to educate visitors about the operation, maintenance, and preservation of airplanes. An adjacent landing strip will accommodate the museum's demonstration flights.—*A.C.S.*

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The Arts Club is Chicago's latest preservation casualty.

Mies-Designed Interior Faces Demolition

Chicago's tradition of erecting architectural masterworks is all too often paralleled by its habit of tearing them down. Buildings as historically distinguished as H.H. Richardson's Marshall Field Wholesale Store, Frank Lloyd Wright's Midway Gardens, and Adler & Sullivan's Schiller Building and Chicago Stock Exchange Building have been demolished over the past 60 years with an embarrassingly regular rhythm.

The latest casualty is soon to be Mies van der Rohe's Arts Club of Chicago, unique because it represents the only major space Mies designed strictly as an interior. The Arts Club, a 75-year-old private institution whose breadth of activities is implied by its name, commissioned Mies in 1949 to design a two-story space at 109 East Ontario Street, a building completed in 1951.

Mies produced an ensemble of three rooms: a lounge and auditorium, a public art gallery, and a refectory, all linked in a first-rate example of Mies's well-known gift for serene spatial flow. The proportions of the rooms, as generous as they are exacting, are enhanced by elegant materials and even by the resourceful manner in which Mies accommodated the club's traditional furniture to his own lean, understated building style.

The most celebrated feature of the Mies design is a staircase that leads from the ground floor to the club's upstairs rooms. This element is a marvel of geometric abstraction, its slender lineaments conveying a lighter-than-air buoyancy.

Chicago developer John Buck has taken over both the Arts Club building and the entire block around it, whose components include several of the statelier facades fronting historic Michigan Avenue. Buck intends to replace the block with a mall of shops and theaters, to start construction early next year. These declared plans by the developer, as well as recently published sketches of his proposal, guarantee that the new building will be cheaply constructed, another meretricious addition to Michigan Avenue, which has already been fouled a few blocks away by a group of recent, papery PoMo hulks. Meanwhile the Arts Club intends to build a new building nearby.

In rejecting the proposals to save either the Arts Club or its surrounding block, the Commission on Chicago Landmarks has managed to turn its back on Chicago's most important cultural asset, architecture, which has earned the city international attention and respect.

Franz Schulze is the author of Mies van der Rohe, a Critical Biography *(1985) and* Philip Johnson: Life and Work, *published in November.*

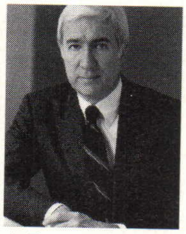
ARTS CLUB: Mies-designed stair visible from street.

LOUNGE: Lean design complements furnishings.

STAIRCASE: Club's most elegant element.

Photograph by Barbara Karant, courtesy of LCOR, Inc., developer of the Chicago Title and Trust Center.

Gene Kohn On Originality



A. Eugene Kohn, FAIA

"Architects, like artists, are influenced by their predecessors and their peers.

Originality evolves from the interpretation and combination of these influences with one's own talent, creativity and philosophical approach. A work of architecture is a success when it is built with invention, while still respecting the past. At Kohn Pedersen Fox we seek originality in all our projects – a building may be on the cutting edge, but it is still based on the sound footings of past experience."

Chicago Title and Trust Center was designed by Kohn Pedersen Fox and brings an aesthetic boldness to the Loop's architecturally varied skyline. The architects specified Kynar 500®-based finishes.

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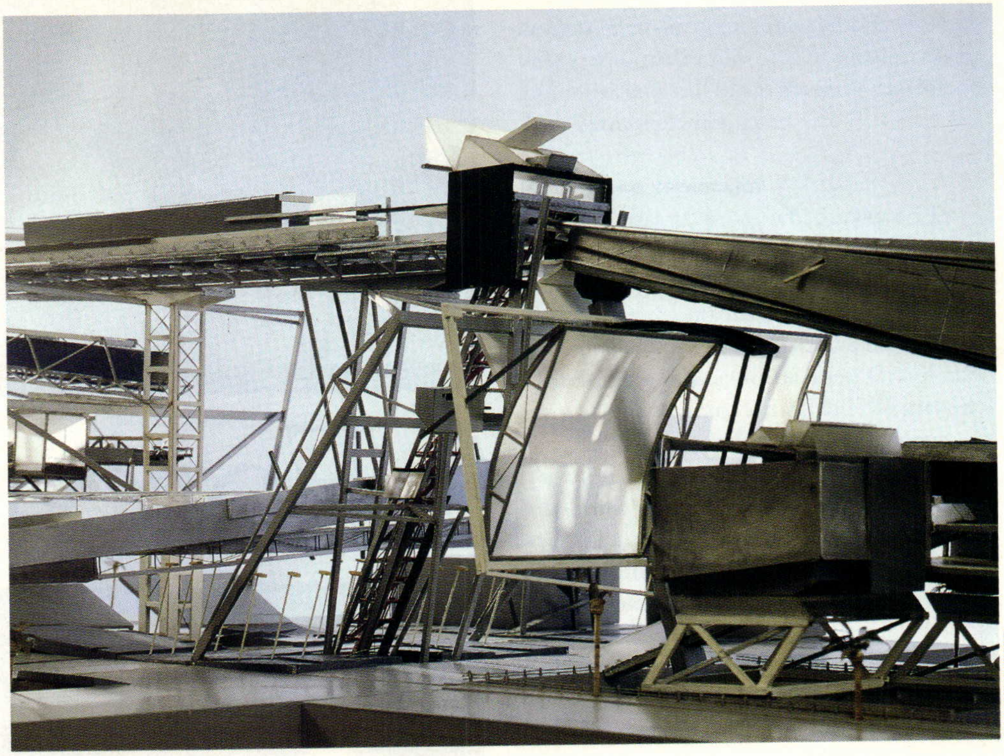


The Tyranny of Political Correctness

Joseph Giovannini argues that multiculturalism is replacing an old dogma with a new one.

ABOVE: Hani Rashid and Lise-Anne Couture's winning entry to the West Coast Gateway Competition in Los Angeles, a freeway monument to U.S. immigrants, symbolizes multiculturalism through fragmented form.

Ayatollahs have recently emerged in architecture professing to hold the one and only truth. Purporting to know, as one editor put it, "the real problems of our culture," they have fingered form as decadent and elitist. The new fundamentalism, dangerous because of dogmatism based on a perceived moral imperative, risks polarizing the profession as it discredits and erases significant work of the last generation. Books—and yellow trace—are burning.

The driving force is the politics of identity—a.k.a. multiculturalism—and the horsemen of the apocalypse are gender, race, and class, with the greens and the politics of suburbia playing supporting ideological roles. Together, the issues are coalescing into a new "politically correct" basis of design that is colliding increasingly with architecture practiced as art or as technology. The traditional left is now divided between conservatives and liberals, the conservatives arguing against what they consider precious, overwrought buildings designed as high-tech or deconstructed jewels without redeeming social value. What has been called a "culturalist paradigm" appears to be threatening design conceived according to the established paradigms of art, history, and technology prevalent most of the century.

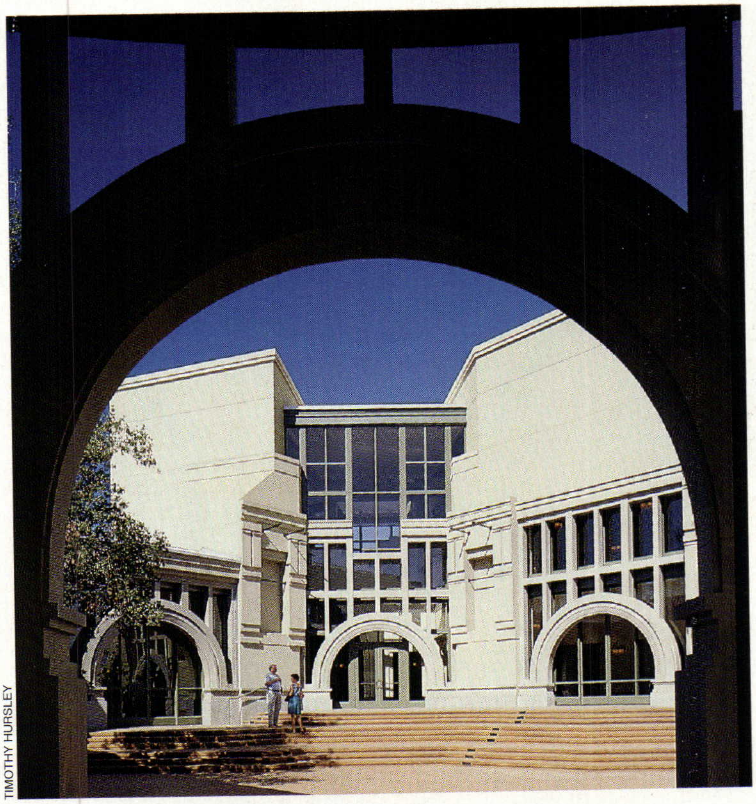
Recently, several cultural institutions mounted enlightened shows that legitimately ushered the issues into a public forum. Last year at the Cooper-Hewitt Museum of Design in New York City, the popular exhibition "Mechanical Brides: Women and Machines From Home to Office" showed how advertising and design "gendered" appliances, creating a lovely, pink world that cast women as the little ladies. At the Storefront for Art and Architecture, also in New York City, "Queer Space" revealed how a sexual minority sees and understands public and private space. And through December 11, the Wexner Center for the Visual Arts at Ohio State displays "House Rules," an invitational exhibition in which the suburban house is redesigned by architects paired with cultural theorists. The house and neighborhood are reconceived and reconfigured to reflect emerging social issues. Conferences and books such as *Sexuality and Space* and *Out of Site: A Social Criticism of Architecture* proliferate. Students in a seminar conducted by New York architect Jack Travis redesigned Philip Johnson's Glass House in Afrocentric styles.

The social issues revealed in the shows are not the problem, rather it is their misuse in arguments that are often simplistic, careerist, and even contradictory to their own position. The basic impulse in multiculturalism is to break the normative molds of dominant cultures to allow the many constituent cultures their own space and legitimacy. That position is reasonable, healthy, and valuable, even if it means that comforting notions of social unity lapse: The center, because it defines a core that marginalizes everything else, no longer holds in a culture that releases its many constituent parts into their own independent but

ANDERSEN COMPLEMENTS THE ARCHITECTURE OF A CLASSI

ARCHITECTS: REESE, LOWER, PATRICK & SCOTT
BETHLEHEM, PENNSYLVANIA
PROJECT ARCHITECT: RANDY SOVICH, AIA

ARCHITECTURE



TIMOTHY HURSLEY

BUILDING FOR THE ARTS

Adapting older cultural institutions to accommodate changing collections and clientele is inevitably a tough assignment. Architects must satisfy trustees, curators, or musicians with state-of-the-art spaces while convincing the public that the building is the same venerable museum or concert hall they have always loved.

Even a brand new arts complex can be designed to appeal to local culture. In Southern California, Moore Ruble Yudell drew upon local turn-of-the-century civic buildings to create the California Center for the Arts (above), keeping historical memories intact by incorporating courtyards and arcades.

Whether new or renovated, Mission Revival or Modern, these buildings provide their clientele with technologically sophisticated galleries and auditoriums that will enrich their communities into the next century.

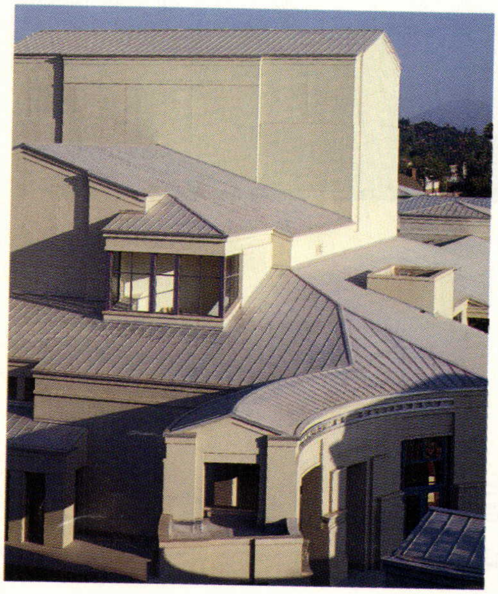
California Center for the Arts
Escondido, California
Moore Ruble Yudell, Architect

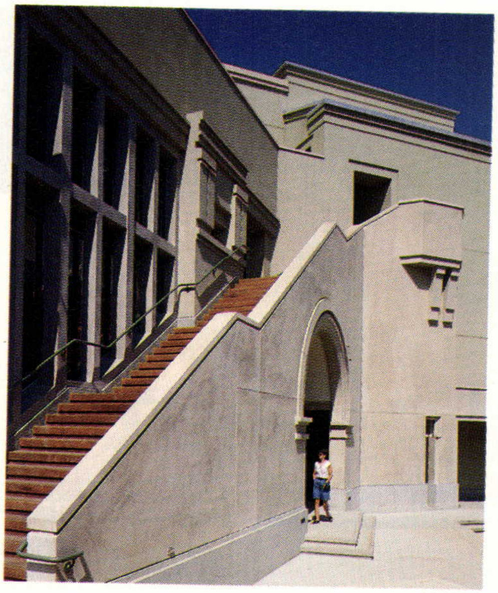
THESE PAGES: California Center for the Arts, as seen from Grape Day Park, comprises theater (below) with conference center behind it, concert hall (center), and art center (facing page, right).

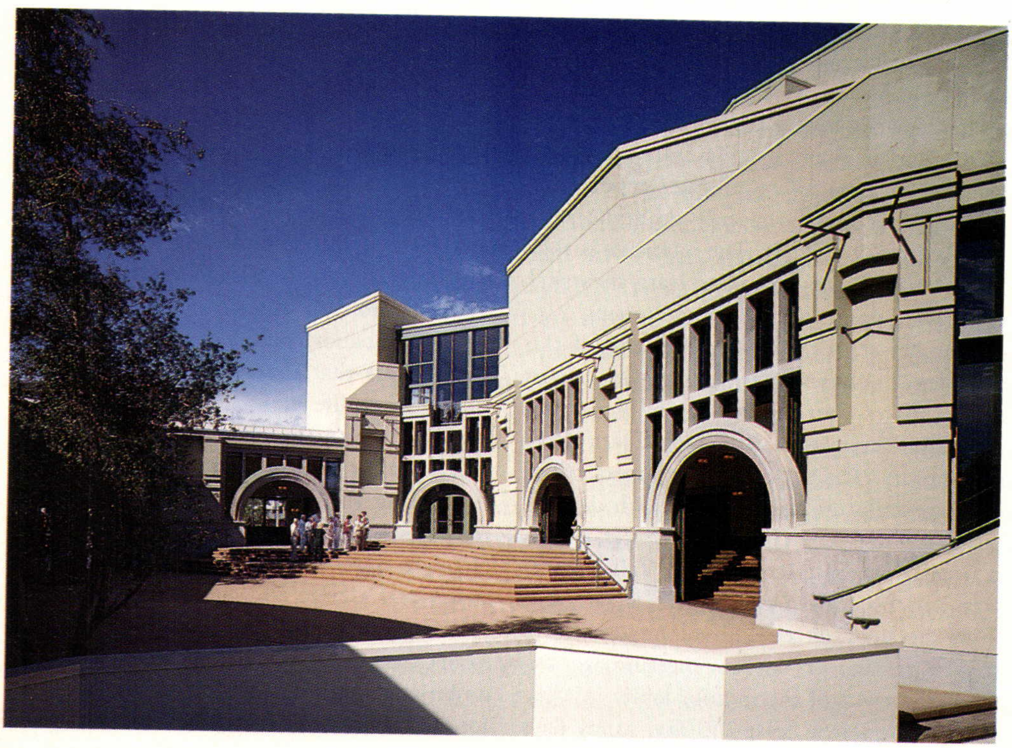
ARTS FUSION

The new California Center for the Arts, Escondido, is the latest addition to a host of public cultural facilities that have appeared on the Southern Californian horizon over the past decade. Beginning with the Orange County Performing Arts Center in Costa Mesa, which opened in 1986, the area surrounding Los Angeles has in recent years been transformed by the construction of lavish new arts complexes in Poway, Cerritos, Long Beach, and Thousand Oaks. Based on programs that fuse the "high" arts of symphony concerts, opera, and theater with popular programming such as musicals, community events, and public art, these new suburban centers present a picture of the cultural coming-of-age of a region whose population has grown rapidly in the last quarter of a century. At the same time, these arts complexes aim to create a distinct identity for small cities lying in the shadow of the Los Angeles colossus.

Escondido's $55 million Center for the Arts, designed by the late Charles Moore with his Santa Monica-based firm Moore Ruble Yudell, is one of the most ambitious of these new cultural complexes. A 1,524-seat concert hall and 408-seat theater are linked with an art center and a convention center on a 12-acre site on the

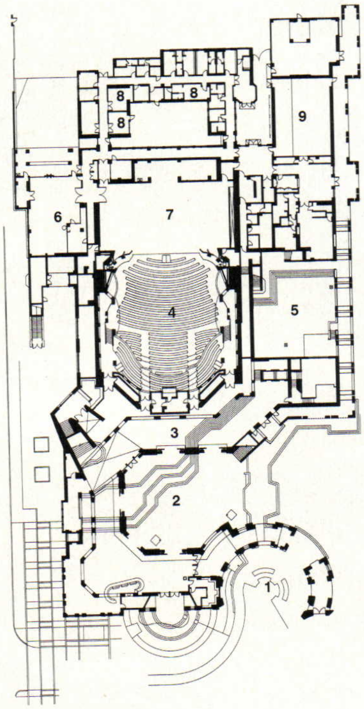






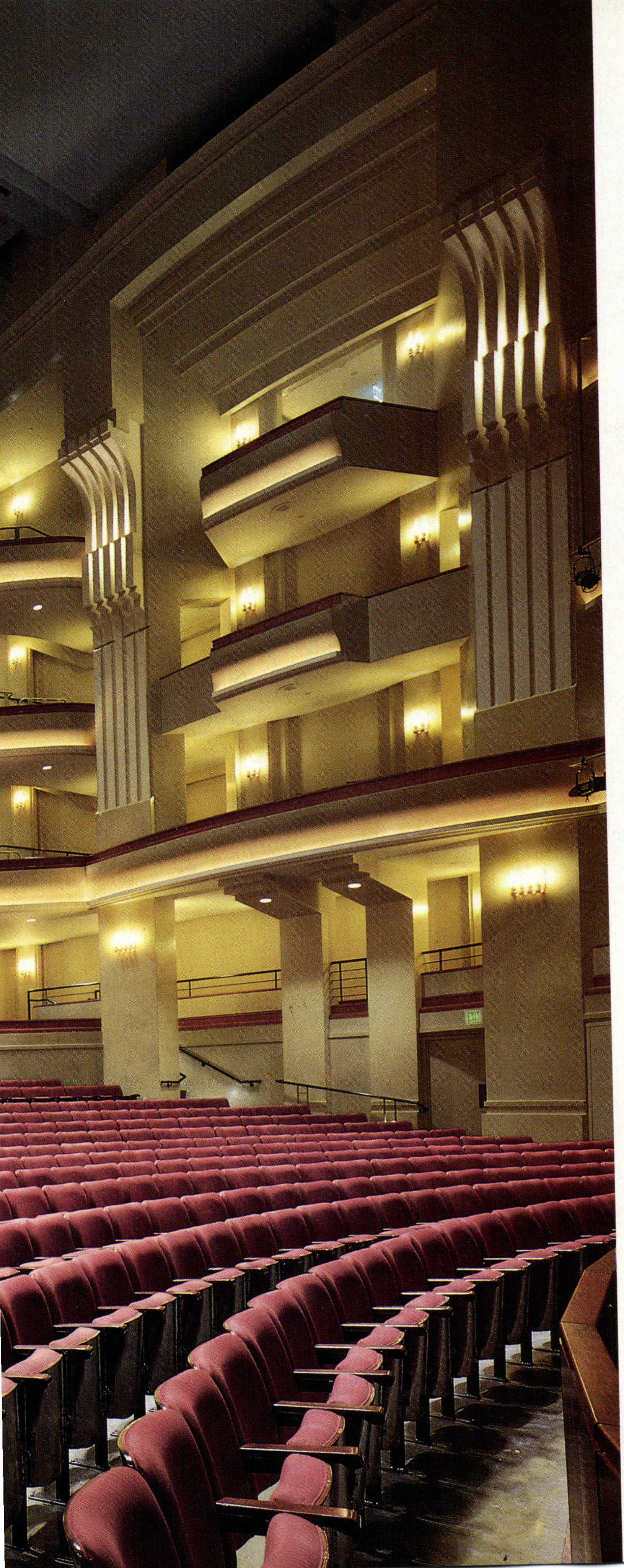
LEFT: Art center incorporates stucco colonnade with green window trim.
CENTER LEFT: Glazed lantern lights foyer of intimate theater.
CENTER RIGHT: Moore Ruble Yudell treated exit stair as a dramatic feature, articulating the mass of the concert hall's east elevation.
BOTTOM: Concert hall entry court presents permeable facade with archways backed by retractable glass doors.
FACING PAGE, TOP: Main access to the complex is marked by a free-form canopy suspended on steel rods over the concert hall's courtyard entry.
FACING PAGE, BOTTOM: North elevation of the theater incorporates arcade linked to concert hall.

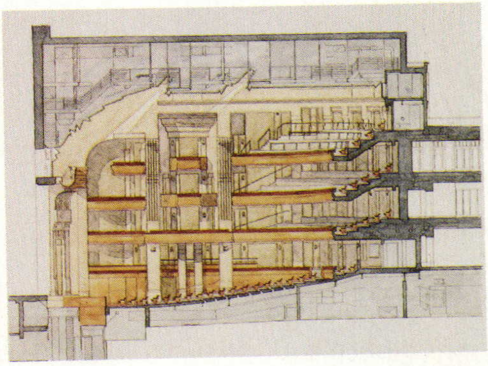
FACING PAGE: Grand staircase in concert hall foyer leads to balcony levels.
PLAN: Concert hall is flanked by entry courtyard to south (bottom) and by smaller courts on the east and west.
TOP: Colonnade surrounding concert hall courtyard creates an informal outdoor performance area.
CENTER: Thrust apron of concert hall's proscenium stage can be lowered to form an orchestra pit.
BOTTOM: Toplit gallery is one of three display spaces in art center museum.



CONCERT HALL PLAN 20'/6m

1 ENTRY COURT
2 PERFORMANCE COURT
3 FOYER
4 AUDITORIUM
5 PUBLIC COURT
6 ACTORS' COURT
7 STAGE
8 DRESSING ROOM
9 REHEARSAL ROOM





FACING PAGE: Concert hall's lighting emphasizes balconies and decorative piers framing boxes.
TOP: Proscenium faces audience in which no seat is more than 105 feet from the stage.
SECTION: Ceiling curves toward the stage, creating a sense of intimacy in the 1,524-seat concert hall.

CALIFORNIA CENTER FOR THE ARTS
ESCONDIDO, CALIFORNIA

ARCHITECT: Moore Ruble Yudell Architects & Planners, Santa Monica, California—Buzz Yudell (principal-in-charge, principal designer); Charles Moore, John Ruble (principal designers); James B. Morton (project director/associate-in-charge); Renzo Zecchetto (associate designer); Alfeo B. Diaz (production director/technical consultant); Martin Saavedra (project manager, concert hall); Hong Chen (project manager, theater); Denise Haradem (project manager, conference center); George Nakatani (project manager, art center); Neal Matsuno (project manager, site development); Linda Brettler, Camilo Carillo, Richard Destin, Ted Elayda, Angel Gabriel, Steve Gardner, John Johnson, Rebecca Kaplan, Jesse Marcial, Cynthia Phakos, Geoffrey Siebens, Eugene Treadwell, Heather Trossman, George Venini (design team)
LANDSCAPE ARCHITECT: Burton and Spitz
ENGINEERS: Ove Arup Partners (structural/mechanical/electrical); Kennedy/Jenks Consultants (civil)
CONSULTANTS: The Talaske Group (acoustics); Theatre Projects Consultants (theater); Tina Beebe (color); Audrey Alberts Design (interior); Nicholson Design (graphics/signage); Horton-Lees Design (lighting)
GENERAL CONTRACTOR: Robert E. McKee
COST: $55 million; $275 per sq. ft.
PHOTOGRAPHER: Timothy Hursley

Seiji Ozawa Hall
Tanglewood Music Center
Lenox, Massachusetts
William Rawn Associates, Architects

THESE PAGES: Seiji Ozawa Hall commands promontory at southern edge of Tanglewood Music Center.

DECORATED SHED

PAUL WARCHOL

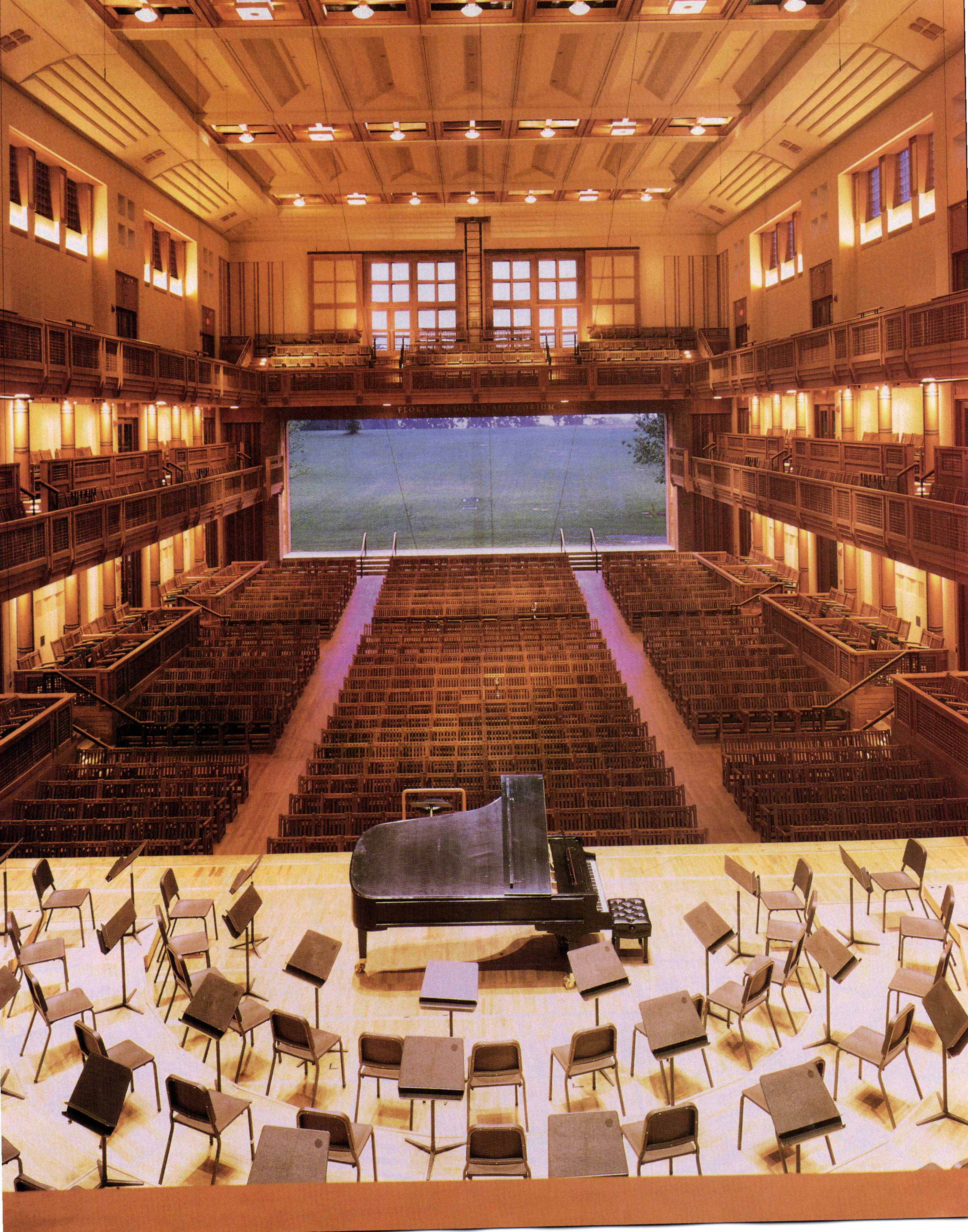
Tanglewood Music Center looks more like a campground than a campus, despite its renown as the seasonal home of the Boston Symphony Orchestra (BSO) and school for promising musicians. Every summer, the center's wooden sheds emanate arias, concertos, and symphonies across a sylvan promontory in the Berkshire Mountains of Lenox, Massachusetts, where "cottages" like The Mount, Edith Wharton's 1902 estate, transformed the region into a fashionable summer resort. So when the BSO decided in the mid-1980s to replace Tanglewood's barnlike theater with a serious concert hall, it envisioned an auditorium with the spatial qualities of a picnic shed and the resonant acoustics of Boston's Symphony Hall.

The BSO posed this paradoxical challenge to architect William Rawn and acoustician R. Lawrence Kirkegaard, whose collaboration resulted in a warm, if fussy, auditorium that is shedlike enough to engage the surrounding landscape yet closed enough to ensure reverberant sound for concerts and recordings. Since the opening of the hall's first summer season in July, its acoustics have been widely praised, except for complaints that high-frequency string notes seem muffled. Already, Kirkegaard has corrected the problem by removing a one-eighth-inch layer of insulation from the hall's ceiling.

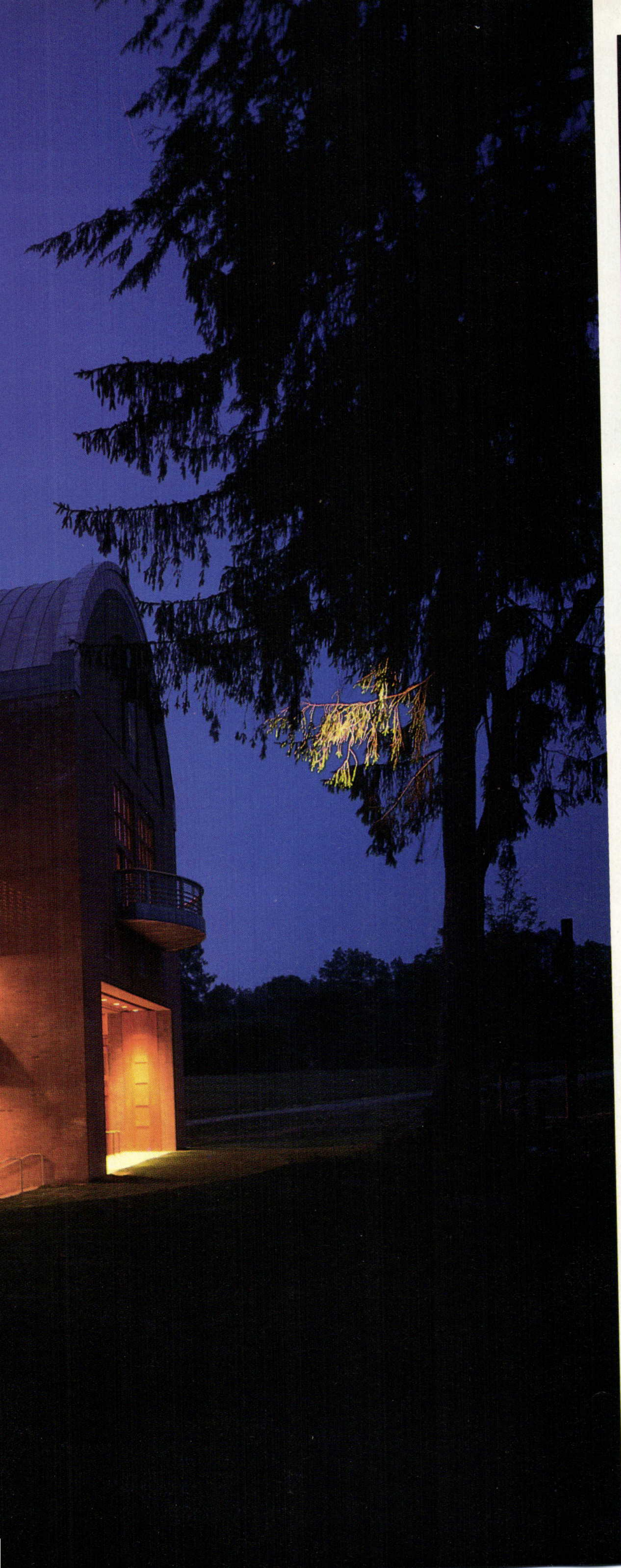
Named after Seiji Ozawa, BSO's music director since 1973, the new, 1,200-seat concert hall takes over the functions of the music center's 1941 opera theater, a primitive teaching auditorium designed by Eliel and Eero Saarinen. This theater is exemplary in its woodsy, Modernist restraint, but only a humble companion to Tanglewood's 1938 Koussevitzky Music Shed, where most concerts take place. Conceived by Eliel Saarinen in the mid-1930s, this beloved, steel-framed amphitheater seats 5,000 under its roof and 10,000 on a surrounding lawn, where Tanglewood's casual, camplike atmosphere culminates in the experience of music in nature.

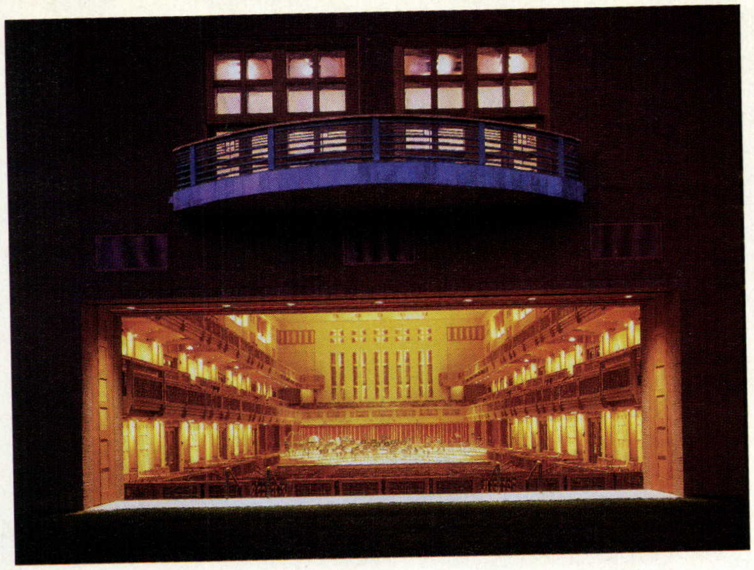
Unlike the modest vernacular of these existing auditoriums, Ozawa Hall establishes a fine-tuned stage for students, teachers, and performers, whose music fills the room and expands around the audience without dissipating in the summer heat. Rawn and Kirkegaard arrived at the hall's monumental shoebox proportions during their tour of the world's best concert halls, including the opulent Musikvereinsaal in Vienna (1870) and McKim, Mead, and White's Symphony Hall in Boston (1901). The architect modeled Ozawa Hall's interior on the Musikverein-

LEFT: Teak railings screen balconies. Ground-floor loge boxes are accessible from exterior porches.
BOTTOM: Shuttered windows above stage suggest traditional organ loft. Rawn designed movable teak chairs to look like garden furniture.
FACING PAGE: Perimeter windows and entrances correspond to concert hall's A-B-A structural bays. Teak-framed doors above opening to lawn lead to public balcony.



THESE PAGES: View from pedestrian approach shows lantern effect of concert hall's gridded railings and windows at night.
FACING PAGE, TOP: 400-pound teak panels fold into wall to create prosceniumlike view from lawn.
FACING PAGE, BOTTOM: Rawn oriented concert hall to gently sloping lawn for outdoor audiences.



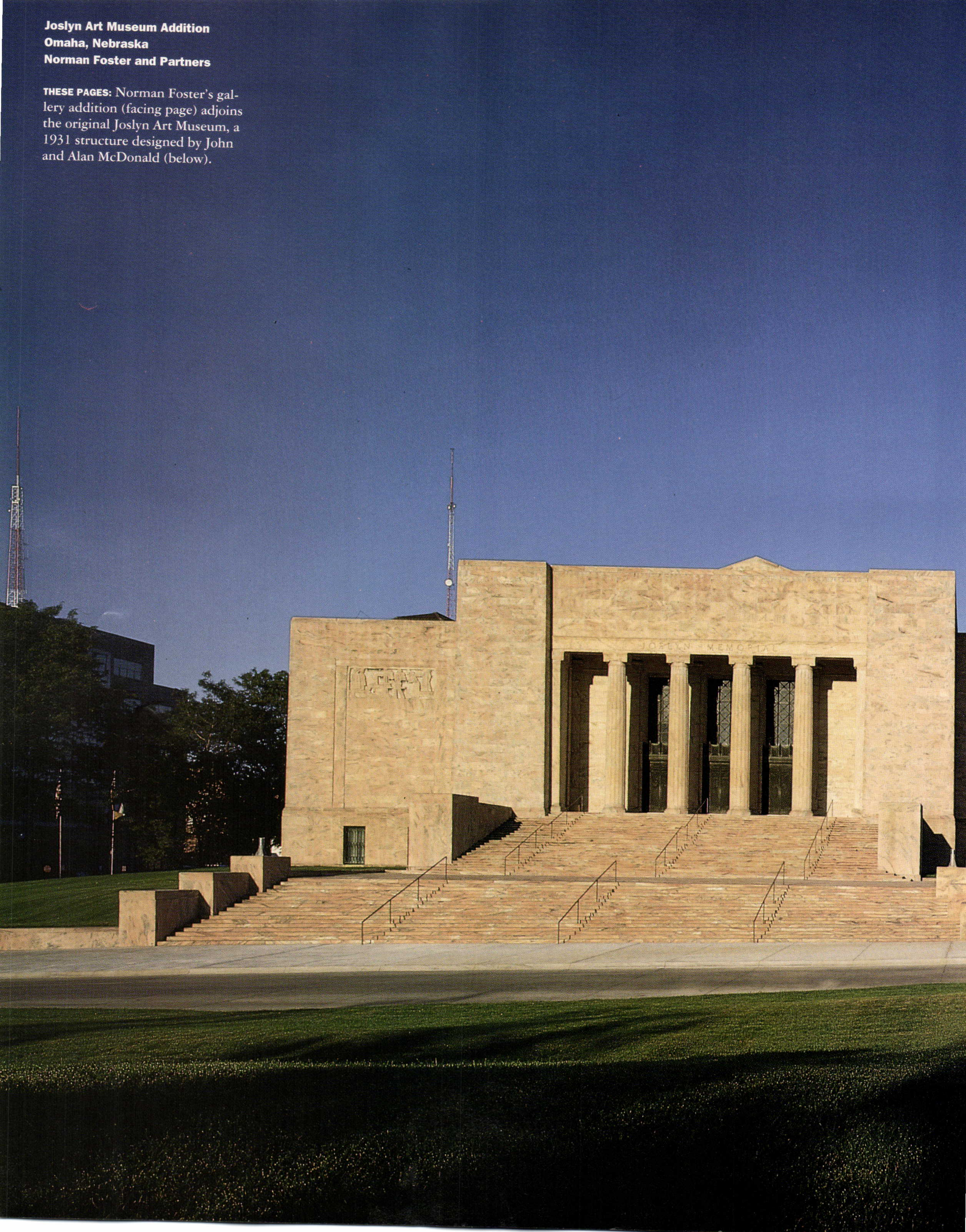


SEIJI OZAWA HALL
TANGLEWOOD MUSIC CENTER
LENOX, MASSACHUSETTS

ARCHITECT: William Rawn Associates, Architects, Boston—William L. Rawn III (principal-in-charge of design); Alan Joslin (senior associate/project architect); Clifford V. Gayley (associate/job captain); Cressler Heasley, Doug Johnston, Jack Robbins, Tomas Rossant, Laura Yanchenko, Richard Yeager, David Yosick, Elizabeth Zachos (design team)
LANDSCAPE ARCHITECT: Michael Van Valkenburgh Associates
ENGINEERS: LeMessurier Consultants (structural); TMP Consulting Engineers (mechanical); Lottero+Mason Associates (electrical); Foresight Land Service (civil); GZA (soils)
CONSULTANTS: R. Lawrence Kirkegaard & Associates (acoustics); Theatre Projects Consultants (theater); Donnell Consultants (cost); Seating Dynamics (seating); Jon Roll & Associates (signage)
MASTER PLAN: Carr Lynch Hack & Sandell (with William Porter)
GENERAL CONTRACTOR: Suffolk Construction Company
COST: \$7.5 million; \$208 per sq. ft.
PHOTOGRAPHER: Steve Rosenthal, except as noted

Joslyn Art Museum Addition
Omaha, Nebraska
Norman Foster and Partners

THESE PAGES: Norman Foster's gallery addition (facing page) adjoins the original Joslyn Art Museum, a 1931 structure designed by John and Alan McDonald (below).



AMERICAN DEBUT

When Omaha's Joslyn Art Museum commissioned Norman Foster to expand its landmark 1931 structure, the unstated architectural issue was one of presence. Designed by John and Alan McDonald and heavily influenced by Bertram Goodhue's Nebraska State Capitol (1920-32), the original templelike museum, often classified as "Egyptian Deco," was detailed so that its cubic volumes seem carved from live rock. The weight of its mass, closure of forms, and gravity of tone are lightened only by decorative geometries and turbulent patterns in its marble surfaces.

Foster responded by deferring to the McDonalds' museum without fawning. "We felt it was a point of honor to leave the [original] building untouched," noted the British architect in a lecture last year.

LEFT: Atrium linking Foster addition and 1931 McDonald structure doubles as a restaurant and reception area. Glazing is 1 inch thick, double-paned, with a thin-film inner layer that reduces UV transmission.

BOTTOM LEFT: Atrium is defined by walls surfaced in Georgian pink marble. Aluminum frames span steel beams to support skylight. Crossbraces support glass end wall. Architects concealed radiant heating, fire sprinklers, and electrical conduits above beams.

FACING PAGE, TOP: Gull-winged ceiling springs from wall between galleries.

FACING PAGE, BOTTOM LEFT: Fins below gallery skylights are constructed of wallboard over steel frame.

FACING PAGE, BOTTOM RIGHT: Daylight from north-facing clerestory is diffused by bouncing off fin onto ceiling.

JOSLYN ART MUSEUM ADDITION
OMAHA, NEBRASKA

ARCHITECT: Norman Foster and Partners, London, England—Norman Foster (principal-in-charge); David Nelson (project director); Nigel Dancey (project architect); Sabiha Foster, Ken Shuttleworth, Graham Phillips, John Ball, Hing Chan, Lulie Fisher, Nigel Greenhill, Tom Leslie, Justin Nicholls, Adele Pascal, Kate Peake, Charles Rich (design team)

ASSOCIATE ARCHITECT: Henningson, Durham & Richardson, Omaha, Nebraska—Patrick McDermott (project principal); Bruce Carpenter (project manager); Douglas Wignall, Jeff Cramer, Patrick Leahy (design team); Greg Gensler (architectural technician)

LANDSCAPE ARCHITECT: Henningson, Durham & Richardson

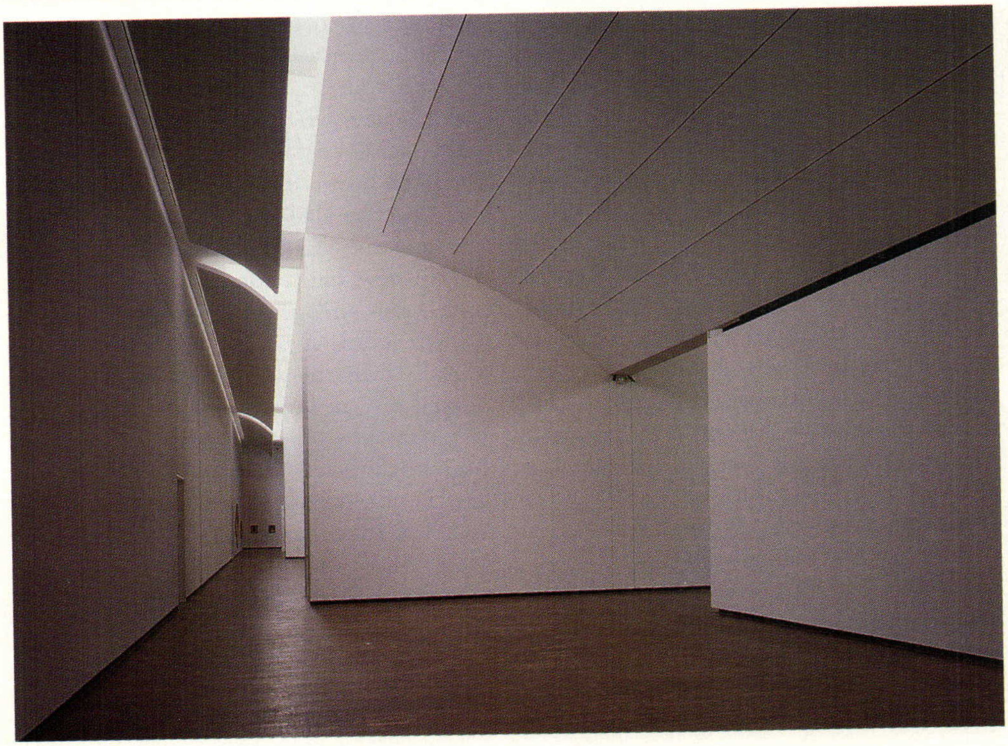
ENGINEER: Henningson, Durham & Richardson (structural/mechanical/electrical)

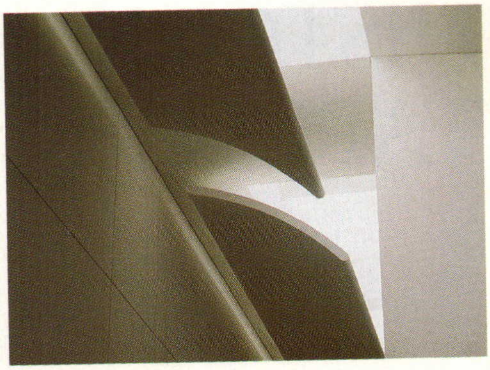
CONSULTANTS: Thomas Morrow (food service); Robert F. Mahoney and Associates (acoustics); Claude Engle (lighting)

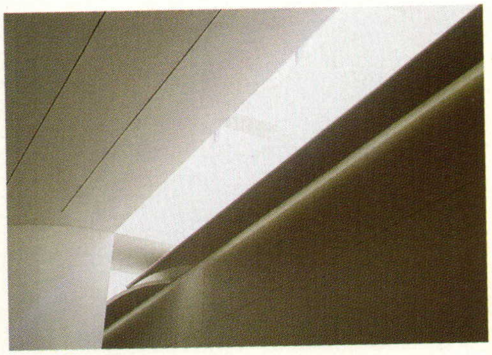
GENERAL CONTRACTOR: Kiewit & Sons

COST: $15.9 million

PHOTOGRAPHER: Thomas Kessler







HISTORIC TAPESTRY

The rich of Providence, Rhode Island, according to a local adage, live on Power Street while the poor live on Hope. Benefit Street—an urban tapestry of mansions, venerable institutions, and contemporary college hangouts—weaves these diverse threads together. The Museum of Art of the Rhode Island School of Design (RISD) has been part of this scene since 1893, when it was established to connect the city's immigrant artisans to Europe's high-art traditions. To house its encyclopedic collection of art, furniture, decorative objects, and textiles, the museum expanded through three stages of construction into a complex of Neo-Romanesque, Colonial Revival, and Queen Anne-style buildings, disrupting its logical circulation with dead-end galleries.

In the late 1980s, RISD decided to build new contemporary art galleries and storage facilities. Philadelphia-based Tony Atkin & Associates won the commission largely by suggesting that the new wing offered an opportunity to connect the institution's frayed spatial sequences. Atkin reopened closed circulation routes and extended existing axes, linking the new Daphne Farago Wing to the old building on three levels. He also accommodated future expansion into an existing courtyard by cladding the windowless Waterman Street facade in stucco.

The new wing's exterior forms, materials, and details strengthen the museum's ties to Benefit Street. A tall granite bollard directs visitors down a gentle ramp, following the diagonal of a nearby stone wall. The wing's programmatic function, joining various historic structures, is manifest on its tripartite east facade, where materials and scale respond to context. Atkin's red brick elevator tower discreetly matches RISD's Neo-Georgian Pendleton House and Charles Platt's 1906 annex, both to the south. To announce the new wing's entry with contemporary clarity, Atkin rendered the middle section as a monumentally scaled, steel-and-glass

checkerboard. The north end, cloaked in eggplant-colored slate shingles, disappears behind the mock-Tudor excesses of Carr House.

The Farago Wing also responds to context in plan, but with less success. Beyond the entry, two stairways complement the diagonal established by the exterior ramp. This angularity jars against the right-angled restraint of the existing buildings. The main staircase to the upper gallery seems too grand for the modestly scaled 12,000-square-foot wing, and the stair down to the entry gallery produces an awkwardly shaped space.

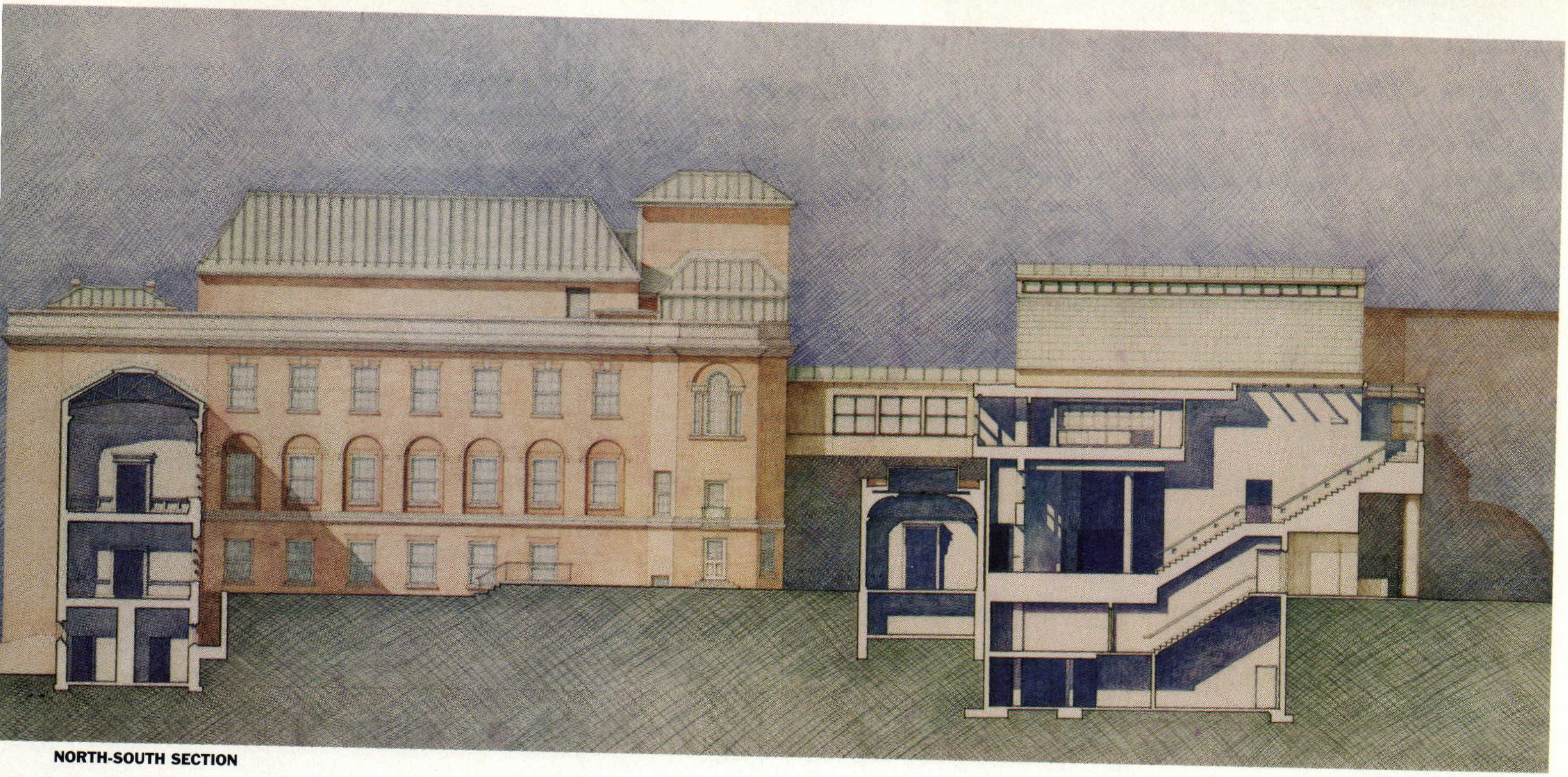
In contrast to the angularity of these ancillary spaces, the upper gallery is a simple rectangle. Here, hidden cove windows skim soft daylight across the barrel-vaulted ceiling to beautiful effect. Movable fiberglass-clad baffles, adjusted by exposed cables and marine winches, control natural illumination on contemporary art installations. Inspired by Louis Kahn's Kimbell Museum in Fort Worth, Atkin's interpretation, however, suffers from an overdose of structural expressionism: Mechanistic elements conflict with the original character of the museum.

Befitting the wing's connective function, the best spaces are the interstitial ones. Reopened axes offer startling vistas, and a new, windowed bridge ties the upper gallery and the original museum. The bridge's significance is expressed on two planes: Programmatically, it joins old and new structures. Conceptually, the bridge links RISD's Museum of Art to its cultural roots.

Through windows on one side, visitors view museum buildings, massed and jumbled with Escher-esque complexity; on the other, a cityscape of elegant Georgian church spires and proletarian smokestacks. Cases displaying decorative objects flank the windows, recalling the museum's origins in the city's craft industries. Weaving art and industry, the bridge reinforces the Daphne Farago Wing's position within Providence's urban fabric.—*Donald Albrecht*

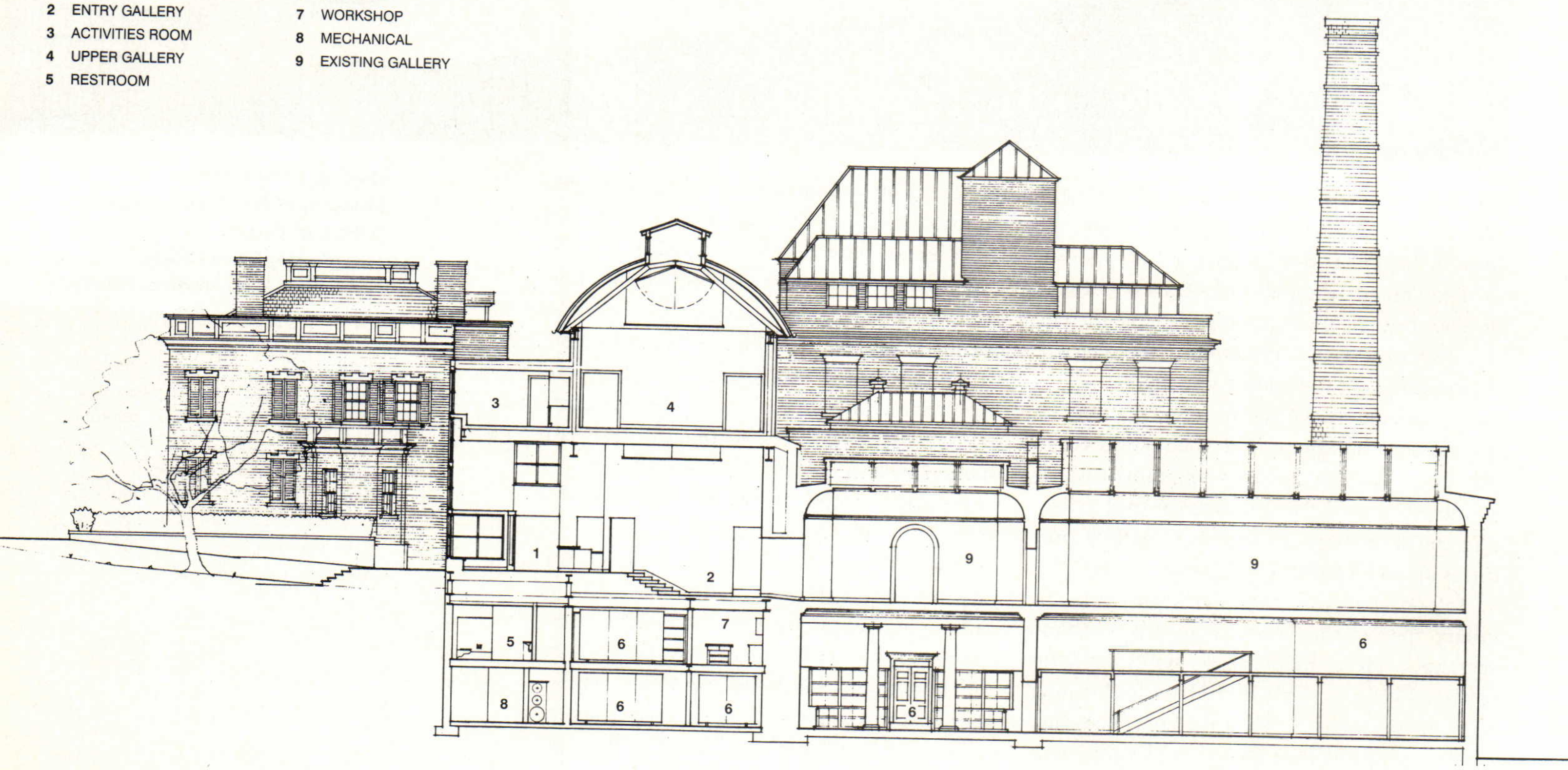
Daphne Farago Wing
Museum of Art, Rhode Island School of Design
Providence, Rhode Island
Tony Atkin & Associates, Architect

FACING PAGE: New wing of Rhode Island School of Design's museum acknowledges Neo-Georgian Pendleton House to the south (left) with red-brick-and-gridded-glass facade.
ABOVE: Stucco-clad, barrel-vaulted facade of new wing on Waterman Street is flanked by Carr House (left) and Waterman Building (right).



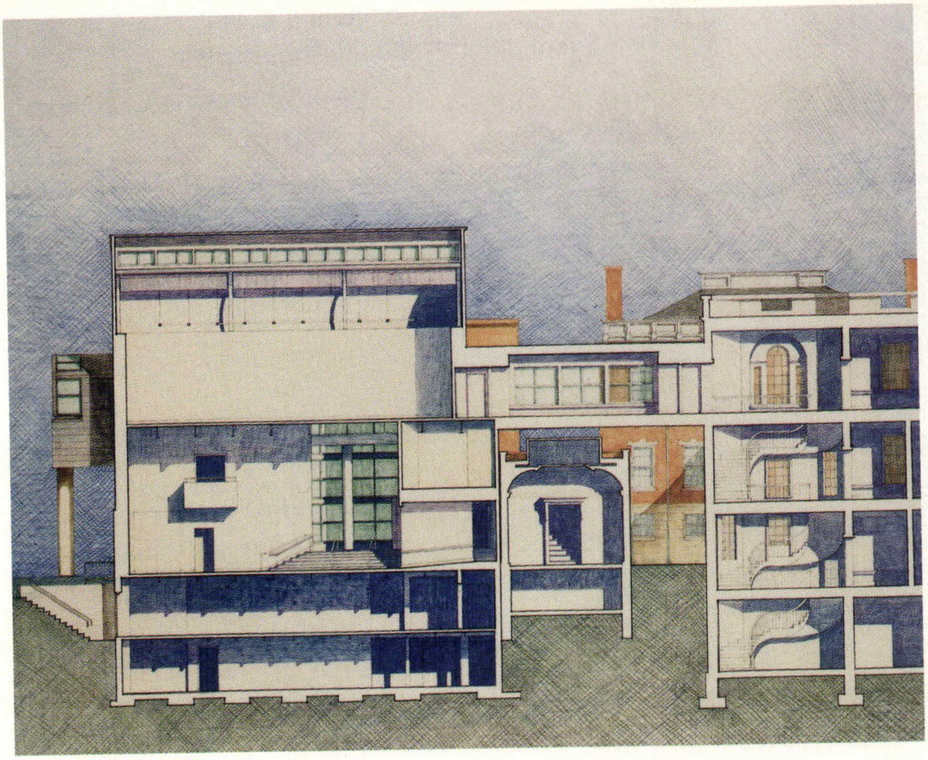
NORTH-SOUTH SECTION

1 FOYER
2 ENTRY GALLERY
3 ACTIVITIES ROOM
4 UPPER GALLERY
5 RESTROOM
6 STORAGE
7 WORKSHOP
8 MECHANICAL
9 EXISTING GALLERY



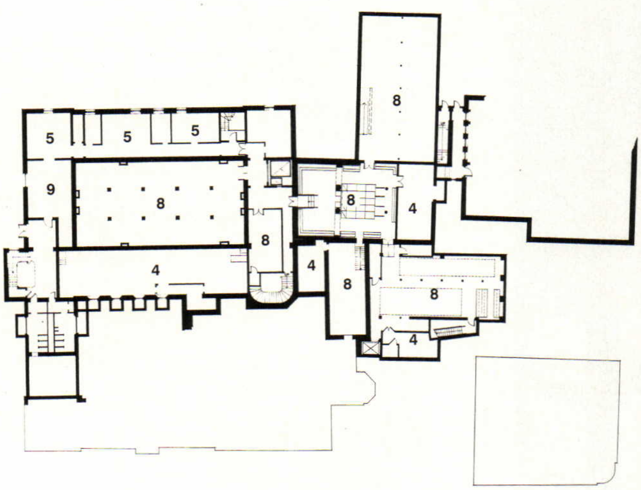
EAST-WEST SECTION

20'/6m

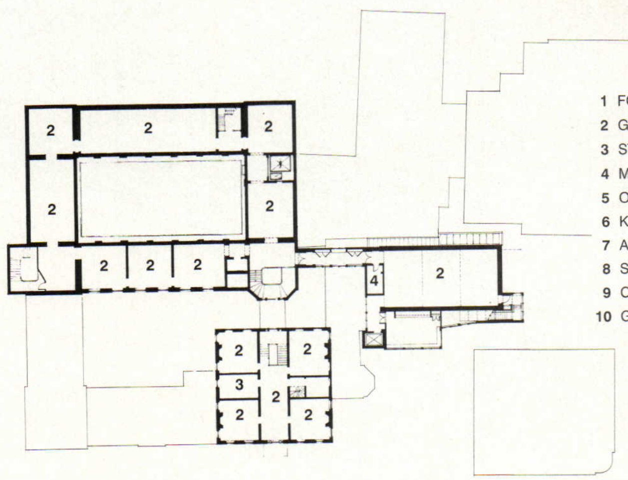


NORTH-SOUTH SECTION

FACING PAGE, TOP SECTION: Windowed bridge (center) connects existing museum (left) to new wing (right). New main staircase (right) leads from entry (left) to upper gallery.
FACING PAGE, BOTTOM SECTION: Daphne Farago Wing contains two levels of underground storage; entry gallery; and lantern-lit upper gallery.
SECTION, LEFT: New wing includes double-height entry (left) with upper gallery and two levels of storage.
PLANS: New wing fits into northeast corner of museum. Atkin manipulated circulation to connect addition to existing museum on three levels.

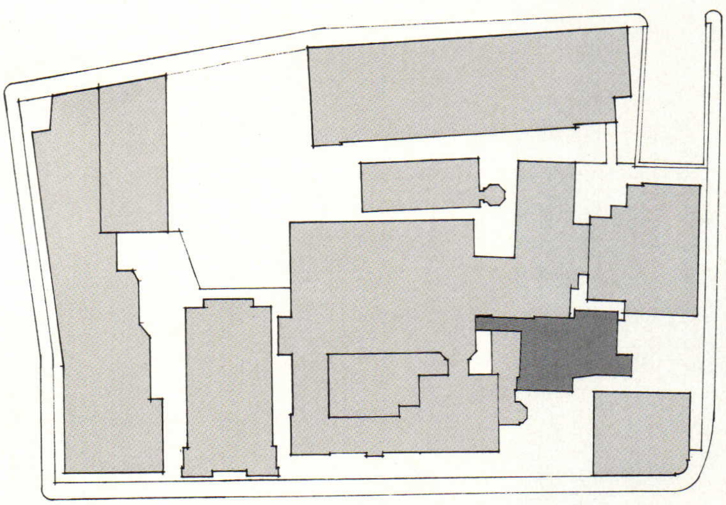


BASEMENT PLAN



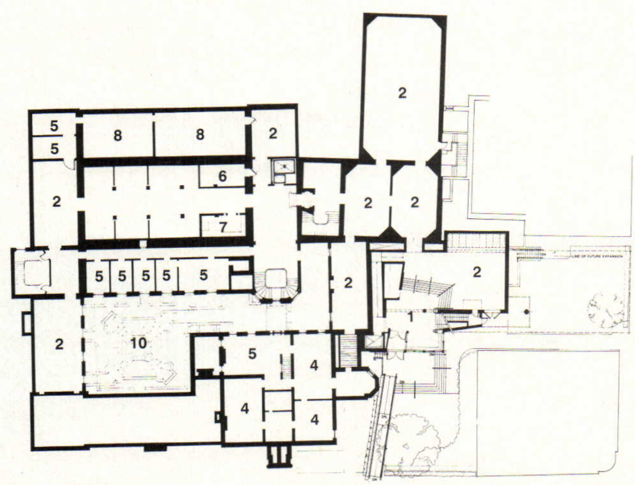
1 FOYER
2 GALLERY
3 STUDY
4 MECHANICAL
5 OFFICE
6 KITCHEN
7 ARCHIVES
8 STORAGE
9 CONFERENCE
10 GARDEN

THIRD FLOOR PLAN



SITE PLAN

20'/6m



FIRST FLOOR PLAN

20'/6m

WARREN JAGGER

LEFT: Angled stair and glass facade echo site conditions. Skylight illuminates entry gallery wall (left).
BOTTOM LEFT: Wall dividing entry gallery and stairway defines perimeter of upper gallery. Sculpted-glass door surround by RISD Professor Michael Scheiner frames balcony opening.
FACING PAGE: Installation by contemporary Polish artist Magdalena Abakanowicz inaugurates upper gallery. Fiberglass-clad baffles control daylight.

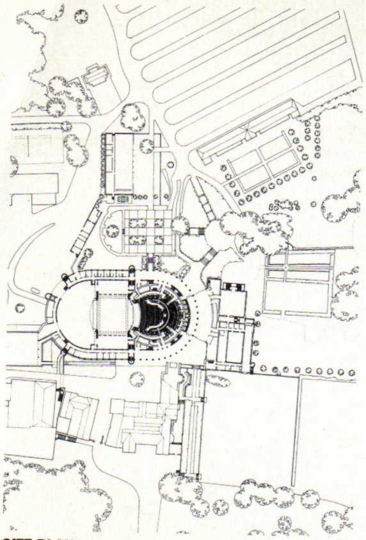
DAPHNE FARAGO WING
MUSEUM OF ART,
RHODE ISLAND SCHOOL OF DESIGN
PROVIDENCE, RHODE ISLAND

ARCHITECT: Tony Atkin & Associates, Philadelphia, Pennsylvania—Tony Atkin (principal); Jane Lawson Bell (project architect); Matthew Milan, Scott Tickell, Edward Bell, David Bae (design team)
LANDSCAPE ARCHITECT: Bradford Associates
ENGINEERS: Christakis & Kachele (structural); Landmark Facilities Group (mechanical/electrical); GZA GeoEnvironmental (geotechnical)
CONSULTANTS: Tigue Lighting (lighting); Gilbert Associates (graphic design)
GENERAL CONTRACTOR: H.V. Collins Company
COST: Withheld at owner's request
PHOTOGRAPHER: Steve Rosenthal, except as noted

Glyndebourne Opera House
Glyndebourne, England
Michael Hopkins & Partners

THESE PAGES: The new Glyndebourne Opera House (facing page) stands like a marquee pitched in the garden of the mostly 19th-century Neo-Elizabethan country house (below).

ENGLISH DIVA



ABOVE: Hopkins' oval theater is located to the east of the Neo-Elizabethan country house.
FACING PAGE, TOP: Hopkins' opera house with lead-clad fly tower nestles in a fold of the South Downs.
FACING PAGE, BOTTOM: Hopkins' building is visible between the country house (left) and former rehearsal rooms (right). Lead-covered roof of opera house is broken by the fly tower, with exposed roof trusses, and the brick drum of the auditorium.

Glyndebourne Opera is one of those eccentric English institutions, like public schools and gentlemen's clubs, that are loved from the inside and despised from the outside. If you are an insider and you can afford 100 pounds for the best seats, then you will probably love Glyndebourne as much for the social occasion—the champagne picnic on the lawn during the long intermission—as for the world-class opera productions that are staged over the 14-week summer season. If you are an outsider and opera is not your cup of tea, then you will probably think of it as a freak survival from the age of the country house party and the village cricket match, when everyone knew his or her place. But the Glyndebourne Opera has proved to be remarkably resilient and adaptable, especially since a major overhaul and expansion this year.

The old auditorium, set on the grounds of a mostly 19th-century Neo-Elizabethan mansion deep in the East Sussex countryside, was a rather ad hoc arrangement with poor acoustics, worse ventilation, and a long history of piecemeal extensions. But it was loved as much for its cozy shabbiness as for the excellence of its productions. Glyndebourne's charm lay in its peculiar combination of formality and informality—the audience wearing formal gowns and tuxedos but sitting in second-hand cinema seats.

When London-based architect Michael Hopkins & Partners won the limited competition to design a new auditorium, increasing the seating capacity from 830 to 1,200 with backstage facilities to match, the fear was that somehow the Glyndebourne magic would be dissipated. During the 1970s and early 1980s, Hopkins was one of the chief exponents of the style known as British High Tech and worked for a time in partnership with Norman Foster. When he left to establish his own practice with his wife Patty, Hopkins continued to develop and refine the High Tech style in a series of single-story factory, office, and laboratory buildings with exposed steel frames and prefabricated, bolt-together infill components.

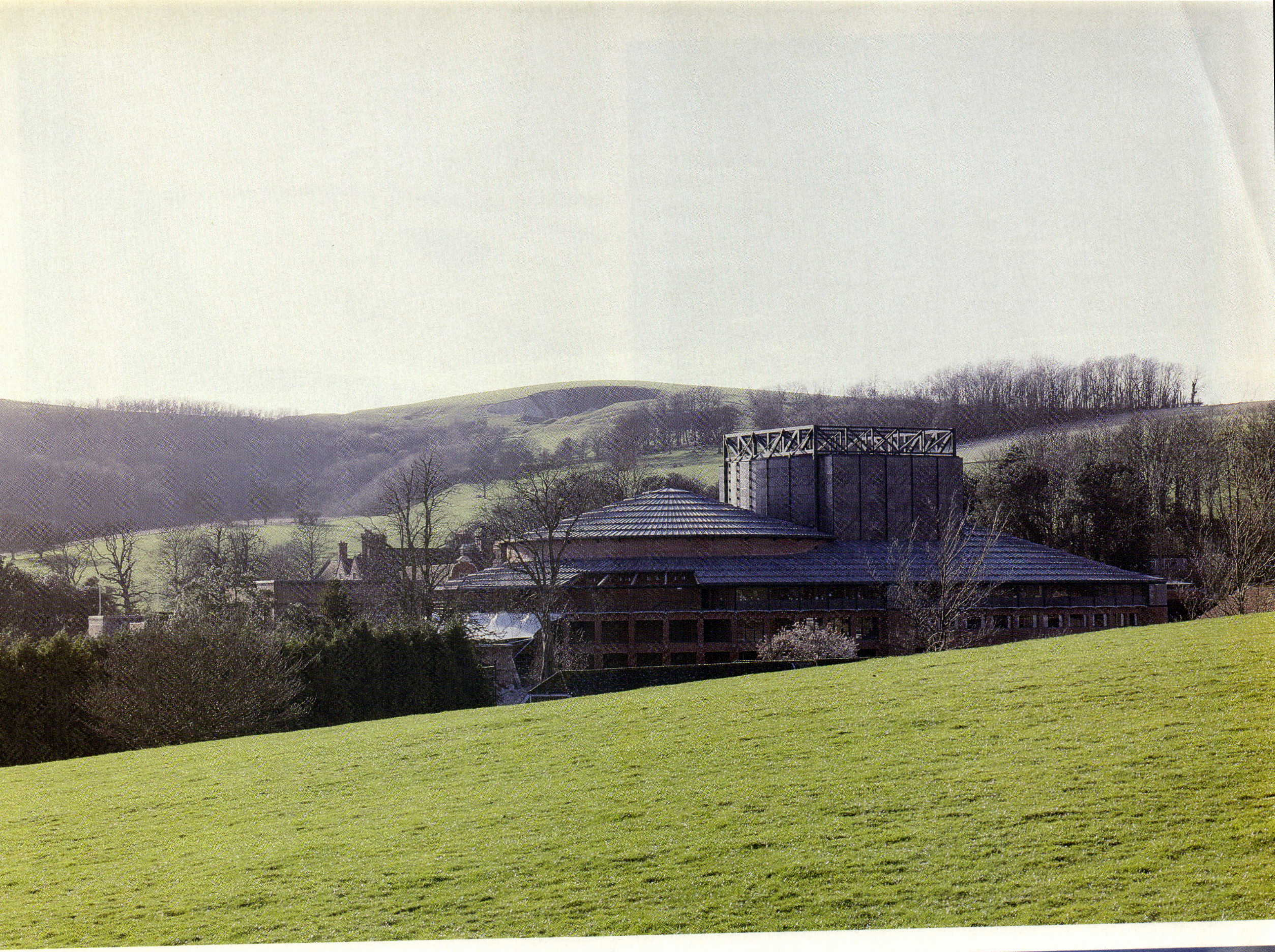
No one would have thought of Michael Hopkins as a suitable candidate to design an opera house. But in the late 1980s his style changed and became more eclectic; more sensitive to context; and more accepting of natural materials like brick, stone, timber, and lead. The turning point was a new grandstand for Lord's cricket ground in London—another summer building to house a traditional English institution. The Mound Stand, as it is known, has a High Tech superstructure with a festive fabric roof, but is mounted on an existing brick arcade, lovingly restored and extended. Everyone, even the Prince of Wales, liked the building when it opened in 1987. Since then, Hopkins has become the British establishment's favorite contemporary architect, designing some of the nation's most important public buildings, including an extension to the Houses of Parliament, now under construction.

Hopkins' solution for Glyndebourne is as eccentric and unexpected as the institution it houses. It, too, combines formality and informality, quality and austerity. One might reasonably have expected an extension to a rambling country house to have been fragmented or articulated in order to reduce its visual impact on the valley in which it sits, but no: The auditorium, front-of-house, and backstage areas are arranged symmetrically about a longitudinal axis and enclosed in a simple oval form like a Roman amphitheater. The silhouette of the roof is broken by the brick drum of the circular auditorium and by the lead-clad fly tower, but the new addition is a very large object in the landscape.

The informality of the design lies in the way this object is placed on the site, behind the venerable country house and atop the same ground as the original 1934 auditorium, but facing the opposite direction. The new building is like a big marquee erected on the lawn—an appropriate image for a building used only in the summer. This impression is reinforced by the fabric canopy and minimal glass screens that enclose the building's understated entrance foyer: no monumental Baroque facade or Classical portico here.

But if the siting implies impermanence, the construction emphasizes solidity and permanence. The two-story brick arcade that surrounds the new Glyndebourne Opera House is left open on the auditorium side to provide promenading terraces for the audience and is infilled with windows around the backstage areas to accommodate offices and dressing rooms. A third story of lighter framed construction, projecting slightly like the belvedere of an Italian Renaissance palace, is capped by a shallow-pitched roof clad in lead with traditional rolled joints.

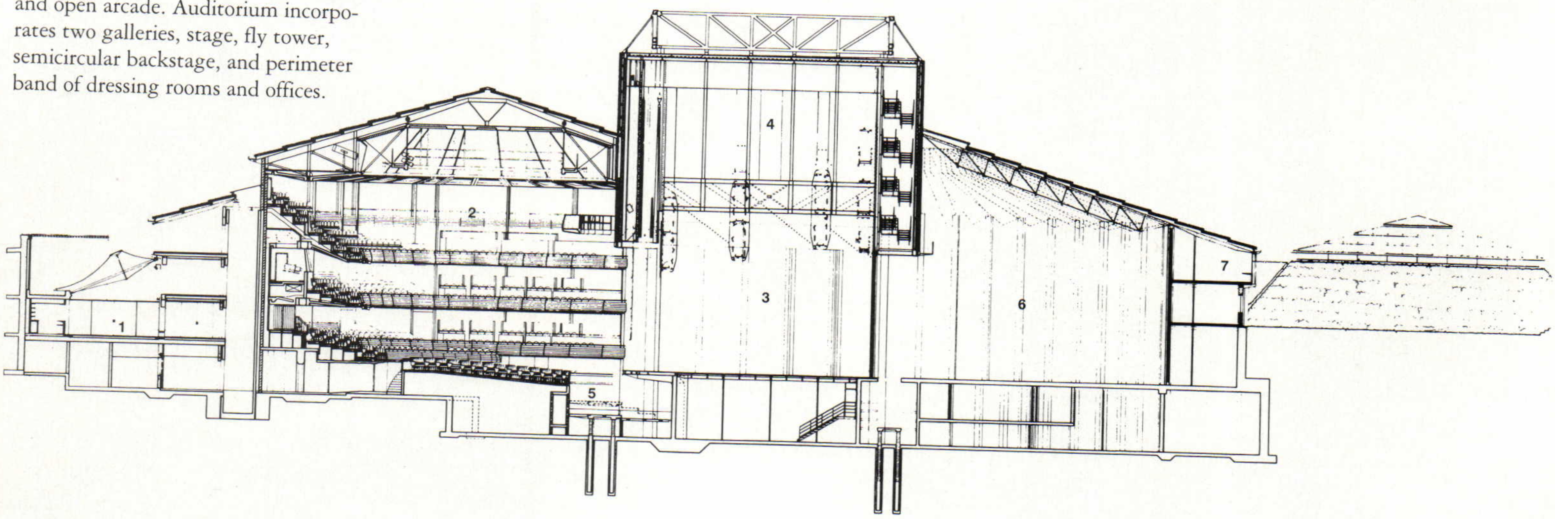
The importance of Hopkins' structure is that it is completely honest. There is no hidden frame of steel or concrete, and the beautifully crafted flat arches really do bear the weight of the walls and floors above them. The raw materials of Hopkins' architecture might have changed radically since his High



PETER COOK

ABOVE: Fire stairs are housed in towers of loadbearing brick and glass block. **ABOVE RIGHT:** Open arcade (right) of opera house is constructed of loadbearing brick with true flat arches. **SECTION:** New building is entered on ground level under entrance canopy and open arcade. Auditorium incorporates two galleries, stage, fly tower, semicircular backstage, and perimeter band of dressing rooms and offices.

1 FOYER
2 AUDITORIUM
3 STAGE
4 FLY TOWER
5 ORCHESTRA TOWER
6 BACKSTAGE
7 OFFICE



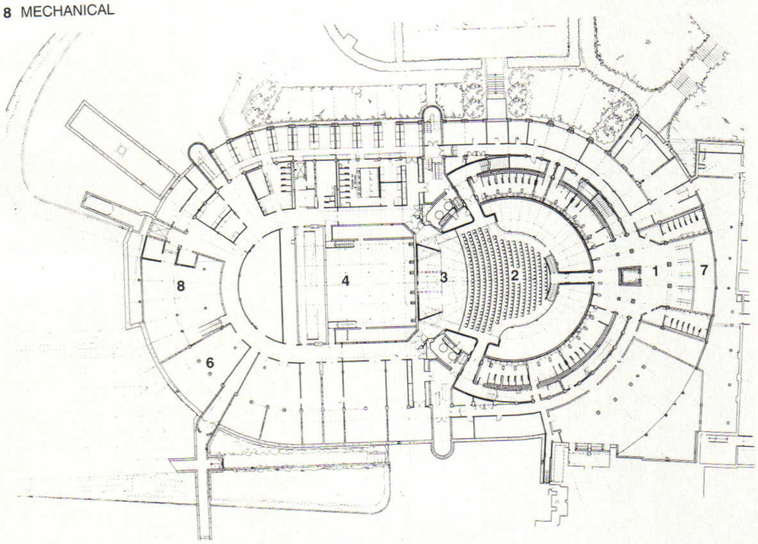
EAST-WEST SECTION

20'/6m

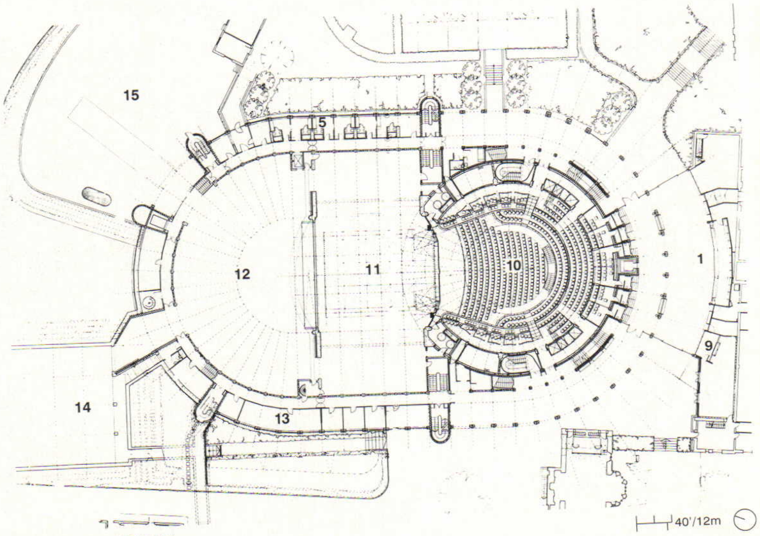
PETER COOK

1 FOYER
2 STALLS
3 ORCHESTRA PIT
4 UNDERSTAGE
5 DRESSING ROOM
6 STORAGE
7 CLOAKROOM
8 MECHANICAL
9 BOX OFFICE
10 AUDITORIUM
11 STAGE
12 BACKSTAGE
13 TECHNICIAN AREA
14 REHEARSAL STAGE
15 LOADING BAY

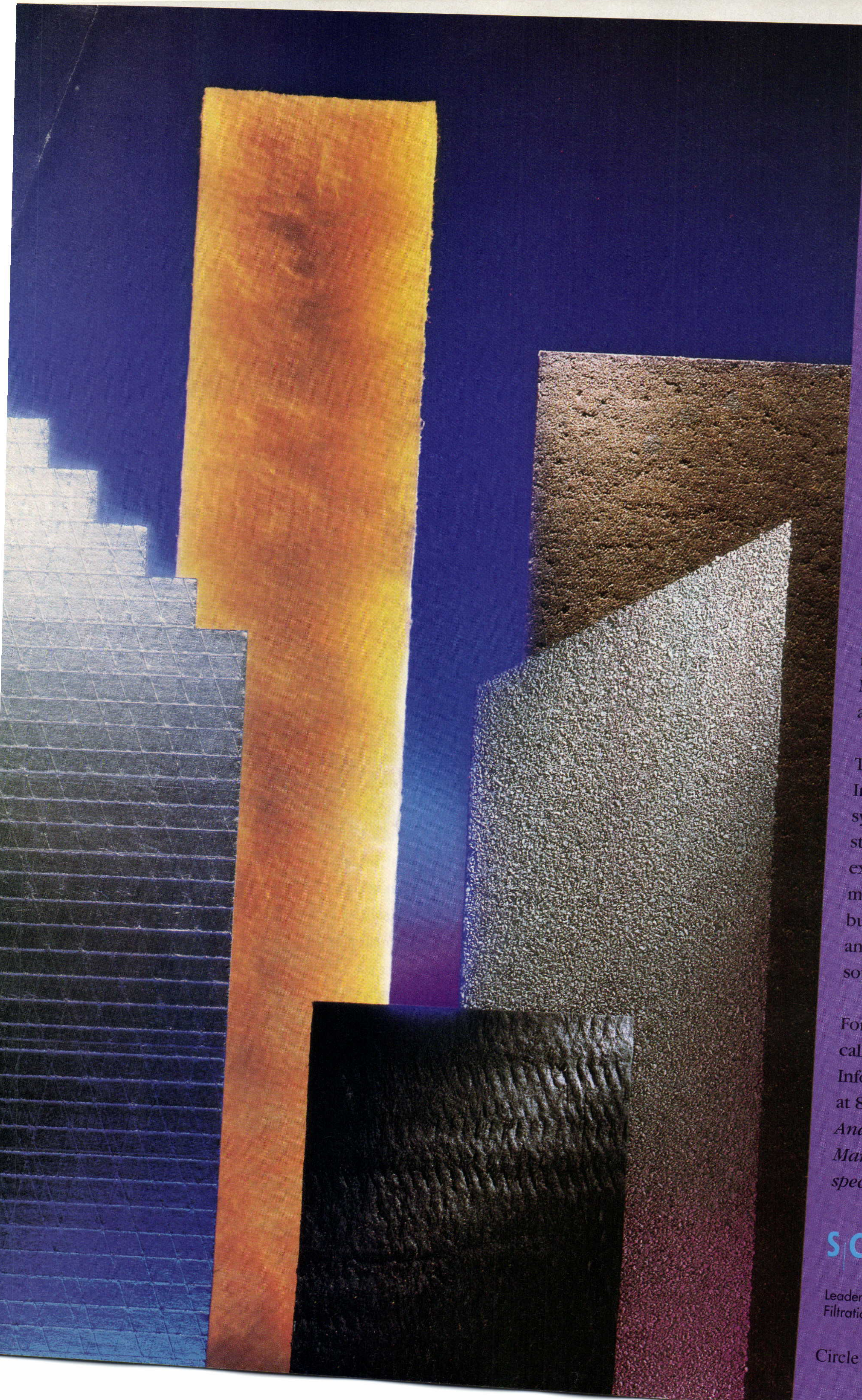
ABOVE: Fabric canopy, viewed from country house, reinforces Hopkins' marquee imagery.
PLANS: Oval geometry of theater is generated by circular auditorium. Offices and dressing rooms surround semicircular backstage area (right).

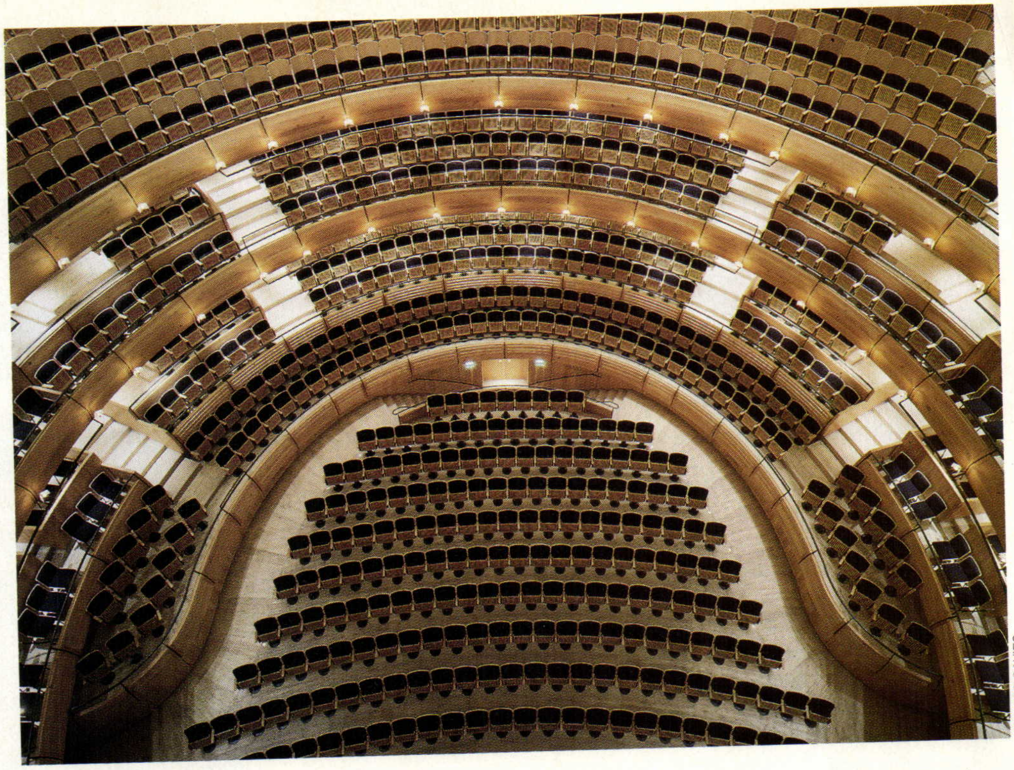


BASEMENT PLAN



GROUND FLOOR PLAN





Acoustic Performances

Architects return to classical theater designs to improve transmission of sound.

ABOVE RIGHT: The new Glyndebourne Opera House improves acoustics with a horseshoe-shaped configuration.

The three new performance spaces featured in our design section this month share an approach to acoustics that draws on classic principles of theater design. In relying on natural acoustics, the architects of the Glyndebourne Opera House; the California Center for the Arts, Escondido; and Seiji Ozawa Hall on the Tanglewood Music Center campus, were inspired by centuries-old theaters. They studied Boston's Symphony Hall and Amsterdam's Concertgebouw, instead of the fan-shaped auditoriums completed over the past few decades.

Acoustic intimacy

Ten to 15 years ago, the main acoustic consideration for theater designers was reverberation—the length of time required for sound to decay in a room. Reverberation is dependent on a room's volume and shape, as well as on material finishes. Now, practitioners are paying attention to building geometries and other acoustic concepts such as loudness, clarity, intimacy, and envelopment, which contribute to the overall sound of a theater. Tanglewood's Ozawa Hall, for example, is designed as a "shoebox" with long side walls and balconies to reflect sound laterally. At Glyndebourne, a horseshoe shape was developed for the new opera house, because its balconies provide strong side reflections for increased clarity and acoustic intimacy.

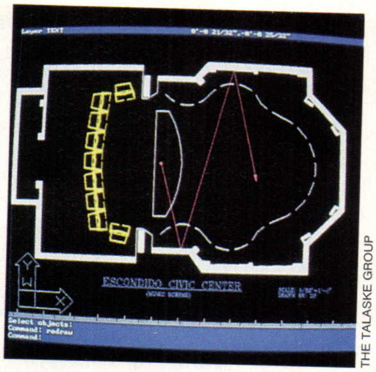
Auditoriums for a range of different performances—from opera to symphonies to musical theater—are more challenging, since each performance type has its own acoustic requirements. At Escondido's concert hall, a modified horseshoe plan and retractable acoustic panels allow for a variety of performance types without complicated architectural gymnastics. Short, side balconies increase the lateral sound reflection necessary for orchestral performances and create acoustic and visual intimacy between audience and performers.

To create these performance spaces, acousticians, architects, and theater specialists work more closely together during the early stages of design. Acoustic specialists are also developing sophisticated tools for predicting sound and even re-creating entire live performances in scale models.

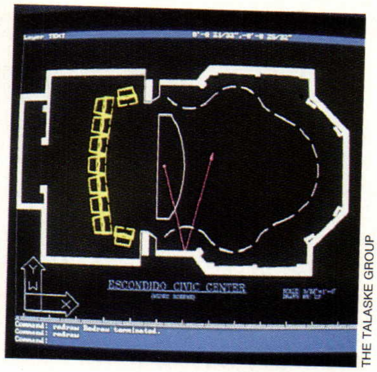
New tools

Computer models of theaters are now routine for analyzing the timing, magnitude, and direction of sound reflections from performers to audience. In some cases, scaled physical models of performance facilities provide the easiest way of analyzing the acoustic properties of a design scheme, because they allow digitally recorded music to be listened to as if in the hall; the acoustic properties of different materials can also be evaluated in physical models. Innovative new software from the Bose Corporation allows architects and acousticians to "listen to" an auditorium from any location and evaluate the effect of acoustic retrofits such as speakers or sound absorptive materials.—*Raul A. Barreneche*

California Center for the Arts
Escondido, California
Moore Ruble Yudell Architects
The Talaske Group, Acoustician



THE TALASKE GROUP



THE TALASKE GROUP

A centerpiece of Moore Ruble Yudell's (MRY's) California Center for the Arts is a new 1,524-seat concert hall for symphonies, operas, musical theater, and drama. To accommodate such acoustically diverse events, acoustician Rick Talaske of the Talaske Group combined a classic shoebox concert hall with an opera house with an adjustable stage. "We spent a lot of time developing this room shape," explains Talaske, "especially in terms of the sound-reflection patterns that would be created within the first 1/4 second. These are important in creating a lively sound in the room."

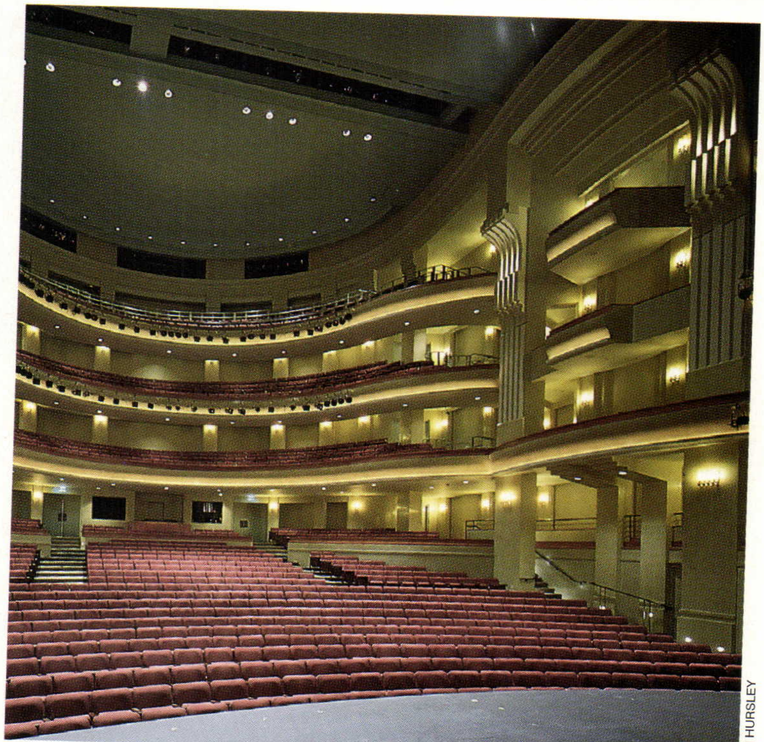
Talaske generated a CAD model to analyze some of those reflection patterns. But the most important tool for testing the scheme's acoustics was a 1:24 scale model of the auditorium interior. The "impulse responses," or acoustic-reflection characteristics, from numerous source and receiver positions were measured within the model. Utilizing digital signal-processing software, the room responses were combined with music recorded in a reflection-free environment; the music could then be heard through headphones to approximate its sound in the hall.

As a result of this analysis, the three balcony levels that wrap around the concert hall's interior were intentionally kept shallow to prevent sound from becoming trapped. Closer to the stage, two bays of small boxes effectively extend the length of the hall to provide the lateral acoustic reflections required for orchestral performances. "When sound arrives to the listener's ears from the side, it sounds louder," explains Talaske. "It also sounds more spacious, and there's added clarity."

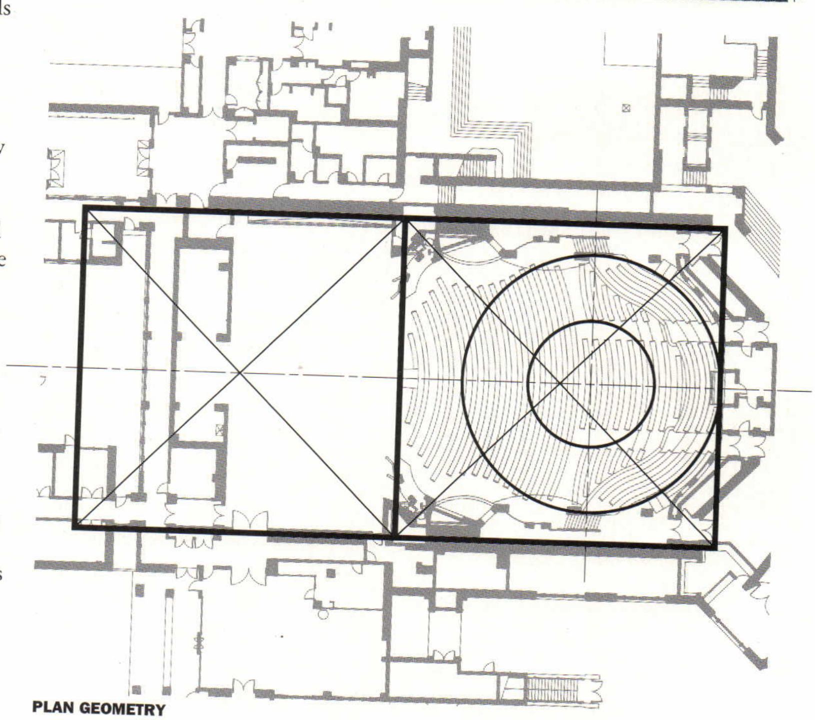
MRY selected material finishes that were hard and sound-reflective—not sound-absorptive—to maintain acoustic liveliness; if excessive fabric or other porous materials are added, the liveliness is lost through absorption. The steel-framed concert hall's walls are finished in 2-inch-thick plaster, as are the ceiling and balcony fronts. Cherry wood on the balconies and seat backs, and concrete floors also create reflective surfaces. "If we had carpeted underneath the seats and if the seat backs were sound-absorptive," Talaske explains, "the absorption of high-frequency sound would result in a much drier overall sound." The curve of the concert hall's rear wall was carefully calculated to prevent acoustic focusing and allow sound to be reflected to the performers and the orchestra-level audience.

Performances such as opera and spoken word require more acoustic absorption than orchestral performances. For such cases, adjustable acoustic absorbing materials are integrated into the design of the space. Retractable curtains, for example, flanking the proscenium and at the rear of the hall minimize reverberation and create a more "articulate" room. In addition, adjustable panels contained in the side boxes can be splayed outward to project sound further, or brought in to contain that sound in the front of the hall.

A number of critics of the preview concert in September found the hall's acoustics too well-blended. But JoAnn Falletta, who conducted the San Diego Symphony's premiere performance in the Escondido concert hall, finds the acoustics "make the audience feel like they're in the middle of the orchestra, which is rare in American concert halls. The sound is very vibrant, with immediacy and presence."



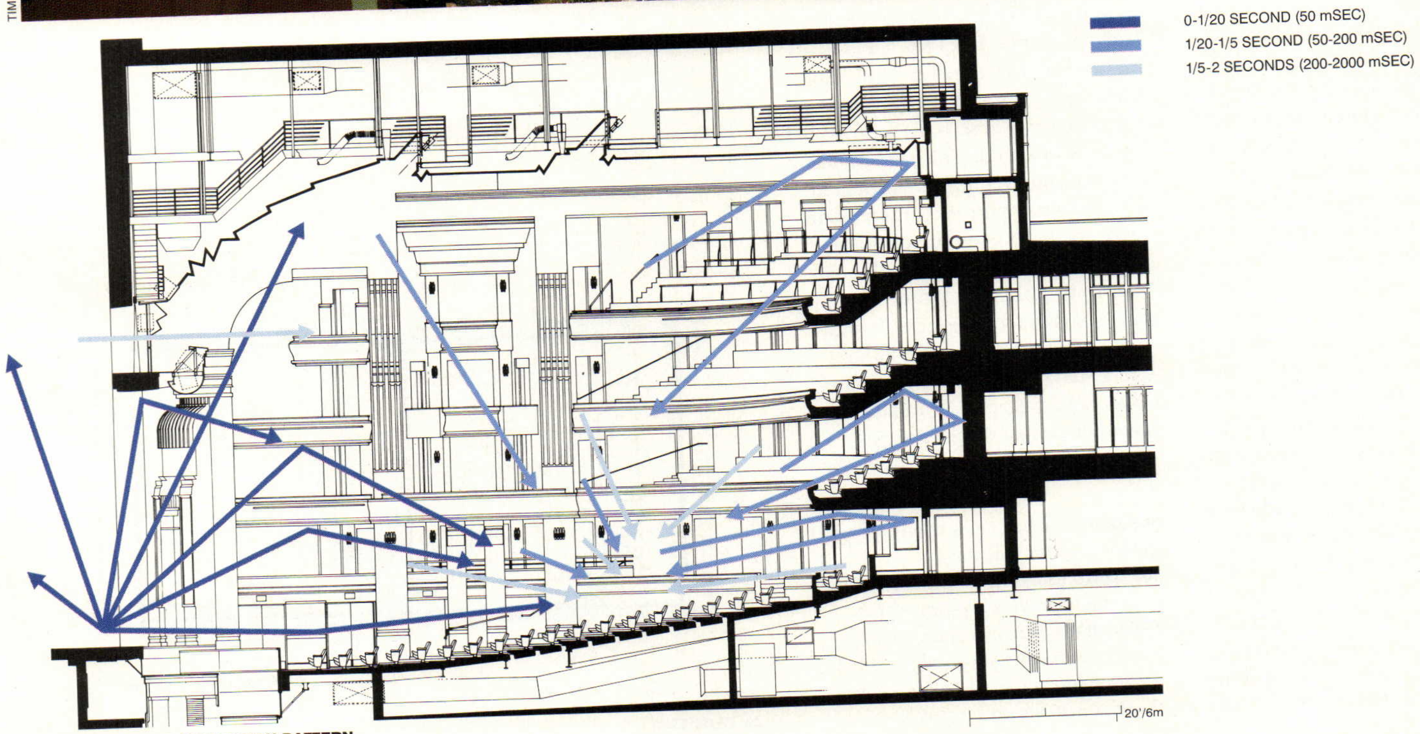
TIM HURSLEY



PLAN GEOMETRY

TOP LEFT: CAD model helped architects perform acoustic tests.
TOP RIGHT: Computer ray-tracing tracks reflection from source to receiver.
ABOVE RIGHT: Balconies are added to front of horseshoe-shaped plan.
FACING PAGE: Sculpted surfaces provide reflections for lively sound.

TIM HURSLEY



PARTIAL SOUND REFLECTION PATTERN

Seiji Ozawa Hall
Tanglewood Music Center
William Rawn Associates, Architects
R. Lawrence Kirkegaard & Associates, Acoustician

STEVE ROSENTHAL

PAUL WARCHOL

Boston-based architect William Rawn and acoustician Larry Kirkegaard of Downers Grove, Illinois, were faced with a complex design problem: to create a world-class, 1,200-seat concert hall that could accommodate outdoor audiences and double as a recording facility for the Boston Symphony Orchestra.

The team decided to create a narrow, intimate, and warm space similar to Vienna's 1870 Grosser Musikvereinsaal, "which is nearly every musician's dream of a perfect music hall," according to Kirkegaard. After visiting numerous concert halls throughout Europe, he and Rawn copied the Musikvereinsaal's shoebox form, approximately a triple cube in volume. Because the shoebox typology is uniformly regarded as a successful concert hall form—and given the project's tight budget—the acoustician didn't create computer or physical scale models of the hall's interior for testing. "It's such a tried-and-true archetype," explains Kirkegaard, "that we already understood a lot about it."

Three levels of seating galleries provide intimate and interactive settings while functioning as the hall's primary acoustic reflectors. The galleries also wrap around the short ends of the structure, incorporating seating above both the stage and the opening to the outdoors at the rear of the hall. A groove is carved into each of the members of the open wood grilles, to prevent sound waves from blending together and causing "chirping" sounds, as they are reflected laterally. The angled glass panels and deep recesses of the end walls also help prevent echoes from the rear of the hall; the heavily modulated ceiling surfaces, meanwhile, eliminate confusing echoes and reflections for the performers. "We worked hard to create the right amount of depth and articulation in the precast roof slab," explains Rawn. The 2-foot-deep recesses in the ceiling structure measure roughly 7 feet wide by 22 feet long.

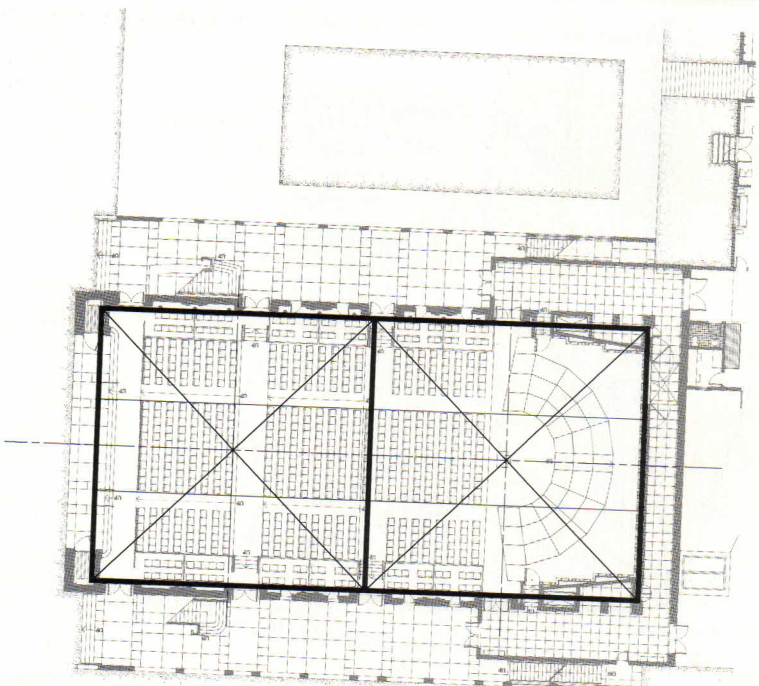
Stucco-finished, concrete-block walls provide the necessary thickness to sustain low-frequency bass response. "New York's Carnegie Hall, for example, has 3 1/2-foot-thick masonry walls," points out Kirkegaard. On the hall's back wall, the stucco was applied more heavily at the bottom—so the surface is 1 1/2 inches out of plumb—to prevent sound from becoming trapped in the rear of hall and causing an echo.

An additional challenge was creating a subtle rake in the concert hall floor that would allow proper sightlines from outdoors. "We wanted the slope of the hill to be gentle, so that audience members could rest a wine glass on the grass," Rawn explains. The slope of the hill is approximately 7 degrees. Inside, the rear two-thirds of the seating is stepped to allow clear sightlines, as well as to conform to ADA codes.

After its first season of summer concerts, critics have praised Ozawa Hall's acoustics. But they cite one minor flaw: Cellulose fiber finishing was sprayed onto the precast-concrete ceiling to absorb higher frequencies of sound, which are more easily transmitted in wet air than in dry air—an important consideration given the hall's exposure to the humid summer outdoors. But the 1/4-inch-thick finishing absorbed too much of those frequencies. "It was really taking the shimmer off high string sounds, especially the violins," laments Kirkegaard. Workers have already removed 1/8 inch of the damping to reduce that absorption.

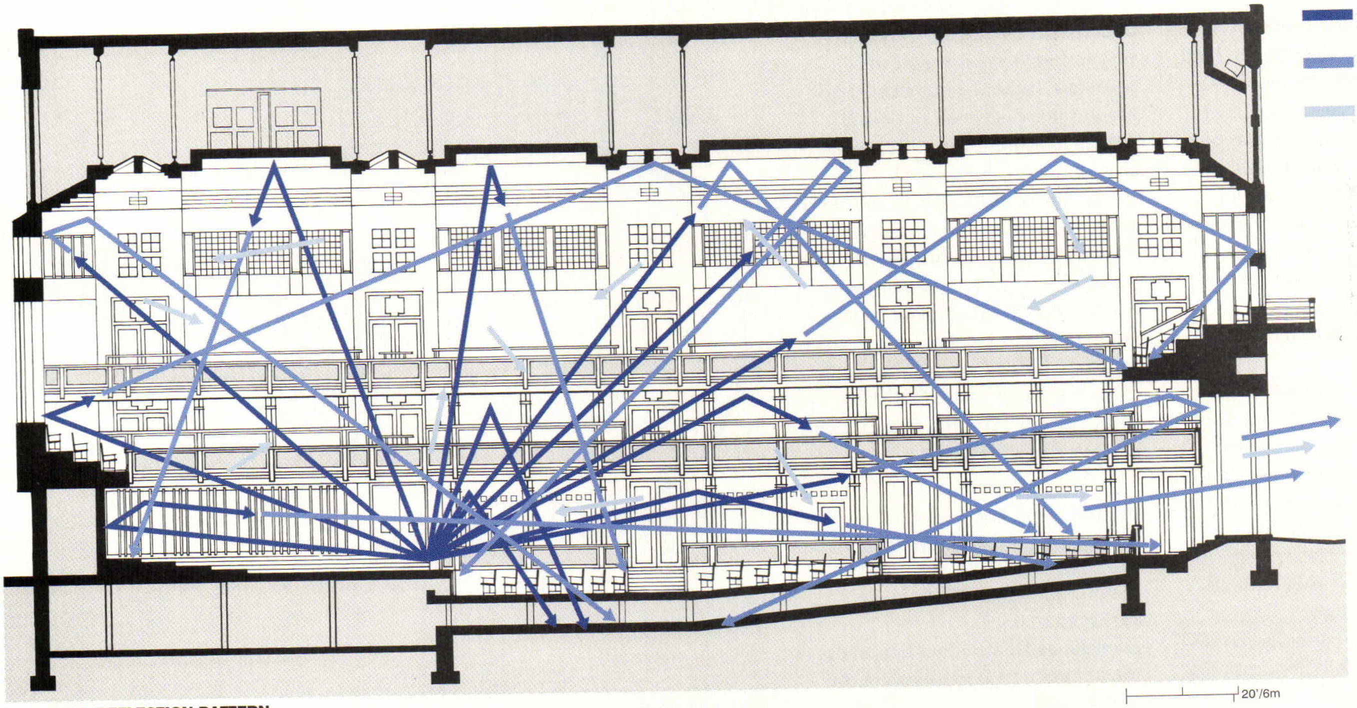
STEVE ROSENTHAL

TOP LEFT: Side balconies wrap corner behind concert hall stage.
TOP RIGHT: Cut-outs in sound-reflective teak chairs provide acoustic clarity.
ABOVE RIGHT: Side balconies act as acoustic reflectors along edges of hall.
FACING PAGE: Sculpted ceiling above shoebox interior prevents echoes.



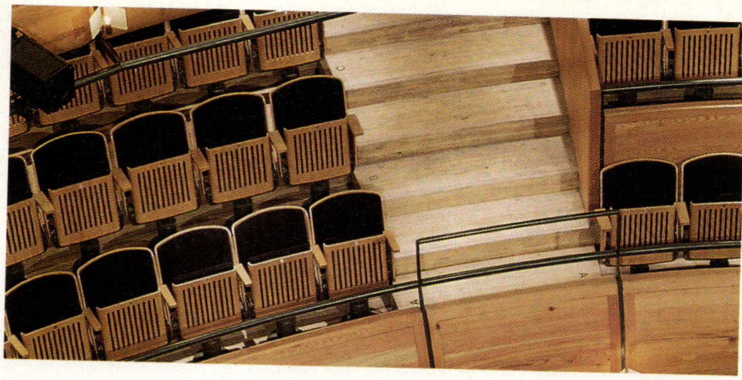
PLAN GEOMETRY

STEVE ROSENTHAL



SOUND REFLECTION PATTERN

Glyndebourne Opera House
Michael Hopkins & Partners, Architect
Arup Acoustics, Acoustician


PETER COOK / ARCHIPRESS

England's popular summer opera house was built in 1934 to accommodate 300 patrons and eventually expanded to 800 seats. In designing a new auditorium to replace the intimate original, London-based architect Michael Hopkins & Partners was charged with keeping the audience as close to the stage as possible, while increasing the theater's capacity to 1,200 seats.

Arup Acoustics in Winchester, England, worked with Hopkins to create a space that would achieve the difficult goal of balancing warm and resonant music against the clarity of performers' voices. If the reverberation time of the auditorium is too short, the music's richness is compromised; if the reverberation is too long, the performers' voices become muddled with echoes.

Hopkins and the Arup team devised a horseshoe-shaped seating arrangement within a circular building form. The horseshoe form, popular in such successful opera houses as Milan's La Scala, offered acoustic intimacy and strong side reflections from the enclosing balconies to lend clarity to the sound. According to Richard Bussell of Arup Acoustics, Glyndebourne was designed to provide long reverberation times. "The typical reverberation time for an opera house is about 1 second, while Glyndebourne's is 1.4 seconds," explains Bussell. "The longer reverberation time actually enhances the music, making it feel fuller and filling the space more."

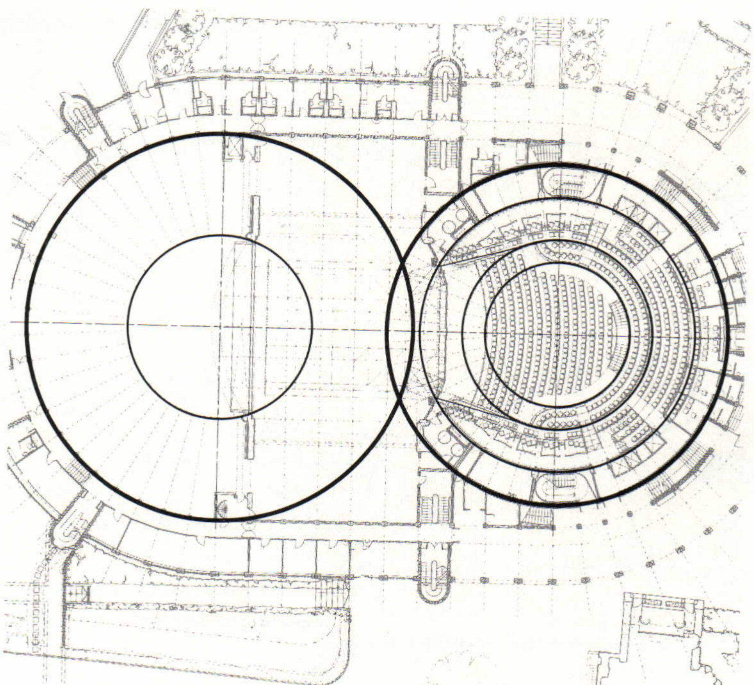
But the clarity of operatic voices is not lost despite the longer reverberation, because clarity is also dependent on a ratio of early to late sound energy. If there are more early reflections created by the auditorium, there will be greater clarity, regardless of reverberation times. Glyndebourne's wall surfaces of salvaged pine and brick were carefully modulated to provide such reflections. The Arup team built a plexiglass-enclosed, 1:50 scale model of the theater interior to evaluate the effect of key architectural elements on the acoustic quality of the space. The theater roof, for example, was originally designed as a dome. "The model revealed that it was acoustically a disaster, that there were some areas of severe sound focusing," according to Bussell. "We were then able to use the model to test three different roof profiles and arrive at a solution, which is a shallower roof."

In plan, Glyndebourne's circular form also posed problems with focusing, since the concave rear walls direct sound to isolated pockets within the auditorium. The convex wood panels installed along the theater's back wall help prevent such focusing, as do the bowed shapes of the theater's balcony fronts.

To minimize noise and vibration from the mechanical system, the architect housed the equipment away from the auditorium in a converted stable. Air is brought into the theater through large, 6-foot-by-8-foot under-floor ducts and diffused at very low velocity through the pedestals of the theater seats. Background noise—which can cause singers to strain their voices—was also minimized by enclosing elevators in 10-inch-thick concrete shafts and providing an interstitial space between the wall's brick layers.

Having completed its first season, Glyndebourne has drawn praise from audiences for the quality of it acoustics. "There is a real beauty in the sound," remarks Glyndebourne's music director, Andrew Davis, "with sonority and warmth."


RICHARD DAVIES


PLAN GEOMETRY

TOP: Wood balcony fronts and seat backs provide sound-reflective surfaces.
ABOVE RIGHT: Wood panels along rear wall prevent acoustic focusing in circular-shaped room.
FACING PAGE: Dome above horseshoe-shaped interior was modified for improved acoustics.

RICHARD DAVIES

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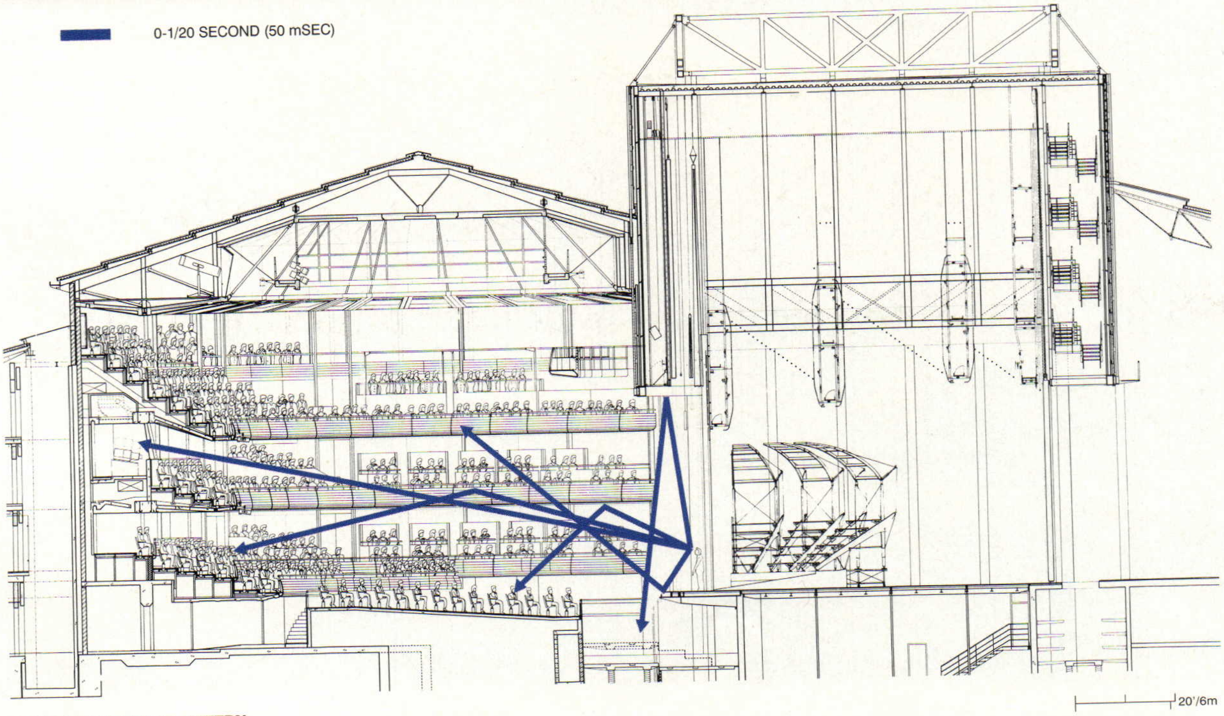
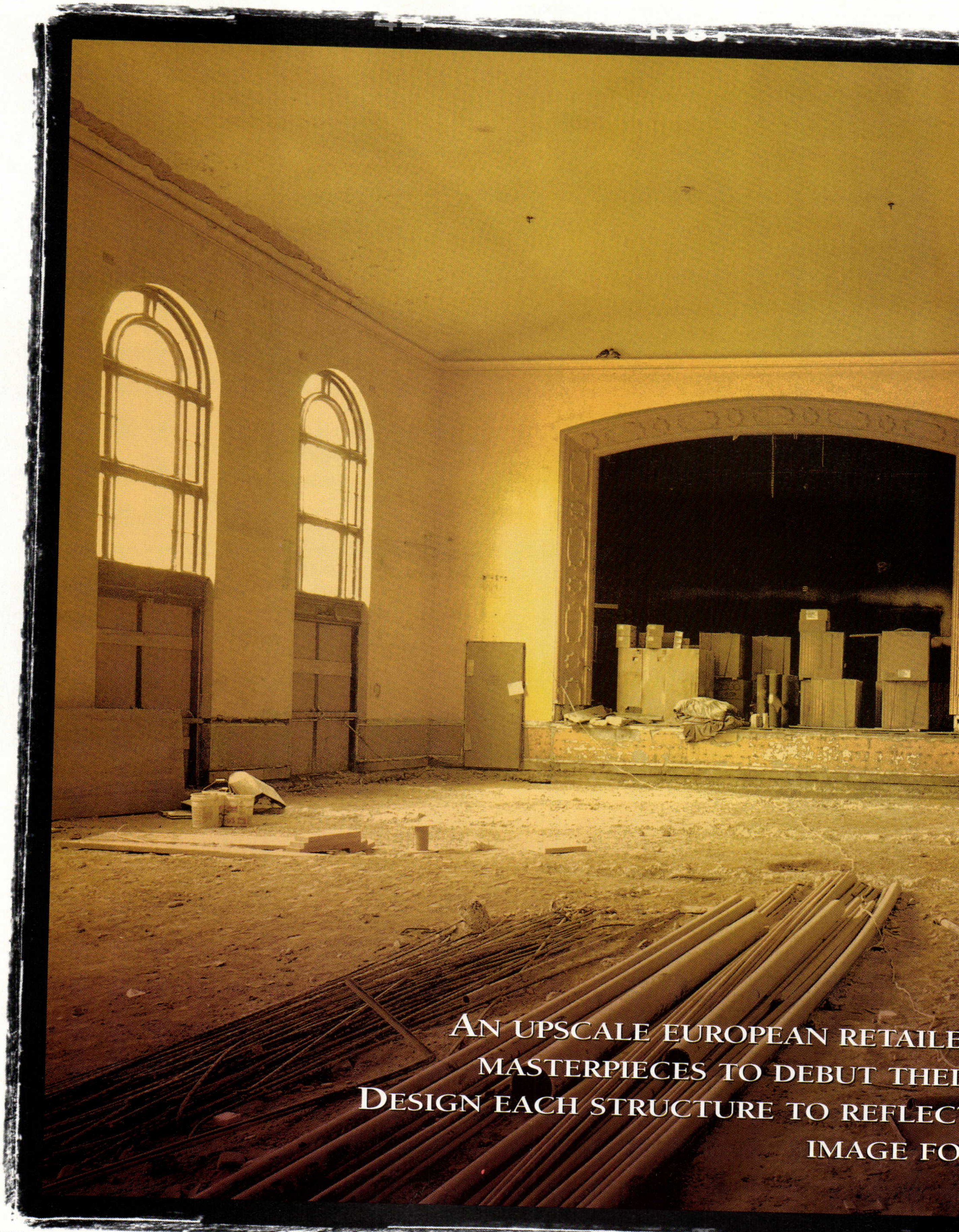


SOUND REFLECTION PATTERN


AN UPSCALE EUROPEAN RETAILE
MASTERPIECES TO DEBUT THE
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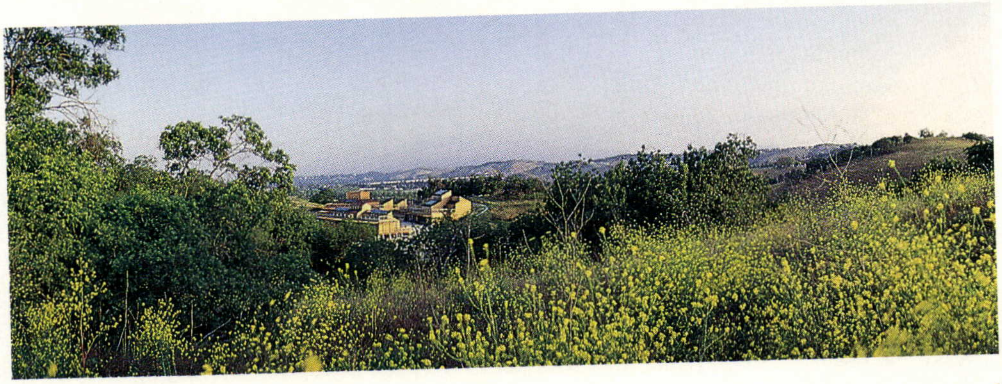
Building to Recycle Nature

A village for research near Los Angeles is designed to demonstrate resource efficiency.



TOM LAMB

ABOVE RIGHT: The Center for Regenerative Studies is situated in a semi-arid valley lying between California State Polytechnic and a landfill in the foothills of the San Gabriel Mountains.

Self-sufficient, "green" demonstration projects are on the rise, prompted by public concern over the exploitation and exhaustion of our natural resources. Many of these prototypes, however, have been overly ambitious, expensive, or impractical; one of the most publicized failures is Biosphere II (ARCHITECTURE, May 1991, pages 76-80) in the Sonoran Desert, an internalized eco-environment divorced from nature.

The Center for Regenerative Studies, a 16-acre experimental prototype sponsored by California State Polytechnic, is one of the more practical projects in this rapidly expanding field. Located 40 miles south of Los Angeles, in a small valley lying between the campus of Cal State Pomona and a landfill operated by the County of Los Angeles, the center is a university-based setting for education, demonstration, and research in regenerative technologies. These technologies include solar energy, water reclamation, soil fertility, food cultivation free of pesticides or chemical fertilizers, waste recycling, and shelter compatible with the land.

Land laboratory

The center is based on the 1987 experimental Landlab Project initiated by the graduate program of the Polytechnic's College of Environmental Design, under the direction of Professor John T. Lyle. In the Landlab Project, Lyle wanted to remedy what he perceived as a deplorable lack of participation by universities in environmental conservation.

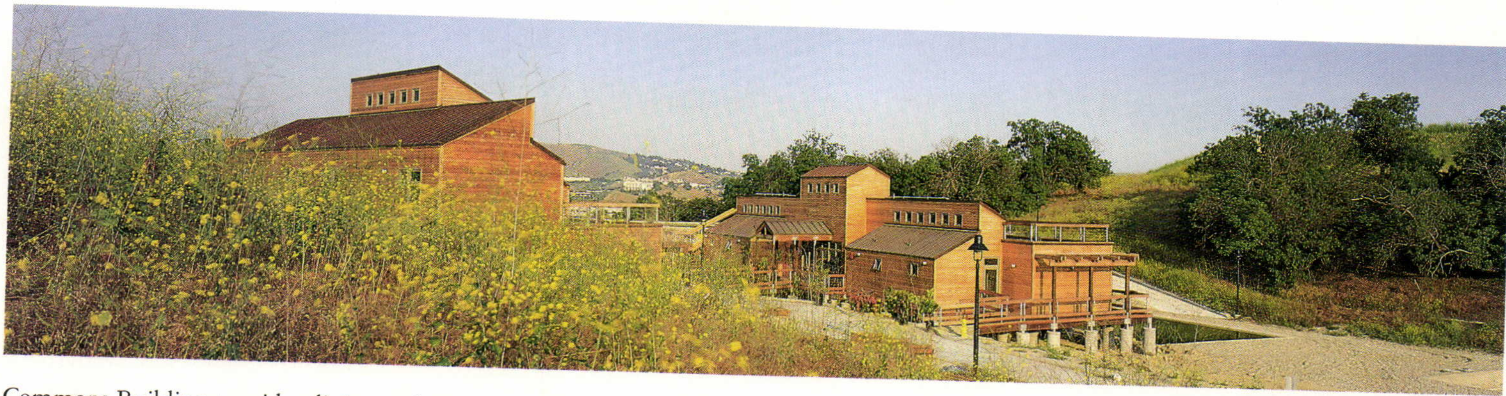
The Landlab—a working laboratory—and the center that grew out of it explore the applications of regenerative technologies in a context integrated with its social and physical surroundings. Students and faculty living and working on the site learn how to develop a micro-environment that is as earth-sustaining as possible in everything from intensive agriculture and aquaculture to nontoxic, renewable building materials. At the same time, they explore the human interaction with regenerative practices.

Phased construction

The center comprises a "village" of living quarters for students and faculty, plus laboratories, a library, a cafeteria, and offices, intended to accommodate an eventual population of around 100. Integrated with the village are systems for irrigation, aquaculture, agriculture, forestry, and solar generation. Water purification and on-site sewage treatment facilities will be added later. The center's present 16-acre site will eventually expand to 339 acres, including the adjacent landfill and an adjoining agricultural section operated by the Polytechnic.

The center's architectural component, designed by Dougherty+Dougherty of Newport Beach, California, is planned in three phases. The first phase, recently completed at a cost of $3.3 million raised from private sources, comprises 14,500 square feet divided among four small, cedar-sided, copper-roofed buildings set around a village square. The

BELOW: Dougherty+Dougherty designed the center as a cluster of small buildings to convey a village character. The 14,500-square-foot complex includes the Sunspace Building (left), which houses four faculty members, and the Riverfront Building (right), which accommodates 12 students.



TOM LAMB

Commons Building provides dining and kitchen facilities for faculty and students. The Seminar Building contains a lecture room and laboratories. The Faculty House, or "Sunspace" Building, provides living quarters for faculty, while the "Riverfront" Student House accommodates resident students.

The second phase, now under construction, will add 3,400 square feet at a cost of $550,000 including a learning center with a 60-seat lecture hall and additional faculty offices. A future phase will add additional student living quarters, a greenhouse, and an agricultural support building.

Dougherty+Dougherty was chosen for the project based on the firm's decade-long experience in energy-responsive buildings in Southern California. Principal Betsey Dougherty's graduate thesis focused on this area of study, and the firm's portfolio includes the 1984 Cerritos Branch Post Office, one of the earliest local public projects concerned with energy conservation and nontoxic building materials.

Site sensitivity

Intended to be warm, humanistic, and low-maintenance, the south-facing buildings line both sides of the narrow east-west valley that runs through the site, facing a grove of 70-year-old black walnut trees on the west. The buildings are clustered close together to create a sense of shelter and an oasis of shade in a sun-baked, arid landscape. No trees were cut down to clear the site, and construction was designed to require a minimum of excavation. Buildings on the north side of the complex are tucked into the hillside and are backed by concrete retaining walls to create a dense thermal mass that retains the winter sun.

By contrast, the Riverfront Building is raised on piers to generate a natural underfloor airflow that helps cool the building during the summer. Full-height glazing with low awning windows, floor-level grilles, and high clerestory windows provides copious natural daylight and natural ventilation through convection, supplemented by electric ceiling fans. The Commons Building is the only place where a mechanical ventilation system was installed; it was mandated by local laws covering public food service.

Outdoor trellises and flat rooftops will be covered by vines and plantings to help insulate the buildings in a climate that ranges from a winter low of 40 degrees Fahrenheit to a summer high of 120 degrees. Psychologically, these plantings will soothe the eye by adding a cool green tone to mitigate the hard, dry, semidesert topography. In phase three, when the solar-generation and water-flow systems, aquaculture fish ponds, and agriculture and forestry programs surrounding the center are fully functioning, the center will fully integrate self-sufficient human shelter into the host environment.

Betsey Dougherty sums up the benefits and drawbacks of designing and constructing the project. "On the plus side," she explains, "the center has radically changed the way I think about the whole practice of architecture. I now feel that architects are uniquely placed to contribute their special skills to a building process that is more caring than in the past." On the minus side, Dougherty lists the "endless extra, unpaid hours" she had to spend convincing manufacturers, suppliers, contractors, and local regulatory agencies about the advantages of this approach.

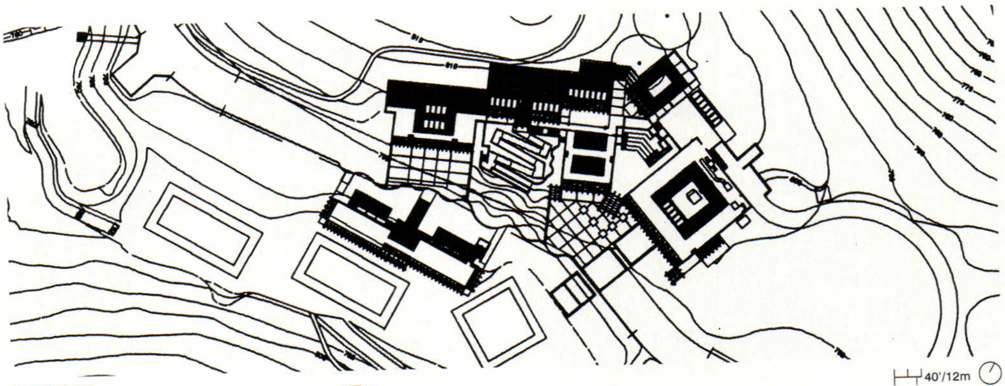
Coaxing suppliers

In the late 1980s, Dougherty had to search long and hard for nontoxic, renewable, ecosensitive materials. She was ruthless in rejecting those that didn't measure up and succeeded in turning around some suppliers, such as the toilet partition manufacturers, who were at first reluctant to meet her exacting specifications. "It was a mixture of bullying and coaxing," Dougherty says. "In the end, I managed to change the attitudes of a number of suppliers who are now eager to explore the opportunities in this field."

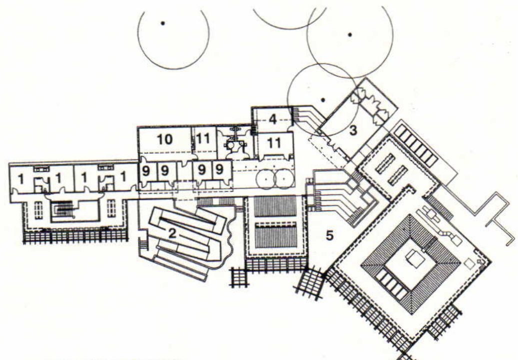
Largely for these reasons, the total first construction cost of the Center for Regenerative Studies' essentially plain, barebones structures is, at $227 per square foot, considerably higher than that of similar conventional buildings. "But when I see the first California green herons come to feed on the tilapia [freshwater fish] in the aquaculture ponds under the shadow of the Riverfront Building," Dougherty reports, "I feel I've had a hand in helping to restore the bosom of Mother Nature."—*Leon Whiteson*

BELOW: The concrete road that weaves through the complex was engineered to accommodate a fire truck, but detailed to resemble a town piazza. **PLANS:** Future phases will include an administration and learning center, additional student quarters, a greenhouse, and an agricultural support building. **FLOW CHART:** Self-sustaining ecosystem is designed to enhance natural flows of water, energy, and nutrients.

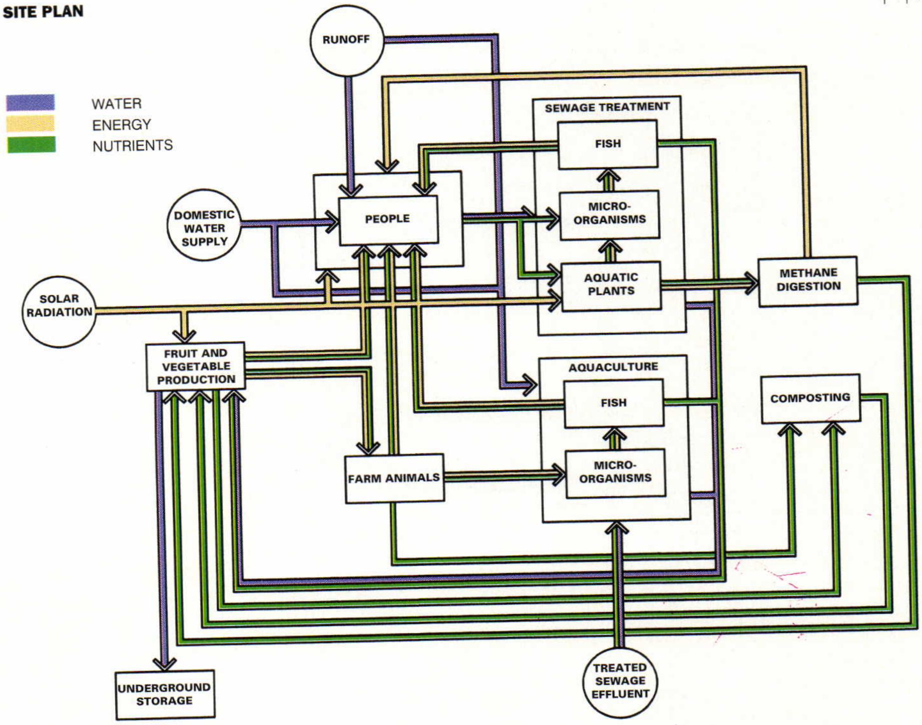
TOM LAMB



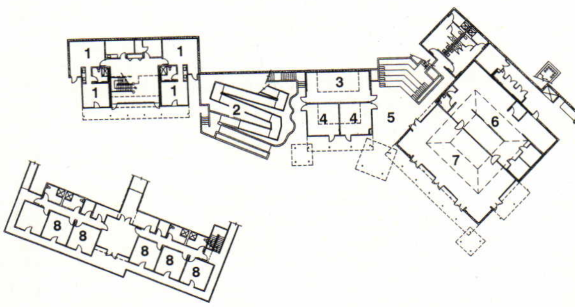
SITE PLAN



UPPER FLOOR PLAN



CYCLE OF ENERGY, NUTRIENTS AND WATER



40'/12m

LOWER FLOOR PLAN

1 FACULTY ROOM
2 SCISSORS RAMP
3 LECTURE ROOM
4 SEMINAR ROOM
5 AMPHITHEATER
6 KITCHEN
7 DINING ROOM
8 STUDENT ROOM
9 FACULTY OFFICE
10 OFFICE
11 CONFERENCE ROOM

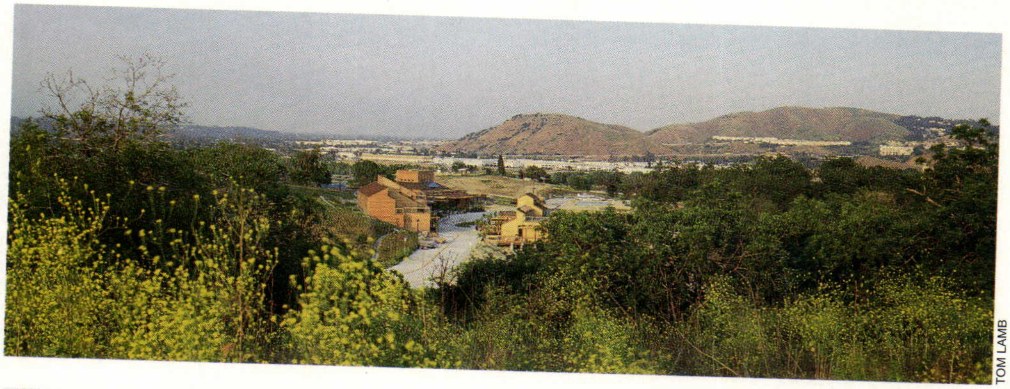
BELOW: The center was sited with minimum topographical changes.
CENTER LEFT: When fully grown, rooftop vegetation irrigated with reclaimed water will provide natural insulation and a source of food.
CENTER RIGHT: Trellis-supported vines shade the buildings.
BOTTOM: Surrounding the center are tracts of upland grains (concentric lines), and adjacent planting beds amid terraced slopes and agroforests.

The center's 16 acres comprise five types of agricultural production, including bottom lands, planting beds, terraced slopes, forested slopes, and upland grain production, plus the area set aside for the built village. The farming will provide a mixed crop of fruits, vegetables, and grains to feed the center's inhabitants in this cultivated semidesert.

When fully operational, this varied layout will generate interactive practices in soil fertilization and irrigation that protect and enhance the soil, while reducing the consumption of water, energy, and materials and eliminating the use of fossil-fuel-derived fertilizers and other chemicals now commonly employed in agriculture. Composting of agricultural waste will provide mulch for crops and will enrich the existing clay topsoil. Some acreage will be given over to growing crops and cultivated only with the hand tools available to subsistence farmers in many Third World countries, to develop strategies that can be introduced in such low-tech environments.

The siting of the center's buildings was partially determined by the existence of a Metropolitan Water District easement cutting through the property from north to south; this feature mandated that the buildings be placed immediately west of the easement, in a small valley with north- and south-facing slopes. The largely treeless and bushless site was shaped for construction with minimum grading so that the buildings should fit into the landscape with little alteration of the topography.

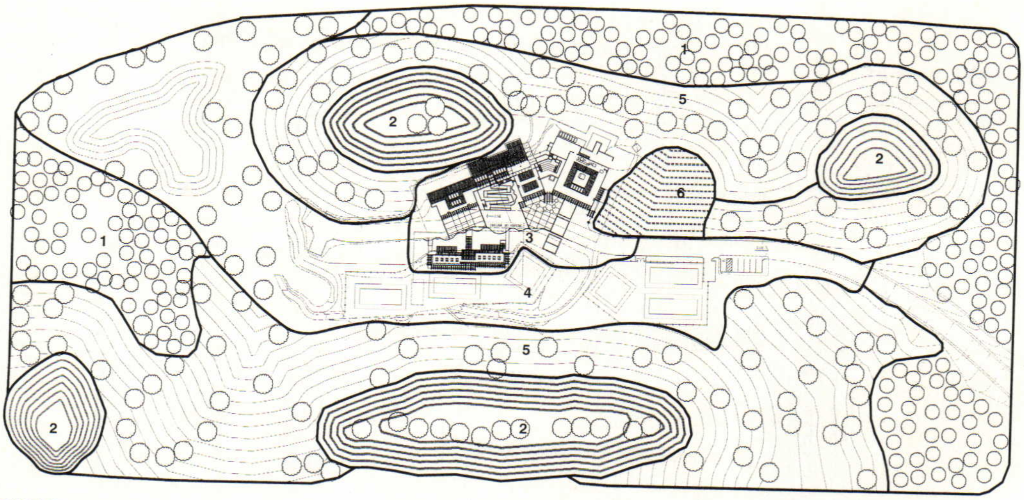
Owing to the proximity of the county landfill, which is equipped with a plant for the conversion of garbage into methane, much of the soil under the buildings shows traces of pollution; this condition requires constant monitoring by soil probes to detect any methane creep in the floor slabs in those buildings set directly on the ground.



TOM LAMB

MILROY / MCALEER

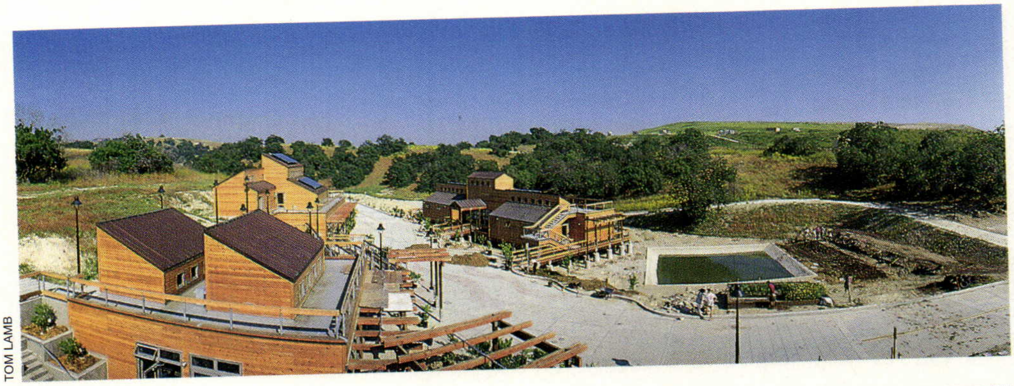
MILROY / MCALEER



LAND USE

1 AGROFORESTRY
2 UPLAND GRAIN
3 VILLAGE
4 BOTTOMLANDS
5 TERRACED SLOPES
6 PLANTING BEDS

BELOW: Ponds filled with fish and plants will treat wastewater cyclically. **CENTER LEFT:** As water evaporates from an aquaculture pond, air is drawn from under Riverfront Building. This convective cycle helps cool the dormitory. **CENTER RIGHT:** A 70-year-old grove of black walnut trees is being regenerated with new growth to encourage the return of native wildlife. **BOTTOM:** Reclaimed wastewater (right) flows through a sequence of nursery and grow-out ponds to reservoir (left).



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MILROY / MCALEER

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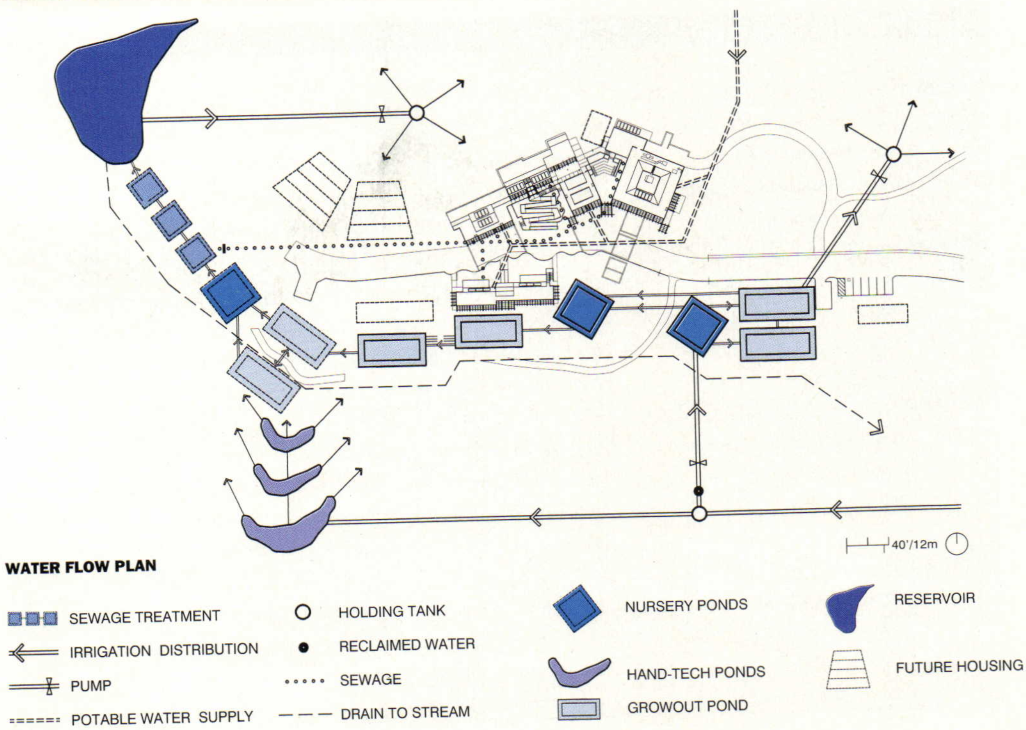


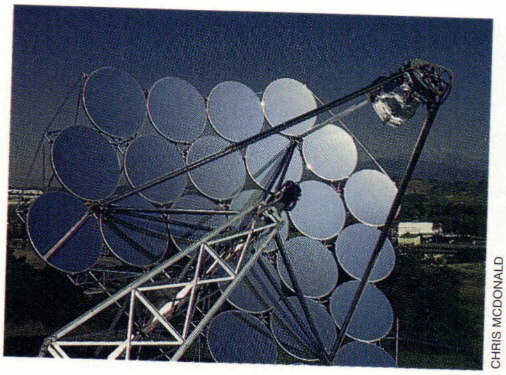
Water conservation within the buildings is encouraged by the provision of efficient plumbing fixtures such as low-volume, high-pressure toilets and showers. Rooftop planting relies on drip irrigation systems using reclaimed wastewater monitored by gauges that regulate supply. Each building of the center has its own water meter that records usage levels, making the residents conscious of the volume it takes to sustain a resource-responsive way of life. "Now we're aware of every drop we use," one student remarks. "Previously, like typical Californians, we never gave it a thought." Estimates of water savings over usage in conventional buildings range between 30 percent and 40 percent.

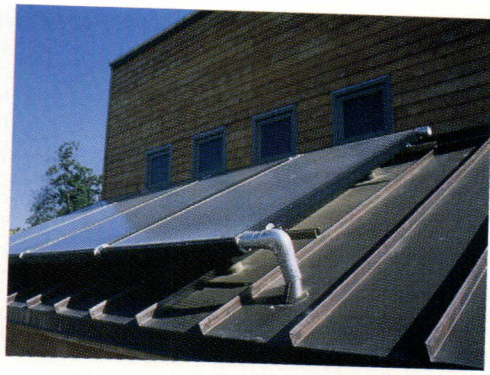
At present, the sewage system is conventionally linked to the main campus by a temporary sewer line. In the future, however, sewage will be treated on site through sludge tanks. These will feed reclaimed wastewater through a series of ponds for agricultural irrigation, and will create an aquaculture to breed fish and water plants and attract other wildlife. Currently, treated wastewater is supplied to the site for these purposes by the City of Pomona's Municipal Treatment Facility.

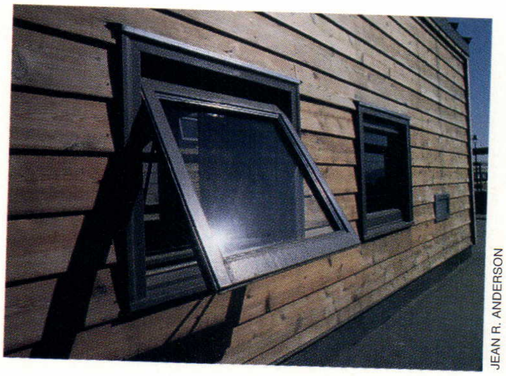
The water-flow plan, when completed in phase three, will comprise nine ponds: Five nursery ponds will nurture algae to feed the tilapia, a species of freshwater fish; four grow-out ponds will cultivate water hyacinths and other plants. The ponds will be linked to a reservoir at the northwest corner of the site.

Reclaimed wastewater is fed into the alternating grow-out and nursery ponds and then to the reservoir, where much of it is drawn off for irrigation. The residue is then gravity-fed back to the beginning of the pond sequence for recirculation, supplemented by the supply of treated wastewater. Six of the nine ponds are currently in place.

BELOW LEFT: On the hilltop solar park, polished mirrors focus light toward a thermodynamic engine, which converts the heat into electricity.
BELOW RIGHT: Rooftop solar panels supply electricity for domestic hot water.
BOTTOM LEFT: Operable windows and clerestory windows allow for convective air currents inside.
BOTTOM RIGHT: Sun-tracking photovoltaic cells supply power to recharge electrical vehicles and operate wastewater reclamation plant.


CHRIS MCDONALD


JEAN R. ANDERSON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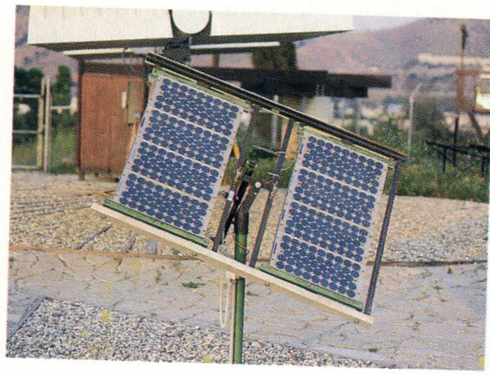

TOM LAMB

The four buildings of the center are presently connected to the electrical power grid, which is supplemented by a wind generator and rooftop solar panels that heat domestic water tanks. In the future, all the center's energy requirements will be supplied by a variety of on-site regenerative technologies, including a solar park and a cogenerator plant that will convert methane gas pumped from the landfill into electricity.

The experimental solar park, now set on a hilltop above the village, will supply power and demonstrate new energy technologies. In one structure, a dish-shaped, sun-following system of photovoltaic cells and polished mirrors provides thermal energy to drive a liquid sodium generator that converts heat into electricity. In an adjacent unit, Fresnel photovoltaic focusing lenses track the sun, generating energy to recharge the electrical vehicles used on site and to power the wastewater reclamation process. At present, the solar park's electricity is also fed into the main grid; later, an on-site biomass heat-storage facility will be built to store power generated during daylight hours for use at night. The solar park is operated by the resident faculty and students, in collaboration with Southern California Edison (SCE) engineers.

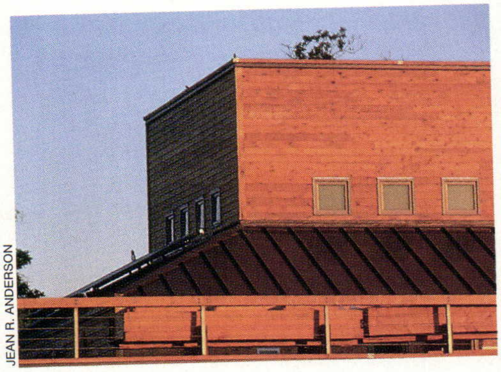
Energy-efficient compact fluorescent and metal halide light fixtures, cooking equipment, washing machines, and space heaters were specified by Dougherty+Dougherty in accordance with SCE, which is actively engaged in encouraging the manufacture and use of such fixtures and appliances. While many of these units have a higher first cost than their conventional equivalents, the long-term energy savings will more than compensate for the extra expense.

Electrical usage in the center is being closely watched by SCE, which has awarded the center its 1994 conservation citation.

ENERGY SAVING STRATEGIES

	GOAL	TECHNIQUE
SITE PLANNING		
Winter	Minimize conductive heat flow	Take advantage of land forms and structures to minimize wind exposure.
	Promote solar gain	Maximize reflectivity of surfaces outside windows facing winter sun.
Summer	Promote evaporative cooling	Locate building near aquaculture ponds and irrigated plantings.
	Minimize solar gain	Reduce reflectivity of surfaces outside windows facing summer sun.
BUILDING MASSING		
Winter	Minimize external airflow	Recess structure below grade or raise existing grade for earth-sheltering effect.
	Promote solar gain	Shape and orient building shell to maximize exposure to winter sun.
Summer	Minimize conductive heat flow	Recess structure below grade or raise existing grade for earth-sheltering effect.
	Promote radiant cooling	Protect outdoor areas, such as courtyards, with buildings and plantings.
BUILDING PLAN		
Winter	Minimize conductive heat flow	Design space under building as buffer zone between interior and ground.
	Promote solar gain	Provide solar-oriented interior zone, such as an atrium, for heat gain.
Summer	Delay heat flow	Specify slab-on-grade construction without ground insulation.
	Promote ventilation	Design interior with an open plan and operable windows for airflow.
BUILDING ENVELOPE		
Winter	Minimize infiltration	Place earth berms against walls and sod on roofs to shelter buildings.
	Promote solar gain	Specify heat-retaining materials and collectors on south-oriented surfaces.
Summer	Delay heat flow	Place earth berms against walls and sod on roofs to minimize heat gain.
	Promote radiant cooling	Provide shading overhangs and plantings for walls exposed to summer sun.

BELOW LEFT: Regular-grade natural cedar siding, which clads all four buildings, is sealed to extend the wood's durability.
BELOW RIGHT: Standing-seam copper roof requires no coating or sealant.
BOTTOM LEFT: A red volcanic aggregate was chosen to create curvilinear paving patterns only after research proved it was from an abundant source.
BOTTOM RIGHT: Mosaic of stone fragments collected on site honors the sun as center's main energy source.



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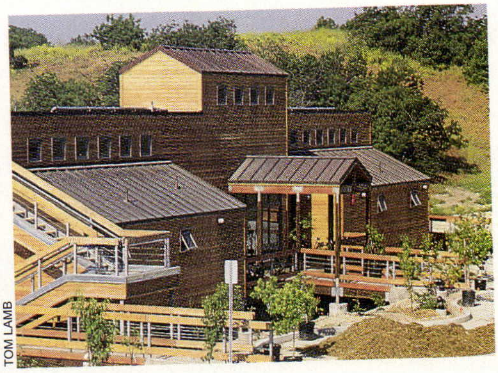

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MILROY / MCALEER

JEAN R. ANDERSON

The building materials specified by Dougherty+Dougherty for the center were primarily considered for their nontoxic, recycled, and recyclable qualities. The architects extended this consideration beyond the actual composition of materials themselves into the practices of the industry that produced them.

For instance, the natural cedar that clads the buildings and provides the exposed beams, posts, decking, and railings was chosen over redwood in recognition of the cedar industry's involvement in developing renewable timber resources. In choosing the quality of wood to be used, the architects selected the more plentiful regular grade over clear-heart grade to reduce the amount of harvesting required. Horizontal boards in cladding, floors, and deck were specified in a 6-inch width, which provides the least wastage in milling. As recommended by the Western Red Cedar Association, all cedar was factory-dipped in a nontoxic sealer, which prevents splitting and extends the wood's natural life.

Roof and wall insulation is rock wool, a recycled product of steel manufacturing. Interior materials avoid all synthetic products, such as vinyl tile, carpeting, particleboard, and plastic laminates, many of which are subject to "off-gassing" that may pollute indoor air. Floors are bare concrete finished with a clear organic sealer or, in the Commons Building, gray quarry tile. Toilet partitions are stainless steel with interior plywood cores, and plywood cores are employed in place of foam in solid-core doors. Though formaldehyde is used in the manufacture of plywood, the architects determined that the material was marginally less artificial than foam. "Sometimes one has to choose between lesser evils in this endeavor," laments Betsey Dougherty, who gathered information about eco-sensitive materials from trade fairs and professional sources.

MATERIAL SELECTION CRITERIA

Dougherty+Dougherty selected materials based on the following characteristics:

- Products that are long lasting, low-maintenance, and durable and that reduce the need for future consumption of materials;
- Materials that can be reused and recycled;
- Materials that are by-products of other manufacturing processes;
- Materials with passive solar properties;
- Materials from industries that have exhibited a commitment to renewable resources, incorporate recycled products in new materials, recycle their own by-products, or provide by-products to other industries;
- Materials that are nontoxic;
- Products that are not based on petrochemicals, except for waterproofing.

It is extremely important for architects and owners to support industries committed to the environment and to demand an appropriate response from all manufacturers and suppliers. This support will show the marketplace that environmental sensitivity has value and is an economically viable alternative. Ultimately, this pivotal shift in the construction industry will have a significant effect on the future of our planet.—Betsey Dougherty


FROM NOW ON, HE'S GOTTA G
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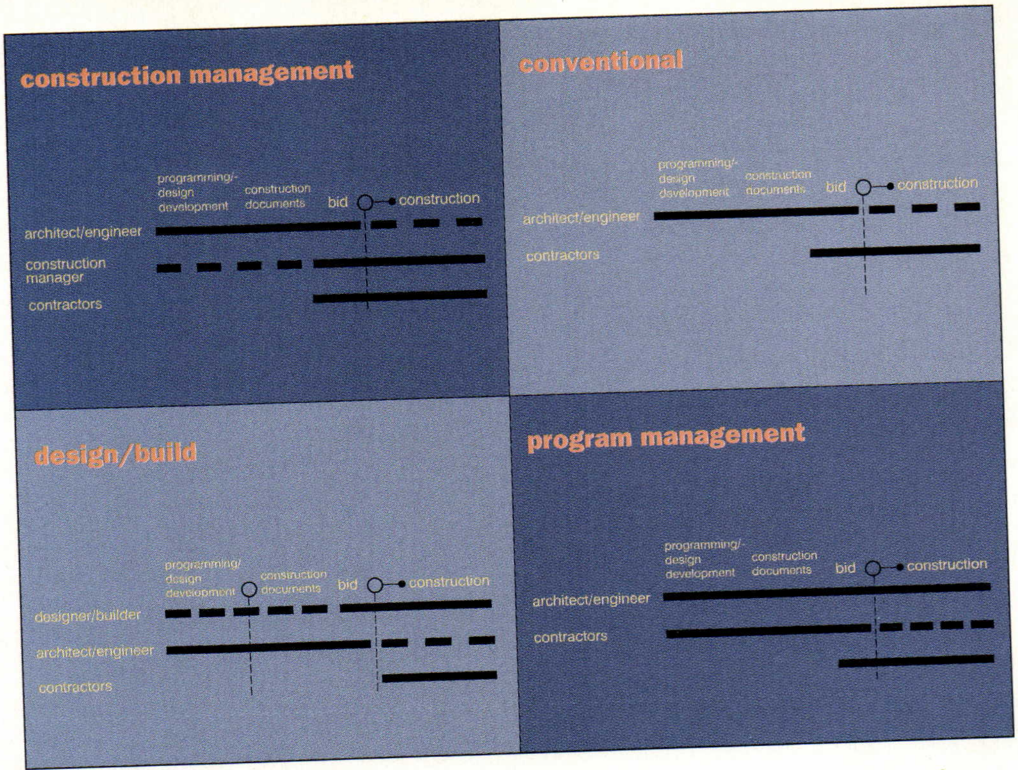


Architects as Construction Managers

Smaller architecture firms are reclaiming control of the construction process.

ABOVE RIGHT: Chart outlines differences in prevalent project delivery systems. Construction management introduces expertise about construction feasibility and cost into earliest stages of programming and design.

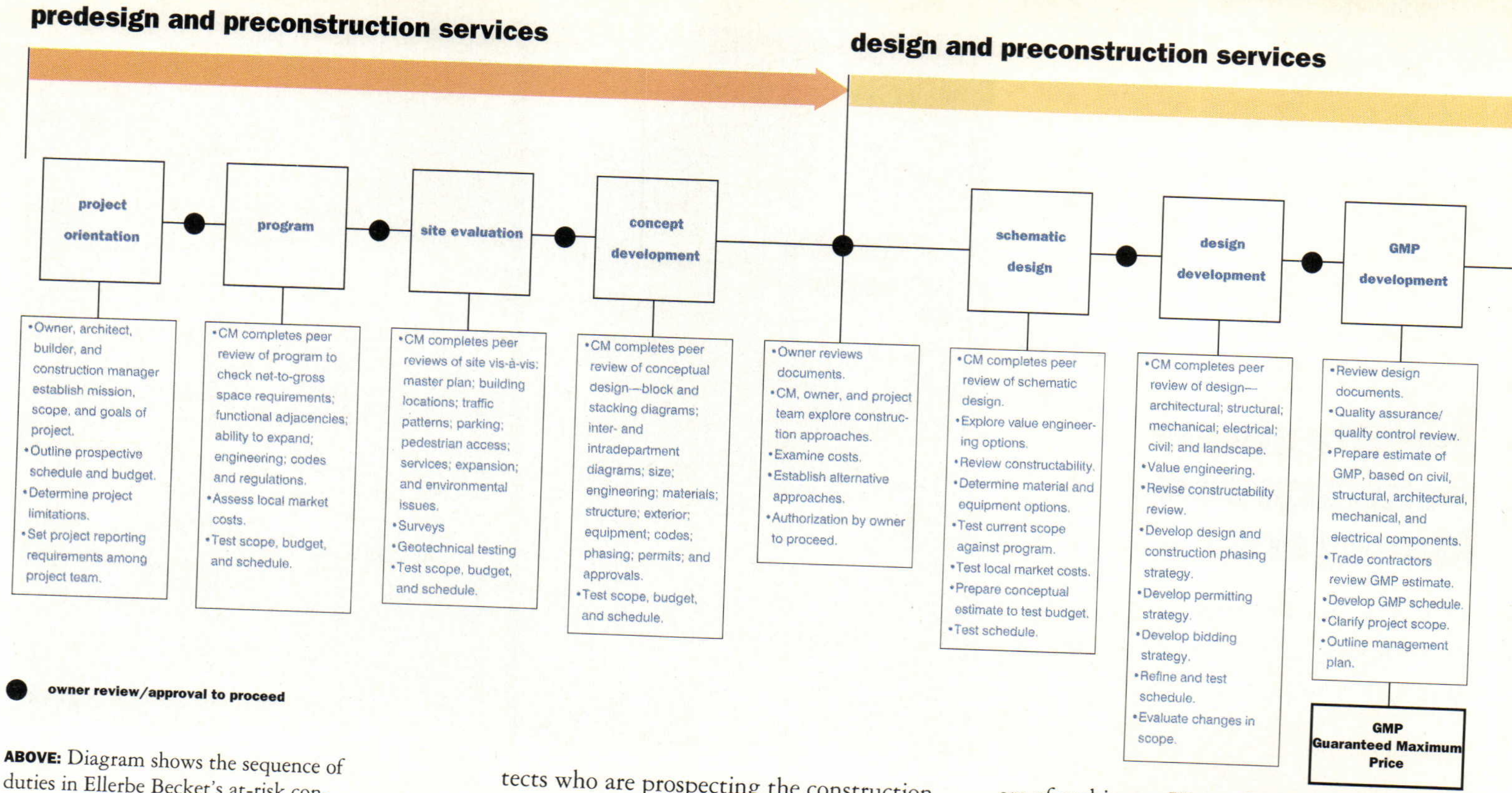
Construction management, the intensive supervision of project delivery from predesign through completion, has long been the province of giant contracting firms. And while large architectural firms such as Ellerbe Becket, 3D/International, and the former CRSS have offered clients construction management (CM) for years, smaller architecture offices generally have stayed away from it because they see it at best as an enormously complicated sideline. Lately, however, a growing number of principals in smaller firms are venturing into construction management in response to rising client demand, as buildings, systems, regulations, and construction logistics grow more complex.

In a 1993 study of clients by the Roper Organization for the AIA, 64 percent of clients reported that the ability to manage construction was "very important" in selecting an architect. Two kinds of owners generally retain a construction manager: Those who commission buildings infrequently, and those with major time constraints. "Owners are tired of getting steeped in construction projects because of all the disputes and lawsuits," asserts Marc Gravallese, the AIA's director of professional practice programs. "Conventional methods [associated with design/bid/build] are waning in value because the owners get too involved. They want to bring on someone who can manage the entire design and construction process for them."

Construction management allows architects to take back control of the construction process. "I frankly got sick and tired of owners putting us in the same boat as contractors when there were problems on a project," remarks architect Lawrence Leis, principal of the Louis & Henry Group in Louisville, Kentucky, a 20-person firm that started offering construction management services this year. "If I'm going to take the rap for these problems, I might as well be in charge."

By providing construction management services, architects can also expand their profits. Architect Robert C. Mutchler, retired principal of 17-person Mutchler Bartram Wild (MBW) in Fargo, North Dakota, is known as the small-firm pioneer among architects in construction management. MBW first entered construction management in 1980, after Mutchler read the AIA's contract B801/CMa—the standard agreement between the owner and construction manager. "There isn't anything in there an architect can't do," Mutchler maintains.

In 1985, Mutchler established another firm, MBW Development Company, to manage construction projects. Most firm principals set up such separate firms for both liability and tax purposes. This strategy keeps CM fees distinct from architectural fee volume, on which liability insurance premiums are based. Mutchler Bartram Wild and MBW Development have provided construction management along with design services for more than $75 million worth of projects, attaining profits of up to 50 percent of gross billings. Mutchler now consults with archi-



ABOVE: Diagram shows the sequence of duties in Ellerbe Becket's at-risk construction management process, which provides the owner price guarantee and frequent chances to review work.

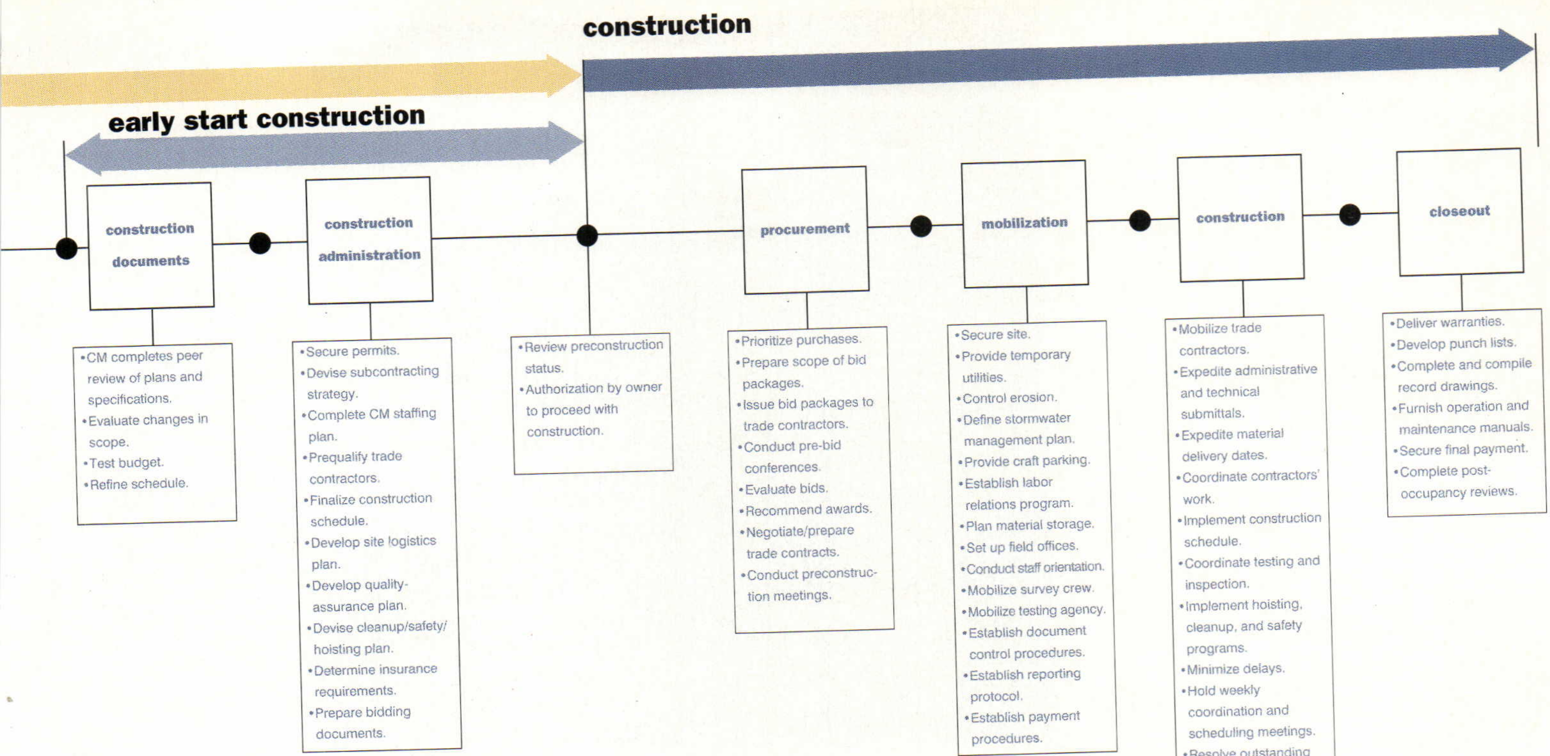
tects who are prospecting the construction management field and reports that relatively few principals consider it because they fear the added risk. "When they enter practice, architects hear that they're supposed to avoid liabilities," Mutchler observes. But in construction management, he adds, "the pay is so good, it covers the risk."

Picking your risks

Exposure to liability is a big concern for architects entering construction management, and the degree of risk they face depends on whether they act as a *CM-agent* or a *CM-at risk*. The CM-agent plays an arm's-length, mainly advisory role for the owner, and the risk is relatively low. The agency CM corrals the contracts, traffics decisions among design and construction team members, and keeps track of all the work and the payments. Cash flows only between the owner and trade contractors, not through the CM-agent. And the CM-agent also doesn't furnish materials or labor and offers no guarantees as to the cost, time, or quality of construction. The CM-at risk, however, assumes all kinds of guarantees, taking sole responsibility for the entire project, from programming and planning, to the bids, the permits, and the punch list. Most humbling, the CM-at risk makes a promise upon the schedule—and often guarantees a maximum project price to the owner before construction starts.

These types of guarantees are enough to spook liability insurers. The two major insurers of architects, Victor O. Schinnerer & Company, and the Design Professionals Insurance Company (DPIC), readily insure architects who perform CM-agency services, but do not cover CM-at risk. "We encourage architects to gain CM-agency competence and go sell it," remarks Roger Brady, DPIC's director of loss-prevention services. "But a CM-at risk crosses the line from professional services to general contracting," at which point the exposure encompasses the "means and methods" of construction as well as job-site safety. "As a CM-at risk, your title implies to the courts that you're responsible for worker safety," cautions Paul Genecki, senior vice president of Schinnerer. "So you should consider having someone onsite who knows about safety, and they should have on their checklist that the workers appear to be complying with safety regulations."

Thus, whether a CM-agent or CM-at risk, the architect acting as construction manager needs to be a good communicator and know a lot about administration. Mutchler observes that when 20 to 30 trade contractors are acting as multiple primes, the volume of paperwork is tremendous. Thus, he counsels that design architects with no interest in construction cannot simply turn into construction managers. The architect needs a strong aptitude for logistics to orchestrate these multiple prime contractors for the owner. "You start to have problems when you lack a team environment," maintains Oscar L. Harris, president of 70-person Turner Associates Ar-



chitects and Planners, and OLH International, his 12-person construction management firm in Atlanta. "If that happens, you risk coming up with an incomplete scope of work, premature awards of bid packages, and poor coordination of contract documents."

Where interests collide

Are architects trained to provide construction management? Most general contractors, naturally, say no, contending that architects' interests collide when they supervise the construction of their own designs. Ralph W. Johnson, senior vice president of Turner Construction Company, the nation's largest general contractor, asserts that construction management "can only be properly executed by a contractor." While the Associated General Contractors of America has developed construction management contracts jointly with the AIA, they cover contractors, not architects, as construction managers. The AIA developed its own contracts for architects acting as CM-agents. (See "Construction Management," ARCHITECTURE, May 1993, pages 147-151, for details on the AIA's contracts.)

Architects, on the contrary, report that they have been doing a lot of the work associated with construction management for years and simply haven't been getting paid for it. And architects say general contractors have a conflict of interest of their own when they double as construction managers. Contractors have a reputation among architects, deserved or not, of ratcheting down cost at the expense of quality. "You've got two priorities as a construction manager," contends Christopher Widener, partner of 10-person Widener Posey Architects in Springfield, Ohio, which began construction management this year. "You've got to get materials to the site, and get them installed. But when you've got a site superintendent working for the general contractor, his main job is to get the GC's work done," Widener contends. "If he's got concrete coming at 1 p.m., he's got to get the forms up and doesn't have time to get answers to the electrical and plumbing subcontractors." But with a third-party construction manager, Widener adds, "the contractor can get the formwork done, and the CM can answer questions."

Managing one's own work is one issue, but how does a design architect feel about another architect managing construction? "They like having a sympathetic and similarly educated construction manager," Widener says. "As a CM, I can relate a whole lot better to the trades in the field because I see what the design architect is trying to do."

Most important is how clients feel about an architect—often employed by the same firm as the design architect—serving as construction manager. Some clients indeed harbor qualms about the potential conflict of interest. "One of our clients thought it would eliminate checks and balances in the process," Widener recounts. But his reply is that the client's interests are actually better covered when the architect takes over because the

DELIVERY METHOD	Owner/Architect/ Client Relationship	Who Protects Owner	Quotation of Firm Price
CONVENTIONAL	Architect is owner's agent, with one to three prime contractors	Architect, part-time	Before start of construction
DESIGN/BUILD	One prime contractor/architect team preselected by owner	Design/build team has sole responsibility	During design stage
CONSTRUCTION MANAGEMENT (separate owner's agent)	Architect and CM both act as owner's agent, with potential for conflict; One prime or multiple contractors	Both architect and CM, part-time	Before or during construction
CONSTRUCTION MANAGEMENT (with guaranteed maximum price)	Architect is owner's agent; CM is prime contractor without competition	Architect, part-time	Before or during construction
CONSTRUCTION MANAGEMENT (architect as CM)	Architect/CM is owner's agent and coordinates all contractors	Both architect and CM, full-time	Before or during construction

ABOVE: Mutchler Bartram Wild's comparison of popular delivery systems highlights some of the advantages of construction management.

chain of command changes. The bids go out to trade contractors who become multiple primes rather than subs. Absent is the general contractor, to whom the subs are ordinarily beholden. "We have 12 bid packages; so in effect we have 12 checks and balances as opposed to one," Widener explains. "We're getting expertise twelvefold from people who have a direct line to the owner. We make a point to the trade contractors before bidding and before construction, that if there's anything that can save the owner dollars, they should bring it up right away. If they were subcontractors working for the general contractor, they'd be a lot less likely to bring up problems than when we act as the construction manager."

The construction manager also needs to act as referee to solve problems trade contractors create for each other. If one trade's negligence costs another trade money—say, if the millwork isn't prestained as ordered and costs the painter extra time—Widener Posey docks the millworker and gives the money to the painter, Widener says. "We have never felt like we've been in more control."

Back to the master builder

In fact, when architects manage construction projects they've designed, they are returning to the idea of the master builder, asserts Randolph J. Collins, principal of Collins & Scoville Architects in Albany, New York. An architect with the design firm is probably the best person to manage construction, Collins says, because "the architect will know from programming what was important to the owner. There's a lot of room for that to get lost in translation," Collins adds, "but construction management brings the process full circle." Architects, as Collins suggests, should bring in their resident construction manager as soon as possible in the design and construction process, ideally during programming. At that stage, the manager can get to know the owner's program requirements, scrutinize the budget, and make sure there's enough money for the design to be changed while there's still a chance to contain costs, explains Brian H. Gracey, senior vice president of the development firm Carter in Atlanta. "In the conventional process, the drawings are finished and decisions are made when you put the project out to bid," Gracey points out. "If it comes in over bid, you don't have the opportunity to control costs. You take off the last things that were put on—the landscaping, the wall coverings—and you never get to the real culprit, which may be the structure, because it's too late to start over." Owners want a greater variety of choices in selecting both systems and materials before they are locked into any specifics, Collins maintains. Often, he says, a general contractor acting as the CM offers too few alternatives, and too late.

Dovetailed schedules

The hardest part, and the most crucial, is when the time comes to devise the construc-

Time Required	Construction Schedule	Costs to Owner	Income to Architect
All drawings completed and bids taken before construction starts (longest method)	Contractor prepares schedule; overruns common	Costs controlled by competitive bidding	Standard compensation
Fast track process saves time by starting foundation and structure before design is completed	Same as conventional	Sacrifices competitive bids; Most expensive method	Less than conventional
Same as design/build	Varies; CM prepares	Competitive bids offer savings, but CM agent costs extra. Multiple bids eliminate prime's markups and offset cost of CM services	Standard compensation without costs of adversarial relationships
Same as design/build	Same as conventional	Similar to design/build	Same as with separate owner's agent
Same as design/build	CM prepares and rigidly enforces schedule	Competitive bidding of subs affords wholesale prices without prime's markups	Standard, plus CM fee

tion schedule, after estimating and before bidding. When fixing the schedule, the construction manager must be sure to order long-lead items such as steel, mechanical equipment, and wall systems early. "We aggressively start ordering materials in the second week of the project," Widener notes. "If delivery takes seven weeks, you can't wait until the fifth week to order." The CM has to build the schedule around various delivery dates and map out the delivery sequence in preparation for bids. The schedule is then written into the specifications. "You prepare a bar-chart schedule for each bid package," Collins explains, "so that the bid is based on the schedule, and the contractors commit to a starting and ending date." Potentially large bid packages, such as those for HVAC equipment, can be broken into smaller packages, such as for sheet metal and piping, to allow flexibility in mobilizing contractors.

The trick is to dovetail the work of various trades to maximize efficiency (see diagram, pages 112-113). Explains Peter B. Winchell, vice president of Ellerbe Becket Construction Services in Minneapolis: "Contractors work on very narrow profit margins, so you have to look for every opportunity to reduce their cost of doing work. If the process disrupts the contractors financially, you're going to get a claim. You have to set up one time when each contractor can mobilize, get in, do their work, get out, and get paid."

The construction sequence must also account for all reviews and inspections that could affect design. Complying with stormwater runoff regulations, for instance, requires an official review, which may alter the design. Likewise, structurally complex projects may require changes upon inspection by building officials. If all work proceeds according to schedule—which it must—construction management can cut the time spent in construction by 25 percent, Mutchler notes, "and then your firm has 25 percent more time to move on to the next project."

Dramatic results

That time saved is a bonus on top of the cash firms can generate with construction management. Mutchler provides the figures on a $2.5-million clinical office building in North Dakota, for which construction lasted one year. The architectural fee was 7 percent, or $175,000. The CM fee at 5 percent came to $125,000. With reimbursable expenses of $15,000 added in, the total gross income came to $315,000. The net income totaled $100,500, or 31.9 percent net to gross, compared with a likely 10.6 percent for both conventional and design/build. "We were quick to realize we could get nearly as much for managing construction as we do for design, with one more person and a secretary," Mutchler recalls. And clients still typically pay the same or less than they would for design/build or conventional delivery with a general contractor. "Most people don't believe me when I tell them how much money you can make."—*Bradford McKee*

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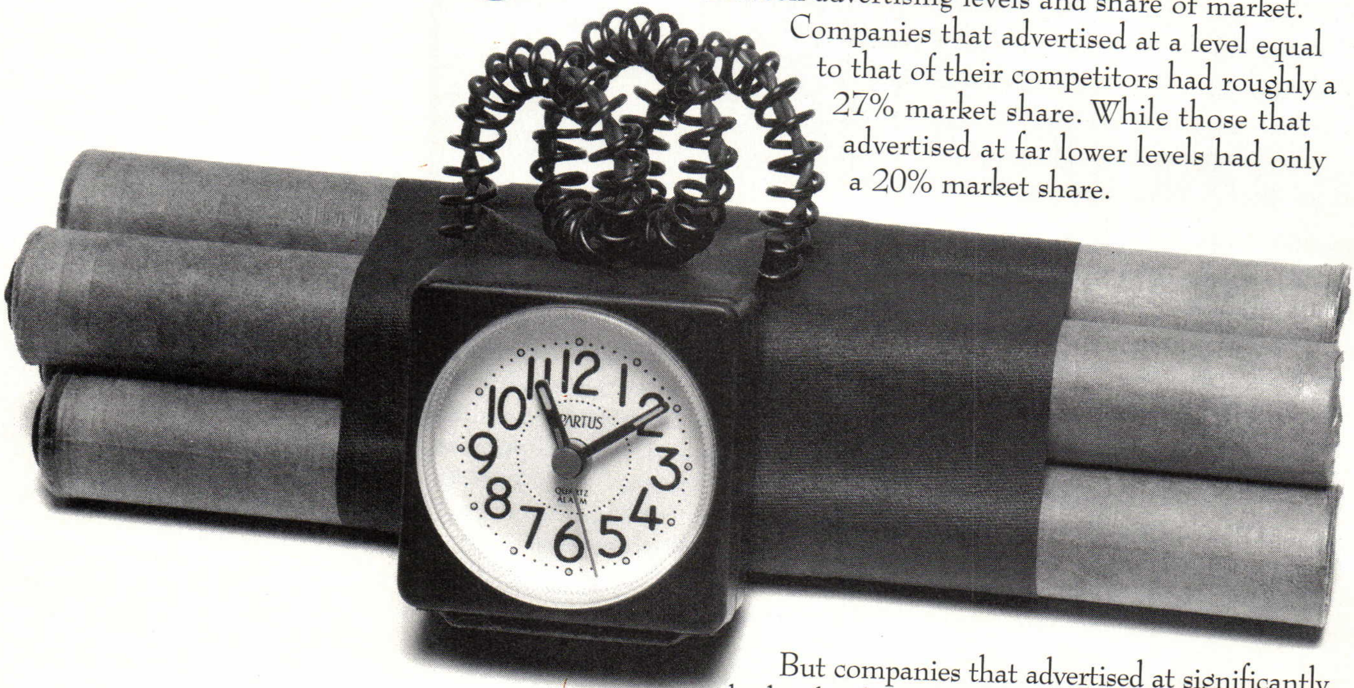
A recent study by Cahners Publishing and the Strategic Planning Institute analyzing more than 2,000 companies showed a direct correlation between advertising levels and share of market. Companies that advertised at a level equal to that of their competitors had roughly a 27% market share. While those that advertised at far lower levels had only a 20% market share.



But companies that advertised at significantly higher levels had a market share of 43%.

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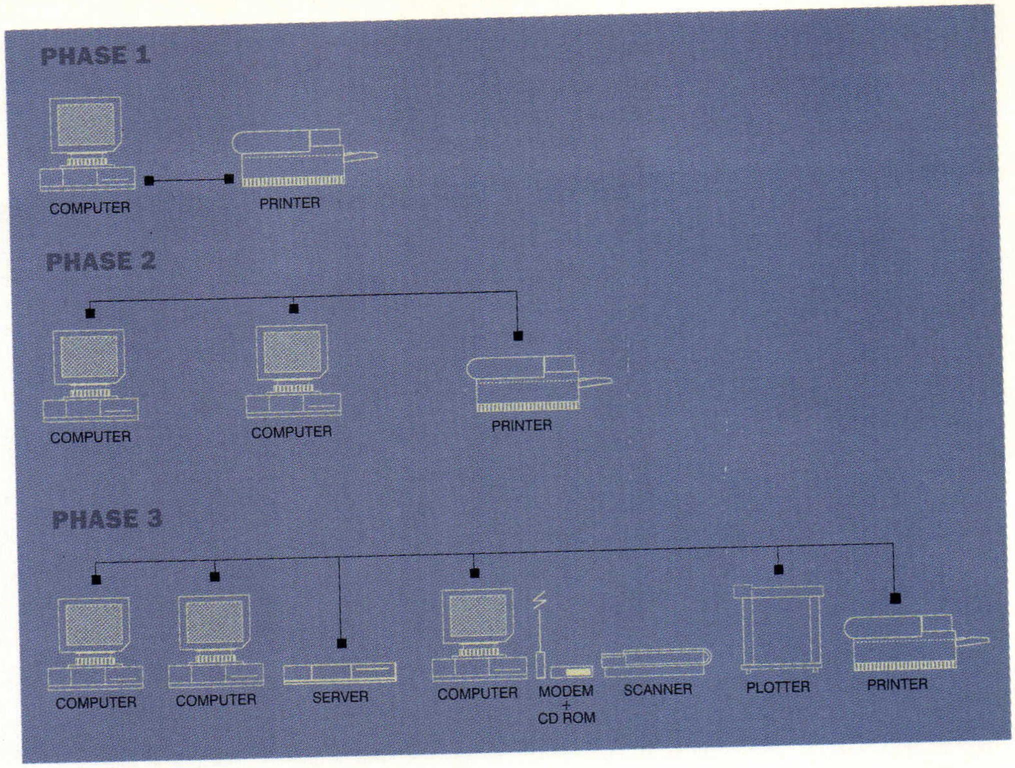
Start Small With CAD

A gradual incorporation of computer systems may be the best way to boost your practice.



ABOVE RIGHT: Beginning with a modest setup, a firm can gradually add components to a network that eventually automates an entire office.

Too many architects falter in automating their offices because they begin with unrealistic expectations about how computers can benefit their practice. By contrast, others succeed because they start with modest goals and gradually expand with experience. They reap immediate, if simple, benefits from technology, then later upgrade to more sophisticated software. Similarly, hardware can be upgraded gradually as firms add equipment to a network over time.

Starting small

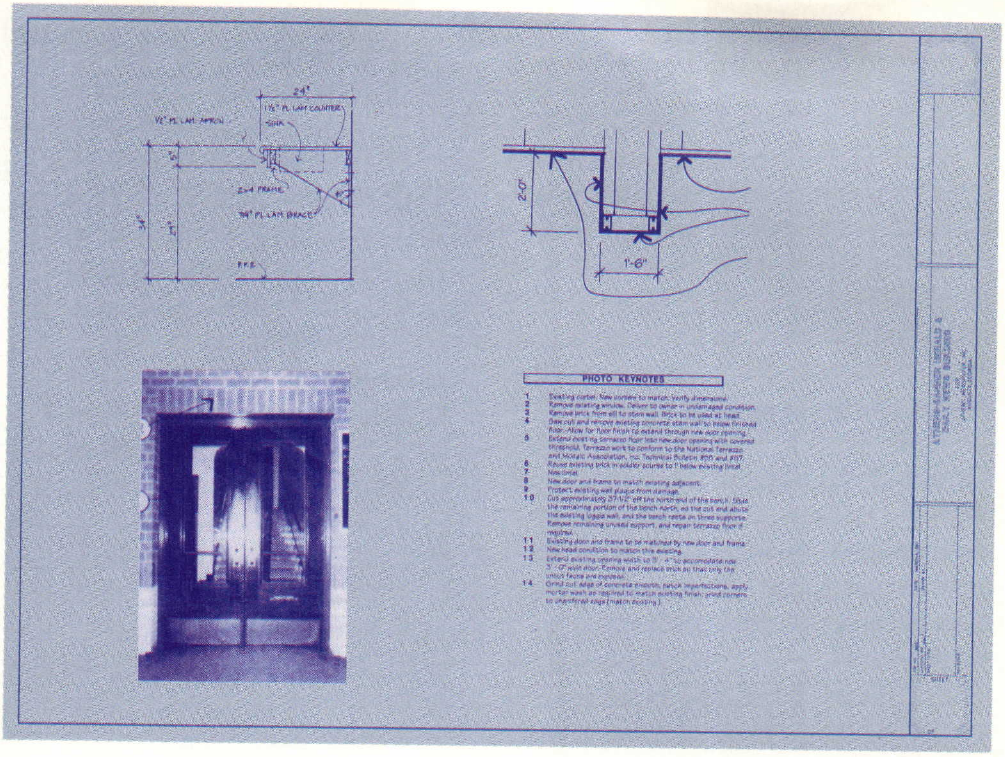
But hardware and software alone do not make a firm more productive, efficient, or competitive. Rather, getting the best return on the technological investment requires a commitment to constantly improving employees' skills. Every individual needs to start from zero in the time-consuming process of learning and adapting to computers. Unless this transition to automation is gradual, it can be unnecessarily painful. So "think small" is appropriate for firms of any size.

Advice on getting started is the specialty of Geoffrey Moore Langdon, principal of Beverly, Massachusetts-based Architectural CADD Consultants and coauthor of *CADD and the Small Firm*, published by the Boston Society of Architects. This regularly updated book has been described as the *Whole Earth Catalog* of computers in architecture. In it, Langdon rates dozens of CAD systems by how well they accommodate architectural processes. This, he argues, is a better purchase criterion than the too-common practice of simply picking whatever software the firm's engineering consultants are using. He warns against biting off too big a system at first. "No matter what you get," Langdon predicts, "in three to five years, you'll be using a different package. But if you choose a Mac or PC system, you'll be able to switch to other systems relatively easily."

Barry Isakson, of Architectronica, a Los Angeles-based consulting firm, has similar advice about hardware. He advises architects to add equipment in phases, but not to plan too far into the future. Isakson explains: "Innovations are happening so rapidly that central processing units (CPUs) are becoming disposable. So unless a firm needs a high-end system for some special function, I recommend inexpensive machines. Some people feel uncomfortable at the low end and compromise by buying midrange equipment, but they do themselves a disservice. I advise them to buy the minimum to satisfy their needs for 12 to 18 months, because after that, the whole picture will change."

Composite drawings

But working with modest software and equipment does not require compromising professional standards. So says Frank Mascia, principal of CDG Architects in Tucson, Arizona, who has been advocating the "think small" approach for more than a decade. With low-end Macintosh systems, he has devised numerous strategies for maximizing his



RIGHT: Architects need not generate complete drawings within CAD. Rather, a drawing can be a composite of hand-drawn sections, CAD-drawn details, notes from word processors, and photographs annotated in illustration software.

firm's productivity. For example, he creates each architectural drawing as a composite of disparate pieces, like a newspaper that publishes drawings, photographs, writing, and data. It's a mistake, Mascia insists, for architects to think the entire sheet needs to originate in CAD. Instead, he figures out the best way to create each component. A single sheet may contain output from spreadsheets, word processors, manual drawings, and illustration and CAD programs. "The key," Mascia notes, "is to match the personality of the tool with that of its function. Some people worship at the altar of technology instead of thinking how best to get the job done."

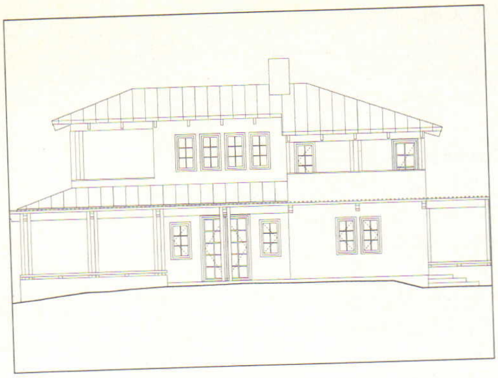
Phasing an upgrade

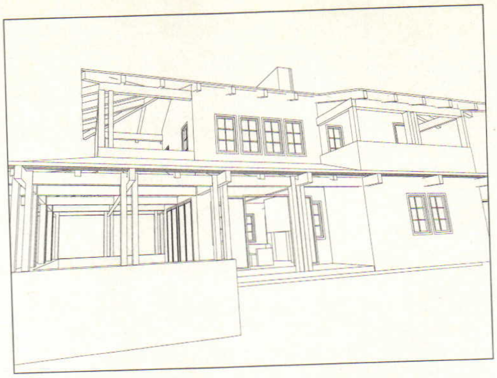
Although many experts recommend the start-slow approach, they also advise architects to anticipate a time when they'll want to move up to more complex systems. To avoid data obsolescence, architects should select a start-up system that is compatible with whatever higher end system they move up to later on. Fortunately, this is less of a problem than it used to be, according to Boston architect Evan Shu, principal of Shu Associates and coauthor of *CADD and the Small Firm*. "The computer industry is growing together," Shu notes. "Full accessibility between CAD systems is coming."

Langdon recommends picking an easy-to-learn, inexpensive system and gradually phasing in its use. He maintains: "Overlay drafting integrates well with CAD if you use CAD where it makes sense and mix it with layers done by hand when that's faster and easier." One advantage of this phased approach, he observes, is that it builds an understanding of CAD layers. Langdon cautions against "the impulse to hit the ground running" with a first CAD system. "Even with the easiest systems," he says, "it takes time to learn how to produce drawings productively. At first, it's important to apply CAD to only one long-range project at a time."

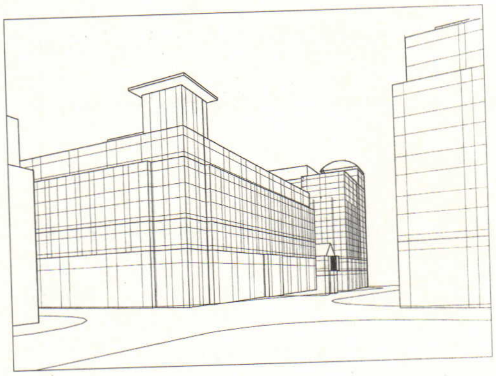
Such a gradual approach was taken by architect Olle Lundberg, principal of Lundberg Design in San Francisco. Four years ago, with no computer background, he committed his firm to automation and purchased Macintosh computers with PowerDraw for 2D drafting and ArchiCAD for 3D modeling. At first, his firm used the computers only for details but soon extended this to include plans and elevations. After their 2D processes had become completely intuitive and more productive than manual drafting, the architects eased into 3D modeling. By the time they had mastered ArchiCAD, they discovered Electric Image, which imports ArchiCAD files for rendering and animation.

Now Lundberg Design uses all three programs and moves files freely between them. The architects begin with a paper sketch, then transfer that to ArchiCAD for design development. From there, they export models to Electric Image to create presentations and export 2D drawings from ArchiCAD back to PowerDraw to complete the construction





LEFT: Lundberg Design developed computer capabilities gradually. The architects' evolution, shown in the Rosow Guest House, included (clockwise from upper left) 2D elevations, wire-frame perspectives, color renderings, and photorealistic images.
BELOW: To produce presentation drawings of the Reston Town Center, Florance Eichbaum Esocoff King used a simple wire-frame perspective plotted from CAD as an underlay for airbrushing and rendering by hand.



drawings. "After four years of trial and error," Lundberg concludes, "we are now doing presentation work that would have been impossible by hand, and our documentation is now faster and far more accurate."

The right stuff

Attaining this level of fluency, notes Langdon, "means not being a purist, but looking at the big picture and using the right software for any particular task, including knowing when to do things by hand." Architect Ken Sanders, who manages information systems for Zimmer Gunsul Frasca in Portland, Oregon, refers to this flexibility as "the right stuff." Sanders credits computer expert Mike Edelhart for identifying this inevitable phase of implementing technology: "First, there's skepticism about what technology can do," Sanders explains. "Then there's excitement as everyone jumps on the bandwagon. After that comes disillusionment when the reality fails to live up to the hype. Only after going through that cycle do you get to the 'right stuff' phase." According to Sanders, you cannot feel comfortable in your ability to apply a tool approximately until you fully understand what it can and cannot do. "You can't avoid the disappointments," he adds, "but if you understand this cycle, you can avoid being whipsawn by them."

Another architect who has discovered "the right stuff" is Glenn Dasher, of Florance Eichbaum Esocoff King in Washington, D.C. Dasher creates rendered presentations with a combination of computer and traditional techniques. He begins by building a simple 3D model in CADVANCE, adds just enough detail to locate the major elements, experiments with the viewpoint until he is satisfied with the perspective, and prints it out. Then he traces it by hand, photocopies the tracing onto watercolor paper, and applies subtle color with an airbrush and colored pencils. "I could generate the perspective by eye," he explains, "but if the view doesn't show everything at its best, I'd have to start over. Or, I could spend more time on the computer to achieve greater precision, but that would take more time than just working it out myself. It's an optimum balance of computer time and my time."

Staying small?

Much of the advice offered here—start small, plan for growth, find a comfort level, and view the computer as only one of many tools—applies to small firms about to buy their first CAD systems. But some of it also applies to firms that have been automated for years. Mascia's firm still seeks the simplest and most efficient way to create every component. "Because we were able to produce work faster than others," Mascia says, "our office grew from six to 35 people during the worst depression in the history of Arizona. 'Think small' is not an issue of system size; it's a philosophy of finding the right match between technology and the way you run your practice."—*B.J. Novitski*

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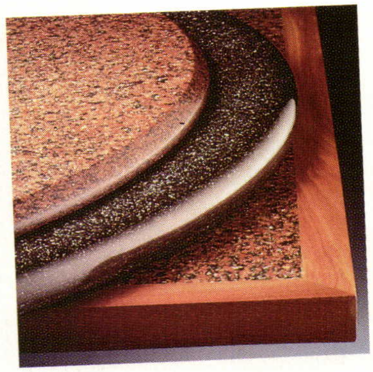

TOP: Herman Miller's Aeron chair, created by industrial designers Bill Stumpf and Don Chadwick, is available in small, medium, or large sizes, with an adjustable seat, lumbar pad, and tilt mechanism. Most of the chair's components are recyclable, and Herman Miller's patented Pellicle material, a flexible, woven composite of polyester and elastomeric fiber, conforms to a sitter's physique, distributes weight to the chair's seat and back, and reduces heat buildup.
Circle 401 on information card.

ABOVE: The design and production of Picto, ergonomic office seating from Wilkhahn, reflects the German company's commitment to environmental responsibility. Constructed of 95 percent recyclable materials, the seating features curved beech laminate armrests, an aluminum base and frame, and a polypropylene seat. The polypropylene backrest is perforated to lessen heat buildup.
Circle 402 on information card.

TOP RIGHT: BASF Corporation, has developed the 6ix Again Recycling Program. The corporation's Carpet Products Group extracts caprolactam, the raw material of nylon fiber, from used carpets and spins it into new yarn. Carpets eligible for the program must be constructed of BASF's Zeftron Nylon 6ix face fiber. Western Solutions, a division of Santa Ana, California-based E.T.C. Carpet Mills, specifies this recycled yarn in its solution-dyed commercial loop and cut-pile carpets, including the Classic Solution and Optimum Solution lines (shown).
Circle 403 on information card.

CENTER RIGHT: Ecodeme, a 100 percent polyester fabric from Guilford of Maine, derives 45 percent of its fiber content from recycled plastic. It is primarily applied to panel systems and walls. Available in 11 colors, the fabric is sold in 66-inch-wide bolts. The manufacturing process is energy efficient: Guilford reduces the amount of water used in the finishing process from 4 gallons to 1/2 gallon per pound of fabric. In addition, water is recirculated after each high-temperature dye bath and used to warm the next batch. Guilford of Maine is a subsidiary of Atlanta-based Interface.
Circle 404 on information card.

ABOVE: Harder than oak and lighter than granite, Environ, a new interior finishing material from Phenix Biocomposites, combines the appearance of stone with the characteristics of wood. Composed of recycled newsprint, a soybean resin, and color additives, Environ can be sawed, sanded, routed, or glued. Applications include furniture, cabinetwork, ceilings, doors, interior signage, flooring, moldings, and wall surfaces. Manufactured in 3-foot-by-6-foot sheets and in 1/4-, 1/2-, 3/4-, or 1-inch thicknesses, Environ is available in dark green, brick red, or purple—each with black flecks; and black with light gold flecks. Custom colors and sizes are also available.
Circle 405 on information card.

Thermal insulation
Pittsburgh Corning has published an evaluation of its Foamglas cellular glass insulation (above), outlining the environmental impact of its manufacturing process and installation. A lightweight, noncombustible material composed of glass cells, Foamglas provides an alternative to plastic insulating foam, which uses chlorofluorocarbons in its manufacturing. A long life cycle and ease of recycling contribute to the energy-efficient performance of Foamglas.
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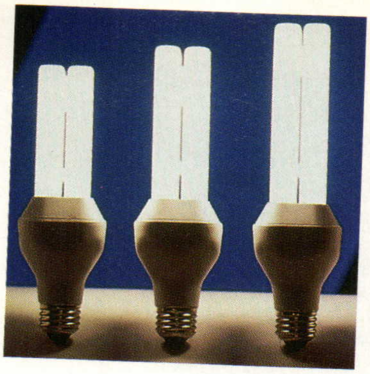

Compact fluorescent
The trim profile and tapered base of Panasonic's new compact fluorescent bulbs combine the operational ease of incandescent lamps with the long life and energy efficiency of fluorescent bulbs. Compatible with standard electric sockets and comparable to incandescent bulbs in lumen output and color rendering, they are purported to provide an average life service of 10,000 operating hours. Three sizes (above) are comparable to 60-, 75-, and 90-watt incandescents.
Circle 407 on information card.

Energy-efficient lamp
GE Lighting has introduced Genera (above), a compact induction reflector lamp shaped like an incandescent bulb and compatible with incandescent sockets. Comparable in energy efficiency and life span to compact fluorescent lamps, GE's Genera is purported to produce light equivalent to a 75-watt incandescent lamp with only 23 watts of energy. Introduced in Germany this past spring, Genera will be available in the United States in early 1995.
Circle 408 on information card.

Electricity control
The Energy Miser remote occupancy sensor (above) from Garcy/Systems Lighting Products turns equipment on when it detects a change in the infrared heat radiated in the area and turns it off following 15 minutes of inactivity. Sensing devices are positioned on lights and screens within the system's 90 degree range. The unit measures 5 inches wide, $4^1/4$ inches deep, and $1^3/4$ inches high and can be mounted beneath a shelf with Velcro fasteners.
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