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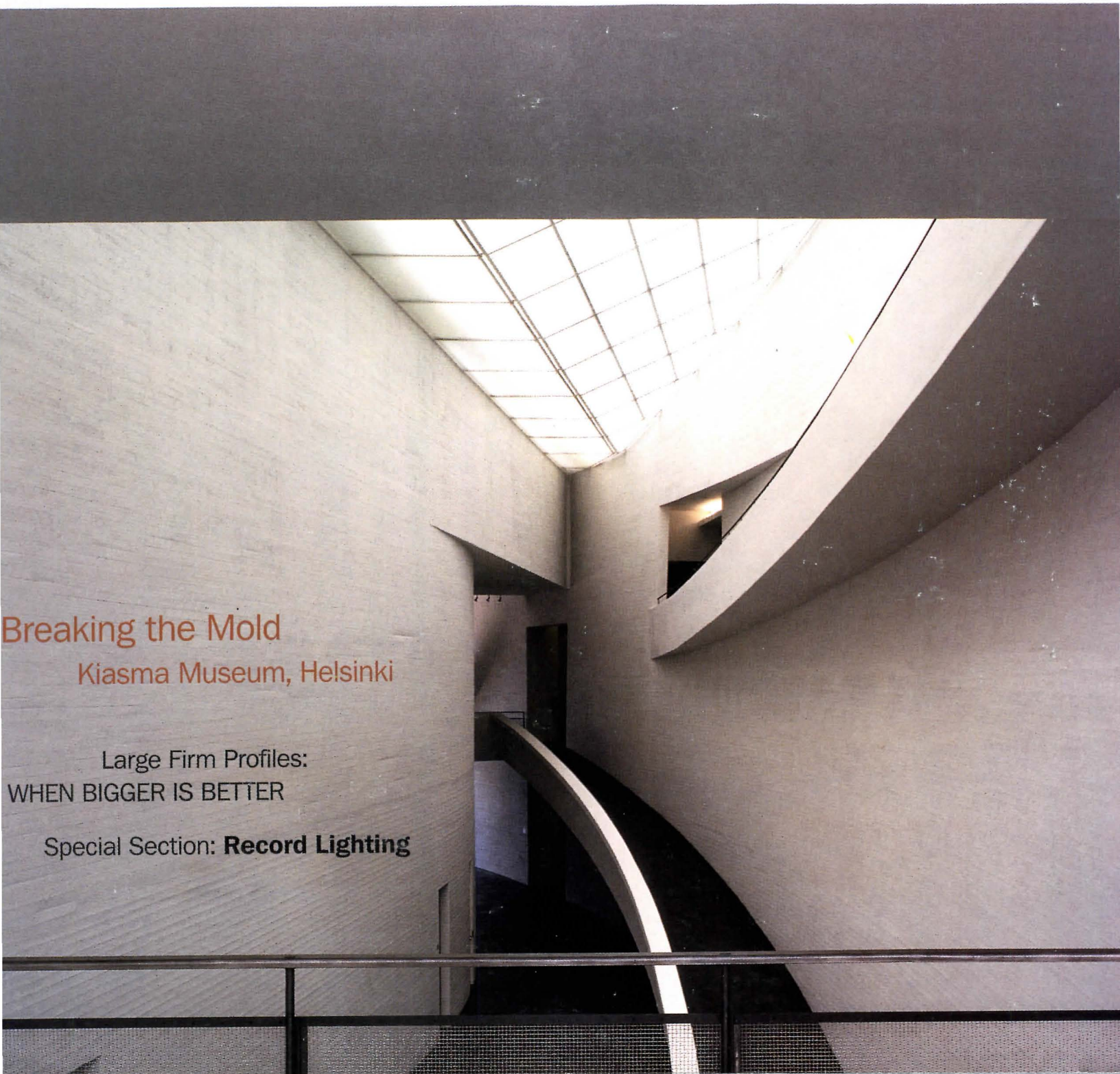

Breaking the Mold

Kiasma Museum, Helsinki

Large Firm Profiles:
WHEN BIGGER IS BETTER

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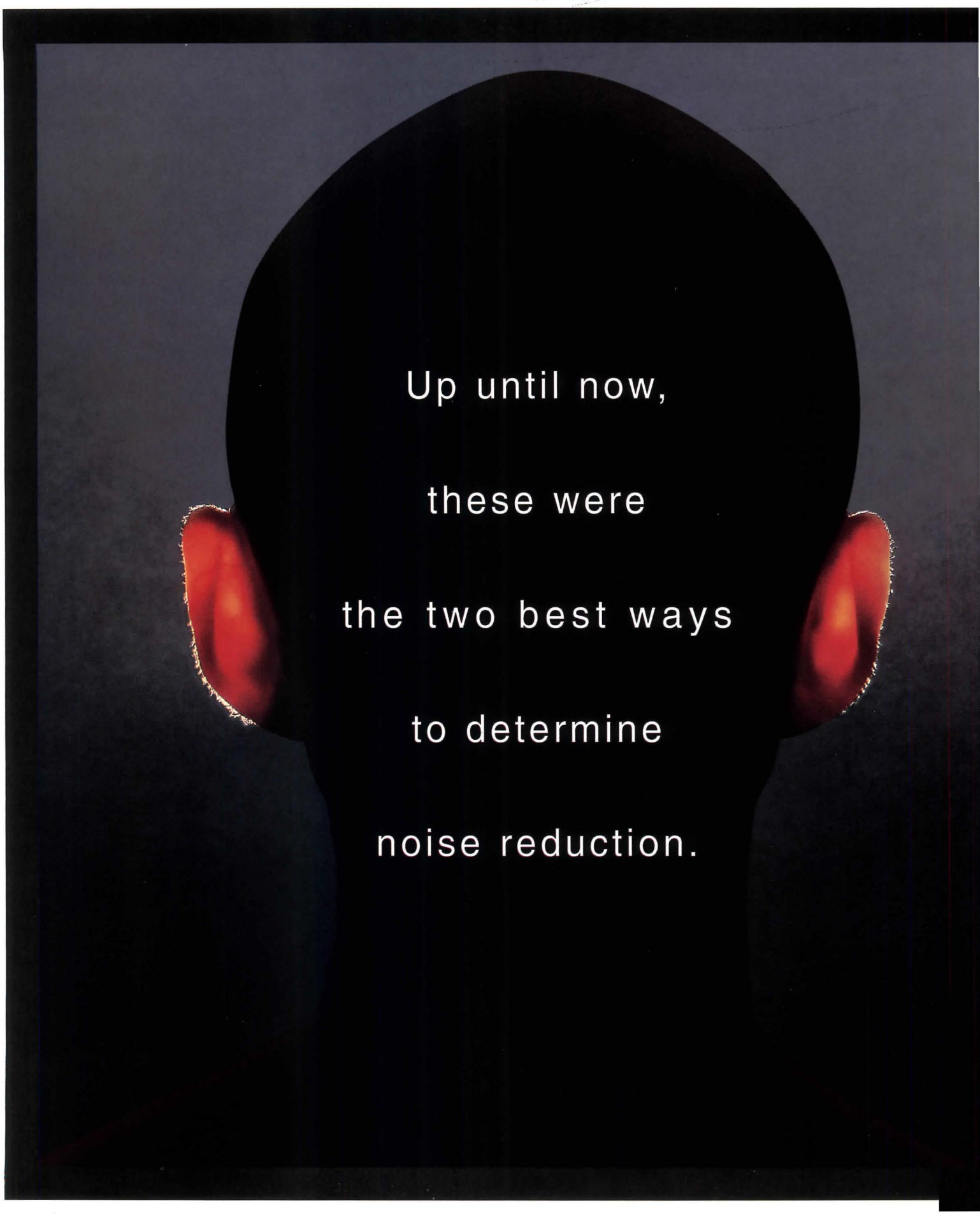

Up until now,
these were
the two best ways
to determine
noise reduction.

EDITORIAL
The Critical Connection

BY ROBERT A. IVY, FAIA

Who can forget the moment when the jury went sour? There you stood before your handiwork, a lone and vulnerable student, while one professor arched an eyebrow, posed a rhetorical question, then speared your project with a humorous flourish, leaving all of your careful reasoning in puddles, accompanied by the guffaws of the audience and a rising blush. Never again, you vowed, would you be subjected to such a moment.

Unfortunately, an abusive jury experience in the university, even a single bitchy critique, can color our subsequent opinions of the value of criticism. Upon graduation, we hope to flee the abstract confines of the studio and rush toward the positive rewards of real work. But employment is no panacea. If our offices lack noontime or Friday critique sessions, we may awaken to the realization that something vital is missing. Could we have lost the critical attitude the university system nourished?

For some in our optimistic profession, formal criticism can seem problematic, either ill-tempered ranting or arcane theorizing. To the general audience, criticism has negative connotations—the slam or the put-down. But recall your earliest days in the design studio, when a professor pinned up sketches and, without overwhelming the class, pointed out the subtle variations among them. Or when a visiting practitioner helped clarify why poor column spacing for an indoor hall inhibited the physically challenged. Your grand design, she pointed out, would not work. All of this specific help—the analysis, the evaluation, the judgment—resulted in the development of your individual critical attitude, both a point of view and an essential skill for a lifetime's practice.

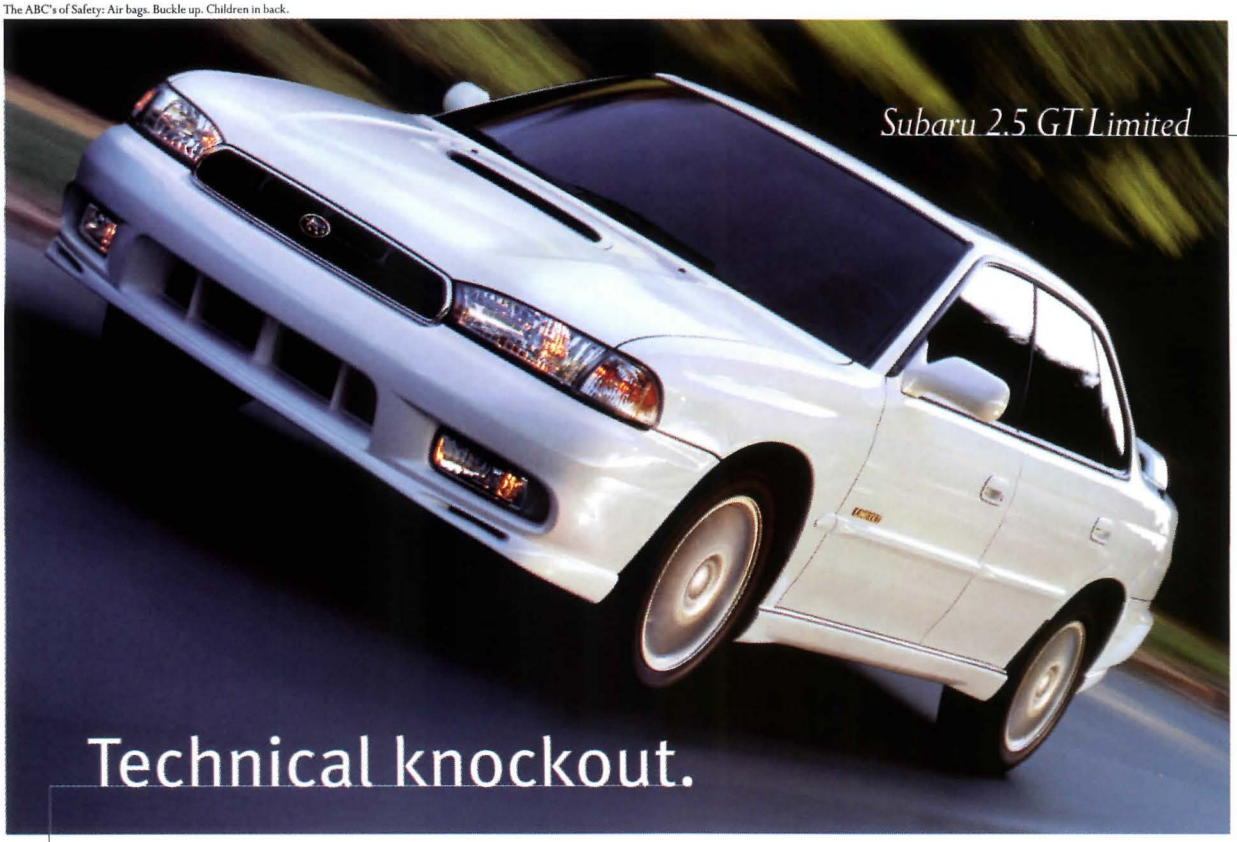
Criticism can be a mature architect's intellectual lifeblood. For a designer whose current solutions seem locked in a dead-end corridor, criticism proposes options, a variety of answers within programmatic determinants. It offers responses from differing points of view, from the client to the larger society and from theory to history. Rather than relentlessly pejorative, good criticism is liberating, a framework that allows you to make up your own mind.

At ARCHITECTURAL RECORD, we have been judicious in doling out criticism. When it has appeared in this magazine, our critical writing has implied that a project deserved the effort, and when we have taken the trouble to evaluate a significant architectural project, as we do in this issue, we have employed credible writers to do so. Observers like Thomas Hines, a respected scholar, have enjoyed the liberty of a blank page. That tradition will continue.

As readers, you continue to express an interest in a critical voice in your publication. In partial answer to that desire, we are engaged in an ongoing exploration. Suzanne Stephens's comprehensive assessment of the state of architectural criticism in March 1998 laid the groundwork for debate. Plans are in the works for familiar writers and new talent to discuss interesting buildings, urban projects, social and cultural questions, and legislation that are worth the ink; the dialogue should spill over onto our Web site, where you can express your own points of view. In addition, we will gradually increase our own critical analysis of individual projects, with an eye toward journalistic clarity and broader understanding.

The result will be a continuing effort to heal the breach between the academy, architectural theory, and practice. Why, after all, should graduation disconnect us from a critical attitude, a hallmark of our education, when it can be a source of energy and strength and a useful tool for growth and professional development?

The ABC's of Safety: Air bags. Buckle up. Children in back.



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LETTERS

Future garages

It was interesting to read your article on robotic parking garages [The Future, June, page 232]. This technology is not new or, at any rate, it sounds very similar to the "pigeonhole" garages that we did back in the 1950s in Houston, Atlanta, New Orleans, and other cities. You might mention to Mr. Haag that customers in the 1960s really hated that operation. Given today's increase in the variety of vehicles and damage claims, I hope technology has come a very long way in the interim.
Thanks for the report.
—Charles Burgess
Houston, Tex.

Simple tastes

It is very difficult for me to believe that the owners of the New York City private apartment featured in the May issue's AIA Honor Awards [page 121] are anything other than victims of their architects' whimsy. Do they really agree, as the article stated, that "By eliminating almost all furniture and forgoing even the client's art collection, the design heightens a sense of separation from a hectic world"? I'll eat my words if the clients write to express their delight with the design; you eat the award if they say they've added a table or a chair, or have taken a painting or two out of storage!
—Charles L. Campbell, AIA
Colorado Springs, Colo.

Speakers want to be heard

I was amused to read the article "Plaza and Free Speech Wall Take Center Stage on Iowa Campus" [June, page 117]. The information in the article differs so markedly from the reality on campus that I wondered if the project might actually be at another University of Iowa in another Iowa City.

Public speakers, rallies of all sorts, and other events have always been held on the Pentacrest—the central area of campus, bracketed by the Old Capitol, a pair of Beaux-Arts classroom buildings, and downtown Iowa City. Pedestrian traffic is heavy here, hence the popularity of the spot. By contrast, the new Kautz Plaza is a relatively obscure cul-de-sac with only a fraction of the foot traffic. To my knowledge, nobody uses it for public speaking, rallies, or anything of the sort your article implies, despite the earnest wishes of the university administration to get those sorts of activities out of public view.

It will be a long time, if ever, before the Kautz Plaza reaches the lofty goals of its designer and the not-so-lofty goals of the university administration.
—David Arbogast
Iowa City, Iowa

Credits/corrections

In the May issue, Hector Velasco Facio should have been credited for the photographs of the Valeo Electrical Systems plant that appeared on page 215 and at the bottom of page 218.

The May issue's coverage of this year's AIA Honor Awards (page 103) neglected to mention that the San Francisco office of Skidmore, Owings & Merrill received not only an Architecture award but also an Interiors award for its renovation of the U.S. Court of Appeals.

The May story on construction logistics (page 239) misspelled Kubitz and Pepi, original architects of Logan Airport's Terminal E. Zimmer Gunsul Frasca designed the Doernbecher Children's Hospital in association with Anshen + Allen.

In the June coverage of the A/E/C Systems show and in that issue's software review (pages 171 and 176), Sigma Design was spelled incorrectly. ■

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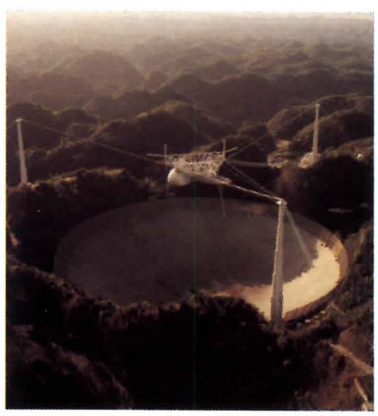

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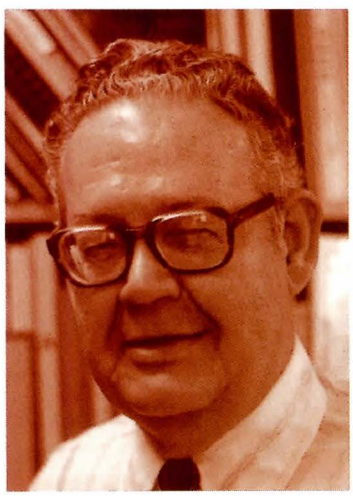
CIRCLE 9 ON INQUIRY CARD

SPEAK OUT Architects and engineers need to be educated together so they can learn how to work better together.

C. HERBERT WHEELER, FAIA

C. Herbert Wheeler, FAIA, is Professor Emeritus of Architectural Engineering at Pennsylvania State University. He earned a master's degree in architecture from M.I.T. in 1940, then worked as an architect and engineer until he became a professor in 1964.



The two great design professions need to team up in the classroom as well as the workroom. Why? Because architects and engineers need each other, but they have lost track of each other.

It didn't use to be that way. The first half of this century saw a tremendous explosion in building technology. Electricity, plumbing, air conditioning, elevators, illumination, acoustics, computers—all of these advances led to the development of technical schools, which taught the latest theories and techniques.

Architects and engineers were educated side by side; after their schooling they teamed up to work in the fast-growing building industry. The professions of architecture and engineering as we know them came into being, and states began registration processes for both professions.

Unfortunately, the disciplines grew in different directions. The building industry soon became a factionalized place where planners planned, designers designed, and constructors constructed—all at breakneck speed.

Early on, amid this nascent chaos, the building industry's organizations saw the need to plan and control their future. Leaders of the architectural profession prepared a much-needed study, "The Architect at Mid-Century." This paper addressed almost every aspect of architectural practice and education—without mentioning the work of engineers.

The study also made over 40 recommendations, all of which were constructive except one. That particular piece of advice called for the abandonment of the title "architectural engineering" for any educational course focusing on architecture. It was recommended that "instruction in certain specialized phases of buildings should be designated as Building Engineering."

Certainly, the authors didn't imagine how much time and money would be spent on structural systems, foundations, soil analysis, fire protection, acoustics, and other technical characteristics of a modern building.

As a result—although the question arose whether architects and engineers would organize to practice together or continue on their separate paths—educators did not create programs that fostered interprofessional cooperation.

The failure to collaborate has caused the professions to drift too far apart. Architects are not unaware of the problem; several years ago, they asked the Carnegie Foundation to examine the educational aspects of modern architecture. In 1996 the foundation published a highly regarded study, "The Building Community—A New Future for Architecture Education and Practice."

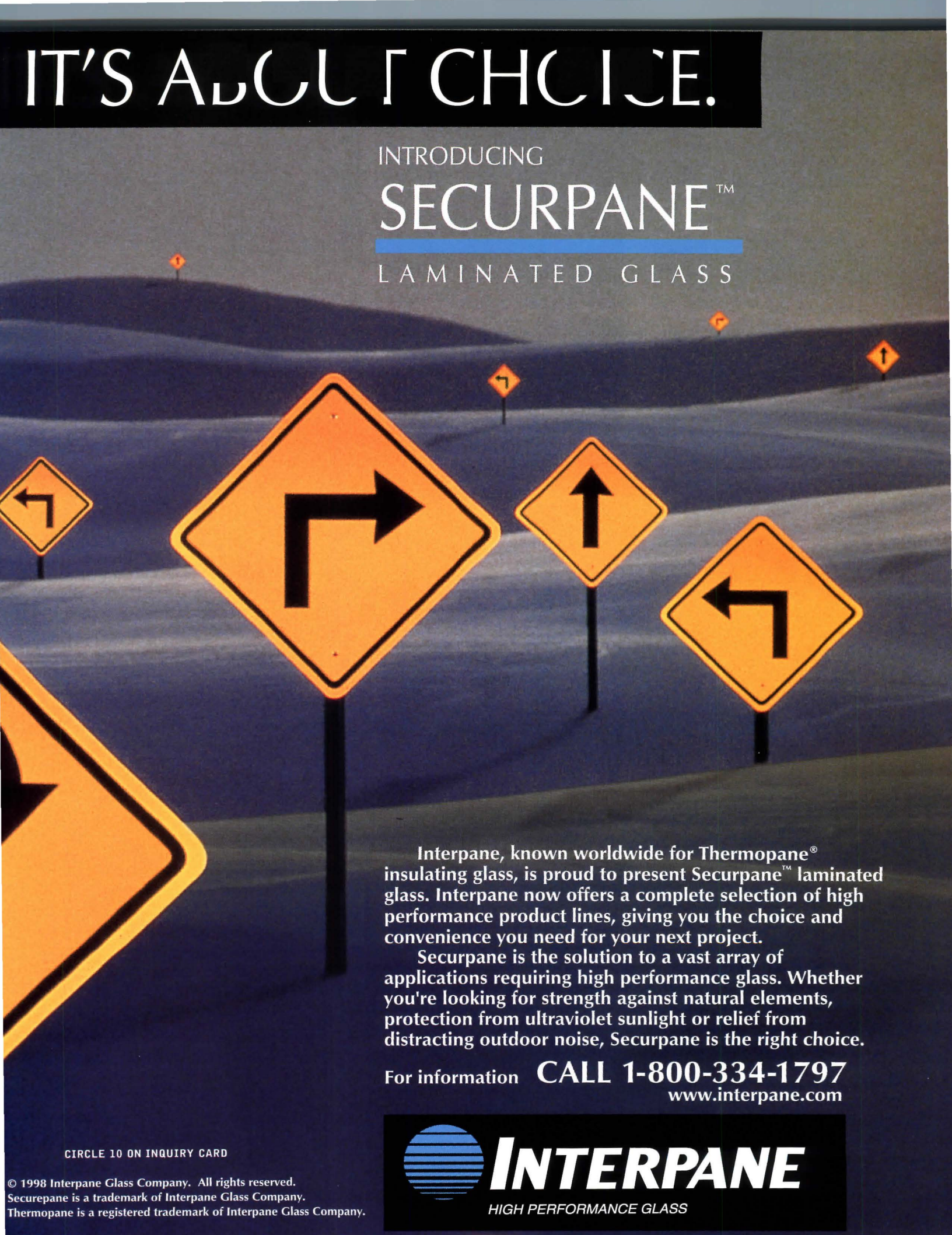
The study is thorough and clear. It suggests a greater exposure to practical architectural experience in school, cooperation between educators and practitioners, and a better understanding of the business of architecture. It states that "the worlds of architecture practice and education depend on each other for their purpose and vitality."

But the study declared the need for the unification of the architectural profession without mentioning the word engineering or even acknowledging the close working relationship between architects and engineers.

What can we do to bring architects and engineers back together? A new collaboration must be facilitated. The time is right for a different study: an extensive, multidisciplinary look at the role of what could be called the "prime professional for an architectural project." The prime professional, a client-oriented project management position, is a multifaceted, modern job description. The Interprofessional Council on Environmental Design, for one, could mastermind such a study.

New ways of producing projects, such as design/build, are emerging as a natural evolution of the marketplace. But instead of letting nature take its course, architects and engineers must take charge of their own destiny by redefining how they work together—and, as a necessary prerequisite, how they are schooled to understand one another. ■

Contributions: *If you would like to express your opinion in this column, please send submissions by mail (with a disk) to Speak Out, Architectural Record, Two Penn Plaza, New York, N.Y. 10121; by fax to 212/904-4256; or by E-mail by visiting www.archrecord.com and clicking on News/Features/ Dialogue. Essays must not exceed 700 words. The editors reserve the right to edit for space and clarity. Where substantial editing occurs, the author will receive text approval.*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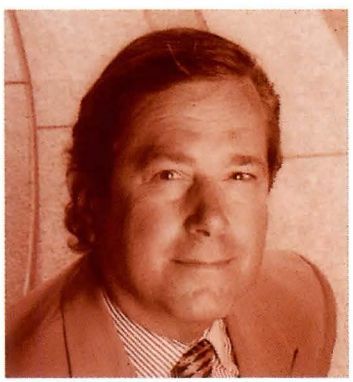
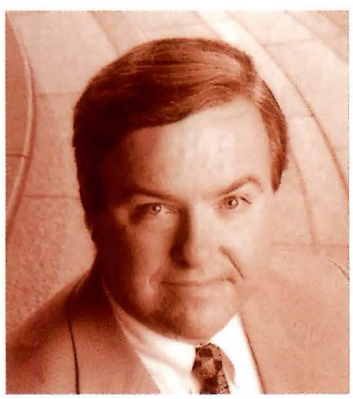
MENTORS A family-run firm in Los Angeles has a time-tested strategy of collaborating with engineers throughout the design process.

David C. Martin, FAIA (top), is a design partner at AC Martin Partners in Los Angeles; his cousin, Christopher C. Martin, AIA, is a managing partner at AC Martin. Their grandfather, Albert C. Martin, founded the firm in 1906.





How to work and communicate best with engineers is not a new topic for architects, but it is still a relevant one. ARCHITECTURAL RECORD *asked David and Christopher Martin to discuss the process they use to integrate architecture and engineering from a project's beginning.*

When our grandfather founded AC Martin Partners in Los Angeles in 1906, he was an architectural engineer working in a fast-growing city with frequent material shortages. This didn't slow him down. Lacking the steel needed to build a movie palace for Sid Grauman, he used his engineering skills to develop a new system of reinforced-concrete construction.

This innovation came about as a result of integrating the design professions; these days, in a very different marketplace, the same kind of advances can be made with the right collaboration between architects and engineers.

A truly integrated process is not linear; it does not begin with a program, move to design, transfer to engineering, and conclude in a solution. Instead, the process we have developed involves "thinking simultaneously": solving architectural and engineering problems at the same time.

This constant collaboration between the disciplines, unusual in a midsize regional firm, is the way we meet the many challenges common to our profession, such as deciding whether a renovation is feasible, figuring out how to work within a limited budget and maintain design excellence, and learning how to cater to the environmentally conscious needs of today's builders.

During the Postmodern era, the separation of the disciplines often resulted in expensive engineering solutions for architectural embellishments. The current era, however, once again celebrates design that expresses its construction and purpose. The poetry of a design idea includes the technical resolution.

With this in mind, in our office even early sketches have been through an architecture and engineering filter. For us, a beautiful design has to have integrity and be buildable.

The built expression of the integration of the different disciplines results in richer architecture. After all, architecture and engineering are really part of the same discipline—namely, building.

Sometimes structural engineering actually directs the design process. For example, with our recent renovation and seismic rehabilitation of Los Angeles City Hall, the focus was on the structural system, which protects the building from a possible seismic event by creating a plane of isolation at the base. Because we understand the original expression of structure in the architecture, our design solution for this and other renovations can be respectful, not brazen.

Simultaneous thinking also offers a balance that appeals to technology-driven clients. Early on in our firm's development, high-rise, aerospace research, and computing center clients required an integrated process that met precise seismic and air-conditioning standards for continuous operation. Currently, we find that university and government labs require facilities that fit into strong campus contexts while remaining adaptable to tomorrow's technologies.

Sustainable design is also growing in importance, and an integrated approach is key to designing buildings that are more environmentally friendly. Even when budgets are modest or furnishing selections are outside the architects' contract, sustainability goals can be achieved. The simultaneous approach assures that energy savings can be accomplished and that the design is not compromised in the process.

"Green" environments are just the beginning. Thinking simultaneously is a flexible and dynamic approach that we believe will move the design disciplines into the future on a more steady footing.

The simultaneous process is a method that has allowed us to renovate important landmarks, meet strict budgets in a changing economy, design buildings for long-term sustainability, and create humane environments for design-conscious clients and users. ■

Questions: *If you have a question about your career, professional ethics, the law, or any other facet of architecture, design, and construction, please send submissions by mail to Mentors, Architectural Record, Two Penn Plaza, New York, N.Y. 10121; by fax to 212/904-4256; or by E-mail by visiting www.archrecord.com and clicking on News/Features/Dialogue. Submissions may be edited for space and clarity.*

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CIRCLE 11 ON INQUIRY CARD

PULSE RECORD readers were asked: Do architects make good clients?

Yes: A client who has a foundation in design is more inclined to understand the contract and fee-collecting process of design. If the client has theoretical and conceptual design experience, not arrogance, it's a bonus.
—Venkatesan Cadambi
WLC Architects
Rancho Cucamonga, Calif.

Yes: Under the right circumstances, architects can make the best clients. Owners such as public agencies or corporations, through their in-house architect representatives, are becoming increasingly sophisticated in terms of their knowledge of facilities. They are well aware of issues such as sustainable design, quality interiors leading to increased productivity, life-cycle costs, and other building performance considerations. Design firms that want to apply new technologies and innovative design approaches can do so to a greater extent when a client fully understands what the designer wants to accomplish. The client can then team with the designer to reach a common design objective.
—Terrel M. Emmons, FAIA
Chief Architect, Naval Facilities Engineering Command
Alexandria, Va.

Yes: The client who is an architect can understand the architectural aspects better than the client who is not an architect. The only exception is a hasty client.
—Maria Tatai
Budapest, Hungary

Yes: Often our firm is its own client for projects that we develop, design, and build. In these instances, we struggle with the same issues that most clients deal with. Although the additional architectural expertise that we bring to the role of client is helpful, it must be balanced by the necessary knowledge and skills of a client. The same is true for clients other than ourselves. Our most successful clients understand a great deal about the architect's needs in a project.
—Brad Buchanan, AIA
Buchanan Yonushewski Group
Denver, Colo.

Maybe: Architects make good clients only if they allow the architect to be an architect and the client to be a client.
—K. Scott Roberts
Hampton, Va.

Maybe: The client-architect is dependent on the professionalism of the hired architect and must learn to sedate his or her ego. If this does not occur, the hired architect must still take the high road. And even if the client is difficult to deal with, the architect may grow sharper from the conflict.
—Miles Battle
Giuliani Associates
Washington, D.C.

Yes: As clients, architects can better understand process and design concepts. Most design decisions in practice are driven not by administrative bureaucracy, but by the inspiration of creative thinking. The success of our profession depends on the natural creative tendencies that nurture the quality of projects.
—Alfredo R. Trevino
Marziani and Associates
Newtown, Pa.

This Month's Question

Are ADA requirements difficult to understand and put into practice?

The Americans with Disabilities Act (ADA), enacted by Congress in 1990, is a civil rights law that prohibits discrimination on the basis of disability. Since enactment, a number of lawsuits have been filed testing the intent and language of the law. Although the law helps define accessibility, architects must refer to a variety of regulations and guidelines, which are continually being updated, to interpret what constitutes compliance with the ADA.

Are ADA requirements difficult to understand and put into practice? ☐ Yes ☐ No

Copy and fax this form to 212/904-4256; or, to respond by E-mail, visit www.archrecord.com and click on News/Features/Dialogue.

Note: Pulse reflects individual responses to each month's question and is not meant to be construed as formal research.

Let us know your opinion:

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May an editor contact you for comments?
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CORRESPONDENT'S FILE Lisbon's world's fair provides a dramatic display of modern design that offsets the city's declining historic core.

BY DAVID COHN

David Cohn is an international correspondent for ARCHITECTURAL RECORD and lives in Madrid, Spain.

Expo '98, the world's fair that opened in Lisbon on May 22, is a contemporary rite of passage for the Portuguese capital. Following nearly a decade of solid economic growth, it represents the city's official debut in the world marketplace. The fair is also part of Lisbon's bid to join the exclusive club of prosperous city-based regions that are emerging, in the face of fading national borders, as the basic economic units of the European Community.

Portugal was one of the 11 nations that met the stringent criteria for monetary union within the Community. But it remains the second poorest member, held back by the effects of nearly 50 years of dictatorship, which ended with the bloodless Revolution of the Carnations in 1974, as well as the disastrous economic legacy of its African colonies, abandoned the same year.

The Expo thus attempts to bridge a gulf between Lisbon's past and its future, between pessimism and optimism, decline and growth. The gulf is expressed in the physical face of the city, in the contrast between its untouched but declining historic core and the invigorating but chaotic new developments on its periphery.

The Expo stands beside a wide estuary of the Tagus River on 150 acres of obsolete industrial land expropriated and cleared by the government. Just two miles from the airport, it is accessed by an ample new network of roads, a new subway line, rail links, and the spectacular 10.8-mile Vasco da Gama suspension bridge over the Tagus. The site is part of an 815-acre public development project designed to draw future growth to the area, in the spirit of Barcelona's 1992 Olympic Village.

The Expo grounds and many of its facilities will also serve as a future urban nucleus. When the Expo ends September 30, the temporary pavilions will give way to blocks of luxury housing, hotels, office buildings, a private hospital, and schools, while other pavilions will become permanent attractions. Waterfront restaurants and a marina will be joined by a 200-acre waterside park with sports and recreational facilities. The Expo's western gateway encompasses the future base of a 65,000-square-foot shopping center.

The sites bordering the fairgrounds will also become part of the future urban development. A new office building is occupied for now by Expo administration, and newly constructed housing is being used by representatives of participating countries. Hotels are also being built. The realistic planning by the public consortium that supervised the scheme reflects the lessons learned from Expo '92 in Seville, where a planned post-fair high-tech research park failed to materialize.

The Expo, which is dedicated to the world's oceans and commemorates the 500th anniversary of Vasco da Gama's voyage around the Cape of Good Hope, reaffirms the essential themes of Lisbon's history and identity. Visitors can survey the grounds and river from the high platform of Santiago Calatrava's grandiose intermodal transportation station, under an airy, treelike canopy of glass supported by white steel masts.

As the city addresses the river from the grand open space of Marques de Pombal's neoclassical Comércio Plaza, built after the 1755

Siza's canopied ceremonial square features a 212-foot-long suspended concrete slab.

PHOTOGRAPHY: © RUI MORAIS DE SOUSA, FOTOGRAFO

earthquake, the heart of the Expo is a riverside water plaza fronted by Álvaro Siza's Portuguese Pavilion, the site of evening fireworks and music.

The general tone of the Expo architecture is modern, crisp, and restrained, often tinged with Sizian mannerisms—the idiosyncratic formal moves, like playful cutouts or projected screen planes, that Siza, Portugal's preeminent architect, makes startling and interesting. Its colors, especially the marble and stucco of Siza's Pavilion, capture the light of the old city, which Portuguese writer José Cardoso Pires once described as "white tempered with pearl and ash."

The Portuguese Pavilion is the Expo's most original and compelling work of architecture. The only work that looks back from the futuristic premises of the fair to the past, it combines the optimism of the event with a nostalgic evocation of familiar, predevelopment values of civility and tranquility.

The classic look of the restored Chiado neighborhood (left); the North International Pavilions, with their angled masts and cables.

Siza's generous waterside portico is an intimate and welcome refuge. Visitors rest on the continuous marble bench that forms the base of the building, or enter through a pair of doorways to a small cafeteria, like in the bar of an old provincial train station. On the opposite side of the building, a row of simple balconied windows on the upper floor, where international dignitaries are received, assumes the civic dignity of a provincial town hall.

Perhaps equally as daring is Siza's canopied ceremonial square beside the entry to the exhibits. The square is shaded by a thin, suspended concrete slab, which drapes in tension across a clear span of 212 feet, an engineering feat accomplished in collaboration with Cecil Balmond of Ove Arup and Partners. Siza's detailing allows indirect daylight to bathe different surfaces and model the shadows, creating a magical sense of positive spatial presence. The building will become the headquarters for the Presidency and Council of Ministers of Portugal after the fair closes.

The water plaza is flanked on one side by the Utopia Pavilion, a 12,000-seat multiuse auditorium designed by Skidmore, Owings & Merrill's London office and local architect Regino Cruz. It features an awkward rubber-colored elliptical dome supported by boatlike interior wood trusses. SOM also designed the 400-foot Vasco da Gama observation tower and restaurant at the northern edge of the grounds.

Peter Chermayeff's Oceans Pavilion (see page 106) is "docked" on the other side of the plaza. Entered via an inclined gangway, its cubic volume is topped by masts and petal-like glass-and-steel canopies.

The 430,000-square-foot North International Pavilions, host to nearly half the 150 participating countries, are slated to eventually become trade fair exhibition halls. Designed by António Barreiros

Ferreira and Alberto França Dória, they offer a pleasantly extravagant display of undulating space frame roofs supported by angled masts and cables, with fabric elements and moving walkways housed in elevated metal tubes. As is the case with the temporary pavilions that house the other participating countries, exhibits are accessed from the shaded exterior perimeter.

The elegant "Knowledge of the Seas" Pavilion was designed by João Carrilho da Graça as a spare intersection between a floating horizontal plane and a vertical slab. It will become the Museum of Science and Technology after the Expo.

The Expo is not the only sign of vitality in Lisbon. With a population of one million, the city is ringed by crowded new working-class bedroom communities, and the nearby resorts of Sintra, Cascais, and Estoril have become expensive suburbs.

Postmodern bank headquarters clad in exotic stones stand along Berna Avenue, near the Gulbenkian Museum, while riverside warehouses have been converted into lively and fashionable nightclubs and restaurants.

In Belém, beside the Tagus west of the city center, a mammoth cultural center designed by Vittorio Gregotti—with a concert hall, meeting facilities, and a contemporary art center—was built in 1992 to host Portugal's Presidency of the European Community.

However, the heart of the old city has been largely passed over by the new prosperity. In February the city's annual survey of 1,200 structures on its "watch list" found 134 buildings "in imminent and irrecoverable ruin" and 180 in "critical condition." Structural collapses are an almost weekly occurrence. Improvements are hampered by prerevolutionary rents and antiquated legislation.

The problem was brought into sharp focus in 1988 when a fire destroyed 18 buildings in the Chiado. This old literary neighborhood stands at the edge of the Pombalian center, beside the famous Santa Justa elevator, an area of great sentimental value for Lisboans. Siza was called in to oversee a reconstruction that would preserve the spirit of the historic area, a project now nearly complete.

Santiago Calatrava's intermodal transportation station near the Expo.

Siza restored and rebuilt the severe Pombalian facades. He limited the depth of new constructions to open a system of intimate midblock passages and patios to the street, utilizing the sharp changes in level over the precipitous terrain. And he designed a simple vaulted subway station and personally supervised the reconstruction of the Empire-style Grandella Department Store. The Chiado Department Store—where the fire started—is still under reconstruction as a commercial center and luxury hotel.

The project is a portrait in miniature of the dilemmas of renewal. Beloved old businesses such as the Ferrari pastry shop, lost in the fire, or the 19th-century Ferin bookstore, with its fragrant sandalwood bookcases, have been replaced by reconstructed buildings housing anonymous boutiques bathed in halogen light and ambient music.

The Expo brings an optimistic sense of the future to Lisbon. But only time will tell if the Chiado's traditional, delicate urban fabric can thrive behind its restored facades. ■

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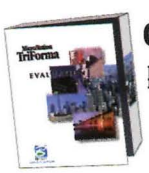

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DATESEVENTS

Calendar

The Inflatable Moment: Pneumatics and Protest in '68
New York City
Through August 29
An exhibition focusing on the French architects and activists Utopie. Also on display are models by Archigram, Frei Otto, Gernot Nalbach, and Coop Himmelblau, as well as structural fragments of built pneumatic projects. Architectural League of New York. 212/753-1722.

Selections from the Design Resource Center
New York City
Through August 30
An exhibition celebrating the Cooper-Hewitt's new resource center presents a rare opportunity for visitors to learn about the curatorial departments. On view are important holdings in furniture, books, textiles, and wallcoverings. Cooper-Hewitt National Design Museum. 212/849-8300.

Forma Italia
Chicago
Through September 6
An exhibition of Italian furniture, lighting, and industrial design from the permanent collection of the Chicago Athenaeum Museum of Architecture and Design, as well as several new pieces that were introduced in April at Milan's Salone del Mobile. Chicago Athenaeum. 312/251-0176.

The Architecture of Graham, Anderson, Probst & White
Chicago
Through September 6
On exhibit is the work of this venerable Chicago firm, a leader in the development of "commercial classicism." The projects on view, dating from 1912 to 1936, include such landmarks as the Merchandise Mart, the Civic Opera House, the Wrigley Building, and Chicago Union Station. Chicago Architecture Foundation. 312/922-3432.

At the End of the Century: 100 Years of Architecture
Tokyo
Through September 6
A major exhibition exploring the history of architecture and urbanism in the 20th century begins its international tour in Tokyo. Models, renderings, photographs, and multimedia components are on view. Museum of Contemporary Art. 011/81/03/5245-4111.

Japan 2000: Design for the Japanese Public
Chicago
Through September 7
An exhibition of recent winners of Japan's G-Mark, an annual government-sponsored awards program that promotes good design. Art Institute of Chicago. 312/443-3600.

National Design Triennial
New York City
Through September 12
A survey of developments in contemporary design, investigating how issues and ideas drive design practices in America. Cooper-Hewitt National Design Museum. 212/849-8300.

The Art of Architecture and Architecture in Art
New Orleans
Through September 20
An experiment in blurring the distinction between the aesthetics of architecture and the aesthetics of fine art, this exhibition features architects' work in various art media and artists' work that incorporates an architectural sensibility. Contemporary Arts Center. 504/523-1216.

Tony Smith Retrospective
New York City
Through September 22
Works by the architect and artist, who trained under Frank Lloyd Wright and designed houses before turning to painting and sculpture. Several of Smith's monumental sculptural works will be installed at public sites throughout Manhattan during the exhibition. Museum of Modern Art. 212/708-9400.

Completing the Federal Triangle
Washington, D.C.
Through September 27
An exhibition documenting the recently completed Ronald Reagan Building and International Trade Center in Washington, D.C., by Pei Cobb Freed & Partners in association with Ellerbe Becket. National Building Museum. 202/272-2448.

Shifting Gears: In Pursuit of a Greener City
Toronto
Through September 27
An exhibition proposing urban design strategies for reducing carbon dioxide emissions. Design Exchange. 416/216-2145.

Fountains: Splash and Spectacle
New York City
Through October 11
This exhibition elucidates the role of fountains—and water as a design force—in defining urban space in Europe and America, with examples ranging from the Renaissance to the present. Cooper-Hewitt National Design Museum. 212/849-8300.

Frank Lloyd Wright and the Living City
Weil am Rhein, Germany
Through October 11
An exhibition of Wright's schemes for Broadacre City, which attempted to erase the dichotomy between city and country. This is the most comprehensive exhibition in Europe of Wright's work to date. Vitra Design Museum. For more information, call 011/49/7621/702-33-51 or visit www.design-museum.de.

Walker Evans: New York
Los Angeles
Through October 11
While Evans is best known for his Depression-era photographs of the American South, this exhibition reveals the full range of his work as a New York street photographer, including some of his earliest and most abstract compositions. J. Paul Getty Museum. 310/440-7360

Do Normal: Recent Dutch Design
San Francisco
Through October 20
This exhibition of works by Dutch designers focuses on the centuries-old design consciousness that pervades every aspect of the country's culture. San Francisco Museum of Modern Art. 415/357-4000.

Under the Sun: An Outdoor Exhibition of Light
New York City
Through October 25
An exhibition of solar-powered installations, including commercial products, experimental prototypes, and commissioned designs. Cooper-Hewitt National Design Museum. 212/849-8300.

New Ways of Revitalizing the American City
Washington, D.C.
Through January 3, 1999
An exhibition illustrating how new cultural facilities have enlivened tired downtowns in Phoenix; Cincinnati; Fort Worth; Newark, New Jersey; San Jose, California; and Kansas City, Missouri. National Building Museum. 202/272-2448.

Robert Adam: The Creative Mind
Washington, D.C.
Through January 3, 1999
An exhibition of the work of the 18th-century Scottish architect, demonstrating the process of design from conception to final presentation. The Octagon. 202/638-3105.

Bechtel's First Century
Washington, D.C.
Through January 4, 1999
A portfolio of projects by the San Francisco–based Bechtel Group, one of the world's largest engineering and construction firms. Highlighted "megaprojects" include the

(continued on page 195)

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CIRCLE 19 ON INQUIRY CARD

FLAWED DESIGN AND FALLING BRICKS DOOM AMSTERDAM SHOPPING MALL

It was supposed to breathe new life into a fairly derelict part of Amsterdam's historic center, but two years after the multiuse complex De Kolk opened its doors, the owner, ABN AMRO Project Ontwikkeling, admits that its centerpiece, a shopping mall, is a failure. The owner is buying out the leases of the few remaining retailers in the mall and readying plans for a far-reaching renovation.

From the start, the design challenge facing architect Ben van Berkel was formidable. The complex is located on an irregularly shaped sliver of land, traversed by narrow alleys and pedestrian streets and surrounded by typically undersized, crooked Dutch buildings dating back more than 300 years.

Van Berkel, perhaps best known for his daring design of Rotterdam's Erasmus Bridge, set large expanses of green glass and red brick at impossibly oblique angles to create a modern interpretation of 17th-century Dutch ambience. He was rewarded with a decidedly unenthusiastic response from critics—and that was before the bricks began falling off the facade.

Van Berkel has publicly defended his design (and denied responsibility for the falling bricks, which are now held in place by chicken wire), but the director of the local merchants' association says it was fatally flawed. "You had to look for an entrance," says Arthur van den Noord, adding that there was no interior link between the parking garage and the mall.

ABN AMRO is revealing little about what it hopes to salvage from the project, but departing shopkeepers suspect that the Hotel Inntel, also housed in the complex, will take over much of the vacated retail space. An ABN AMRO spokesman said only that no decision had been made. *Jim Wake*

THE MUSEUM DESIGN DEBATE: IS THE BUILDING PART OF THE ART?

Are museums simply neutral structures in which art or artifacts are shown, or do they have a more active role in the viewer's experience?

A recent symposium at the National Building Museum in Washington, D.C., attempted to answer this question. The discussion—inspired by the recent publication of Victoria Newhouse's *Towards a New Museum*—was moderated by Suzanne Stephens, and participants included Newhouse; Daniel Libeskind, architect of the Jewish Museum in Berlin; Ralph Applebaum, designer of the permanent installations at Washington's Holocaust Memorial Museum; and J. Carter Brown, director emeritus of the National Gallery of Art.

Newhouse's introduction, tracing the relationship between "the aesthetic experience of art, versus the didactic intention of exhibitions," formed the basis for the ensuing discussion. Brown favored a subdued approach for gallery design. Despite the grand atrium of the National Gallery's East Wing or the flamboyant forms of the Guggenheim in Bilbao, the galleries within provide intimate spaces for viewing art, he said. "Architecture must be supportive, and the aesthetic experience of the art is primary."

Applebaum and Libeskind, on the other hand, advocated a more theatrical approach, with Applebaum explaining that the architecture "acts as a mediator between the viewer and the viewed," becoming a "storyteller." The towers of the Holocaust Museum, for instance, are evocative of the concentration camp guard towers. Even the location of air-conditioning vents, Applebaum said, is intended to reinforce the mood and foster the viewer's empathy.

Libeskind noted that the fenestration of the Jewish Museum, which resembles slashes in the building face, is a metaphor for the scars inflicted on Berlin. The building, he noted, "is a very particular view of content, form, and urban space."

The symposium came at a timely moment, as attendance at museums has been soaring and construction of new museums is booming. Whatever the cause, the interest makes for what Applebaum calls "a new way for people to engage in civic life." *Ellen Sands*

POLISHING THE APPLE **A trio of Manhattan's most recognizable locations will soon be getting new looks. Radio City Music Hall is set to undergo the most extensive renovation in its 65-year history, a $30 million makeover that will close the theater for at least six months. Plans call for a meticulous restoration of the live-theater facilities, as well as the creation of a production center for television specials and the like. Work is scheduled to begin in March, with two New York City firms—Hardy Holzman Pfeiffer Associates and the Rockwell Group—overseeing the renewal.**

A few blocks south of Radio City, the U.S. Armed Forces Recruiting Center—a small but steady presence in Times Square since 1946—is being redone this fall by New York's Architecture Research Office. The 520-square-foot structure will have new exterior glass facades resembling American flags (right), while the reorganized interior will include an important addition: a restroom.

Meanwhile, plans to build a new concourse for Pennsylvania Station within the landmark General Post Office on Eighth Avenue took a major step forward when state officials decided to negotiate with only one firm: Skidmore, Owings & Merrill. An initial plan could be unveiled by the end of the summer. ***Soren Larson***

PHOTOGRAPH: © ROLLANDSE ROOSTE (DE ROLY); ARCHITECTURE RESEARCH OFFICE (TIMES SQUARE)

PEI COMMUNES WITH NATURE AT JAPAN'S REMOTE MIHO MUSEUM

Though I. M. Pei, FAIA, has all but retired from Pei Cobb Freed & Partners, he has not retired from the practice of architecture. "Now I have the luxury of choosing clients and more philosophical challenges," he says.

The Miho Museum, outside Kyoto, Japan, is the project that has most occupied Pei these last few years. And the clients—Mihoko Koyama and her daughter, Hiroko Koyama—must count among the more remarkable ones Pei has worked with in a rich career. Not only are they patrons in the traditional sense, they are the leaders of a 350,000-person spiritual association, Shinji Shumeikai, for which the appreciation of art, beauty, and the natural world is key to well-being.

On the remote, mountainous, often mist-shrouded site where the museum was to be built, Pei's charge was not only to house the Koyamas' art collection, but also to create a space that would represent the civilizing and spiritually enhancing capacity of art.

Pei had first joined with the Koyamas on a much smaller project. Shinji Shumeikai completed a 3,000-seat sanctuary by Minoru Yamasaki (of World Trade Center fame) in 1982, but by the time the group decided to add a bell tower, Yamasaki had died. Pei was then asked to take on the design—and the situation soon blossomed into talk of a museum. Hiroko Koyama says Pei prodded her with the query, "Only a bell tower?" He completed the tower in 1990 and then turned his attentions to housing the family's art, which mainly consisted of objects for the Japanese tea ceremony. At Pei's suggestion, the family doubled the size of the collection, giving it a more international scope.

However, many challenges arose. The site, in an area preserved in its natural state, was subject to stringent requirements. The building could not rise higher than 40 feet, and less than 20,000 square feet of roof could be visible. Environmental rules severely limited road building.

Since the collection included national treasures, extremely conservative display and conservation criteria also applied. For instance, the art could not be moved into the building until two monsoon seasons had passed after concrete pouring. Pei met each demand. Most of the building is underground, with its bearing walls and earth-retaining walls constructed separately so that the monsoon requirement would not delay the opening. Pei's associate in Japan, Tim Culbert, designed vitrines with fiber-optic lighting (which puts less heat on the objects) and hands-free retracting devices so art can be moved as safely as possible.

The Koyamas agreed to the considerable cost of a pedestrian tunnel and bridge (an elegant structure by engineer Leslie Robertson of New York City) to shift the roads and parking lots to a less sensitive area. Visitors proceed on foot from a semicircular entrance pavilion through the quarter-mile-long tunnel, then across a ravine on Robertson's bridge before reaching the formal, symmetrical entry. This leads to a glass roof triangulated with the architect's characteristic tubular-metal supports and shaded by internal extruded-metal slats painted to look like wood. Two long corridors lead to the galleries.

The building has the unmistakable Pei touch, but without his usually tight geometry. The glass roofs—the primary forms visible from the exterior—evoke traditional Japanese vernacular and temple forms. As Pei explains in a recent film made about the project, "the silhouette is Japanese, yet the materials are of our time."

James S. Russell, AIA

PHOTOGRAPH: © TIMOTHY HURSLEY

INTERVIEW: I.M. PEI, STILL GOING

RECORD: You are well past the age when most people retire [Pei is 81]. What keeps you going?

Pei: I am now able to concentrate on what I enjoy doing. I wanted to be able to give the time and thought that certain projects deserve.

RECORD: Why did you take the Miho project?

Pei: I found the Koyamas to be people of great quality, intelligence, and spirituality. Both have a strong feeling for nature. I saw the site and said this is where I want to work.

RECORD: But most of your projects have such a strong urban dimension.

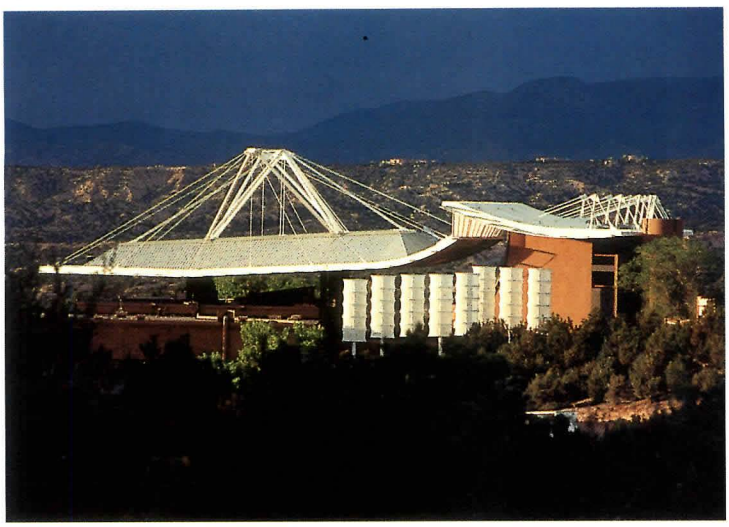
Pei: That's why I liked this one. I came from [the Chinese region of] Suchow, which is famous for its gardens. I wanted to do more work which involved landscape. In urban work, geometry is primary. But nature is different. When possible, geometry has to be there to give discipline, but it can bend, say, to save trees.

RECORD: You are now working in Europe. What makes projects there compelling?

Pei: I look for projects that are public, that have a political or social purpose. It is why I accepted [a project] in former East Berlin on the Museum Island. Chancellor Kohl wanted an exhibition space that dispels German militarism from Bismarck to Hitler. I don't do competitions, but I was attracted to one in Luxembourg because the site is on top of a fortress that I thought had been done by Vauban. He is the architect of Carcassonne—probably the most important architect of military science. It turns out the fortress is Austrian, built on foundations of one designed by Vauban. Still, I took the job because we're dealing with nature and archaeology. How do you build on top of this?

RECORD: What would you like to do?

Pei: I'm still searching for another challenge to work in nature. *J.S.R.*



NO MORE RAINOUTS IN SANTA FE AS OPERA HOUSE GETS A NEW ROOF

Opera lovers have long flocked to the foothills of the Sangre de Cristo Mountains in the summer to enjoy Mozart and Verdi performed at Santa Fe's famous open-air theater. Built in 1968, the partially enclosed opera house was renowned for its stunning view of the desert skies. The only problem: a gap in the roof left some patrons running for cover during the occasional rainstorm. "We used to sell cheap rain parkas in the gift shop," says Susan Switzer, director of public relations for the Santa Fe Opera.

This summer, thanks to a $19.5 million renovation by Polshek and Partners Architects, Santa Fe operagoers no longer need to wear plastic over their tuxedos and evening gowns. The New York firm, known for its restoration and renovation of Carnegie Hall, designed a cable-suspended double roof, with the two parts now overlapping; an 11-foot clerestory window was installed in the space between the halves. James Polshek, FAIA, says the new structure was inspired by "nomadic architecture built by Native Americans and others."

The firm also increased the capacity by 237 seats (to 2,166), replaced the old Plexiglas seats with upholstered ones, brought the theater into compliance with the Americans with Disabilities Act, and restored a small *reflecting pool* located close to the orchestra pit.

Reaction to the renovated opera hall, which reopened last month, has been mostly positive, says founder and director John Crosby. Still, the design hasn't completely solved the weather problem: the sides are still open to the elements. Polshek added wind deflectors, but rain can still blow in, as it did in one recent performance. However, the last thing patrons wanted was an enclosed structure. "You can't have an open-air theater that is completely impervious to the elements," Crosby says. *David Hill*

STERN'S NEW NASHVILLE LIBRARY IS A NOD TO LOCAL CLASSICISM

Nashville will soon have a new public library that echoes the classical architecture of its most prominent public buildings. The design, by New York's Robert A.M. Stern Architects, features a neoclassical exterior and a clear, functional organization of the most significant public areas.

Nashville's classical tradition extends from the State Capitol and War Memorial in the downtown area to many of the city's neighborhoods. The library competition jury didn't want to break from this tradition; Stern was the obvious choice. The jury commended the firm's design for providing "a variety of public spaces, each with a distinct but interrelated character. The layout is well thought out and there is easy orientation within the building."

While Stern is the design architect, Hart Freeland Roberts will serve as consultant and be responsible for the working drawings.

The main facade of the 290,000-square-foot library will be constructed of cast stone, with a main entrance framed by Ionic columns. The major public areas—including a large reading room, a local history collection, and a garden courtyard—are situated on the axis of the Capitol, which the architects believe will strengthen the civic center complex as a whole.

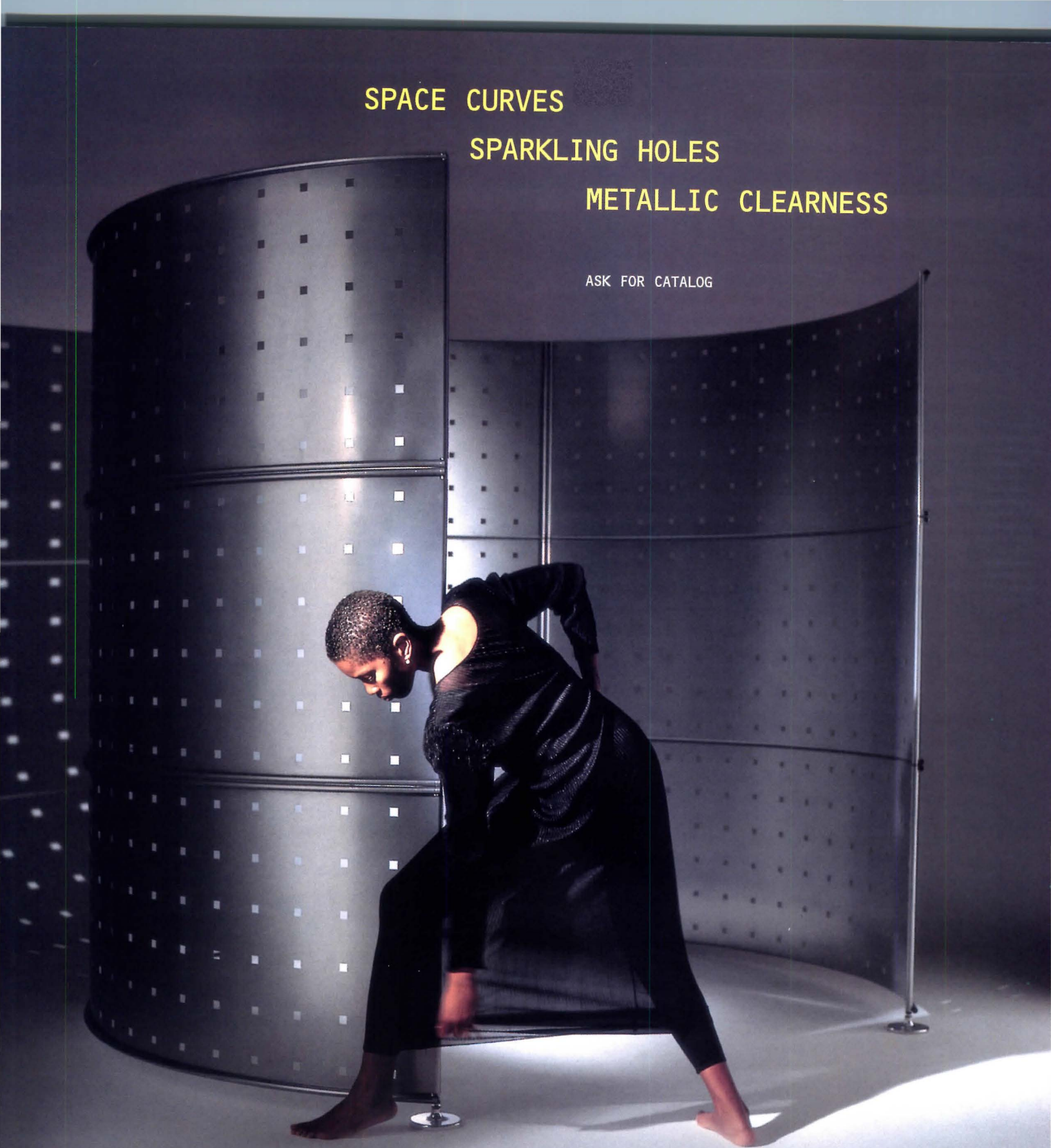
The project is part of a $110.7 million library program in Nashville that includes five new branches and renovations to existing libraries. Construction of Stern's main branch will begin next year. *S.L.*

A MONUMENTAL RENOVATION **Even a symbol of endurance like the Washington Monument can use a little work now and then. The building has long been in need of a new HVAC system and elevator, while the stonework needs cleaning and repointing. Help first appeared a year ago when Target Stores and the National Park Foundation announced they had teamed up to finance and tackle the project; soon thereafter, Michael Graves was called on to design the scaffolding. Graves later explained that he wanted to provide something that would be beautiful in its own right, and perhaps also educate visitors about the traditions of obelisks and monuments.**

The interior work has now been completed, and the renovators are ready to begin on the exterior. Soon to be in place is Graves's aluminum-tube scaffolding, which, he says, "represents the bond pattern of the monument at an abstracted scale." At night, thanks to a contribution from General Electric, the project will be lit by hundreds of lights affixed to Graves's structure, with a glow produced by netting inside the scaffolding. The effect, according to the architect, should be "surreal."

Target has led the way among corporate sponsors, raising $5 million to assist the Park Foundation. The company recently upped the ante, pledging an additional $1.5 million to renovate the 500-foot-high observation platform inside the monument. Graves has been retained for that project as well. The entire effort should be completed sometime in 2000. *E.S.*

PHOTOGRAPHY: © PAUL JEREMIAS (SANTA FE); ROBERT A.M. STERN ARCHITECTS/THOMAS SCHALLER, RENDERER (NASHVILLE)



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CIRCLE 23 ON INQUIRY CARD

FOREIGN PRESS ROUNDUP

VOX POPULI

The May/June issue of *Architecture Australia,* quoting the *Sydney Morning News,* reports that the practice of architect Dino Burratini has collapsed. Burratini designed the apartment complex at East Circular Quay that, when erected last year to great protest, blocked views of Sydney's cherished Opera House. Due to a sharp decline in commissions that the architect attributes to his recent notoriety, his staff has been pared from 68 to 3.

IN SUPPORT OF SKATING

Iain Borden writes in the May issue of *Archis* (Rotterdam) that by subjecting skateboarders to curfews, harassment, and outright bans, we are suppressing what may be one of the few nonconformist gestures left in the urban sphere. Skateboarding, he says, "undertakes a release of energy that either creates or modifies space, espousing play, art and festival." Meanwhile, the June issue of *Techniques & Architecture* (Paris) features new skateboarding facilities in France, bubbling that "[street sports] never cease to reinvent the physical use of the town."

ASIA'S RETAIL RESILIENCE

To prove that the downturn in the Asian economy hasn't brought retail construction in Hong Kong to a halt, local magazine *Hinge* profiled more than a dozen recently completed high-end retail projects. According to one consultant, "Changes can be made now to avoid disrupting or closing stores for refurbishment when the market is busy. . . . It also gives a positive impression to the people on the street that the company is still a solid, growing business."

LOOTED TREASURES

The purchase of Mexican architect Luis Barragán's professional archive, including copyrighted images, by the Vitra Museum in Germany has riled many of the architect's admirers in Mexico. In an editorial excerpted from *La Jornada* in the summer issue of *Arquine* (Mexico City), Fernando González Gortázar writes, "Vitra has hindered the dissemination of what he was and what the master did, inhibited studies of his work, and even tried to exercise rights over . . . his personal archive and his library, which are in the possession of the Fundación de Arquitectura Tapatía in Guadalajara. It is here where we begin to have a feeling of looting, to feel something is being snatched, that we cannot tolerate."

SLAMMING A METABOLIST

In a review of an exhibition of Kisho Kurokawa's work at the Royal Institute of British Architects that appeared in the April edition of RIBA's own *Journal,* Peter Popham rips into the Japanese architect's reputation, calling him "an architect of vast ambition and very modest gifts, who has been taking the world for a ride for the best part of 40 years." Once enamored of the famous Metabolist, having been hypnotized by his talk of Zen and a "culture of greys," Popham "started noticing how incredibly clunky and clumsy his designs were. Daido Insurance Building in Tokyo, Aoyama Bell Commons, Seibu Big Box—these were heavy, graceless, commercial hulks. Even Nakagin [Capsule Tower, an iconic work of the Metabolist school], though arresting, was formally crude."

—compiled by David Simon Morton

PHOTOGRAPHY: © T. Y. LIN INTERNATIONAL

SUSPENSION DESIGN IS APPROVED FOR REPLACEMENT OF BAY BRIDGE SPAN

Nearly nine years after shocking images of a car crashing on the earthquake-damaged San Francisco–Oakland Bay Bridge flashed across the nation's television screens, California transportation officials have selected a design to replace the bridge's weakened East Span. The new span, a single-tower self-anchored suspension design, will be the first major suspension bridge built in America since the 1960s.

The Metropolitan Transportation Commission (MTC), the region's planning agency, made the decision at a June hearing in Oakland, although the California Department of Transportation (Caltrans), which is overseeing the design, had already proposed replacing the 62-year-old East Span, which connects Yerba Buena Island and Oakland, with a mile-and-a-half-long elevated viaduct. Instead, the MTC's Engineering Design Advisory Panel (EDAP) pushed for consideration of a more memorable "signature span," featuring either a cable-stayed or suspension design.

Caltrans' consulting engineers, San Francisco–based T. Y. Lin International and Moffatt and Nichol Engineering, then developed two schemes through an internal competition: San Francisco's Donald McDonald Architects and Weidlinger Associates of New York consulted on the design of a suspension scheme, while H2L2 Architects of Philadelphia developed a cable-stayed option with T. Y. Lin.

Although engineers favor cable-stayed bridges for their efficiency and ease of construction, EDAP deemed the suspension option (above) more compatible with the West Span and the other catenary-shaped structures around the Bay. T. Y. Lin project manager Rafael Manzanerez felt the decision came down to whether "the people here want a new form in the bay, or a form they're familiar with."

At 1,263 feet, the new span will be the longest self-anchoring suspension bridge in the world and will boast a final pricetag of an estimated $1.5 billion. Construction cost will be funded by state bonds, a gas tax increase, and bridge tolls.

The MTC's 18-month selection process generated an extraordinary amount of public discussion—and it hasn't subsided. Caltrans has encountered an 11th-hour challenge by San Francisco Mayor Willie Brown, who fears the new bridge will interfere with his plans to redevelop Treasure Island, and Oakland mayor-elect Jerry Brown, who objects on aesthetic grounds. The latter Brown has been joined in his demand for an international design competition by longtime Bay Area architecture critic Alan Temko.

Nevertheless, design work continues and construction should start in 1999, Caltrans says, with an opening in 2003. *Eric C.Y. Fang*

BALANCED

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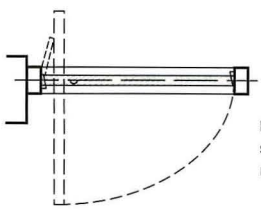

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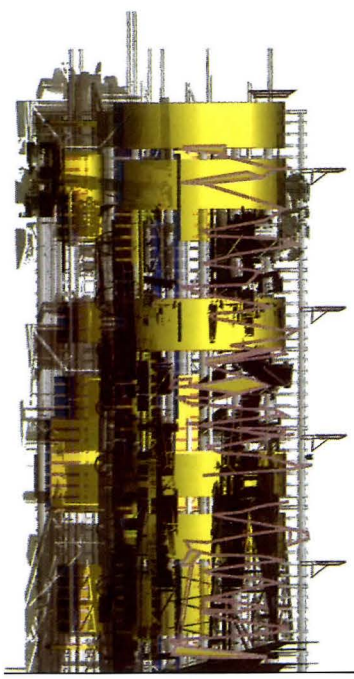
A LOFTY IDEA FOR EXPO FACILITIES: THE WORLD'S TALLEST TOWER

When Japan hosts a world's fair in 2005, the festivities will be centered in an undeveloped, mostly forested area near Seto City. The organizers are considering clearing a space for a traditional, horizontal Expo grounds, but that won't happen if Ken Yeang can help it.

Yeang, a Malaysian architect, has a very different idea: he envisions the world's tallest building, a 150-floor skyscraper that rises 1,968 feet above the forest floor (top of the scheme shown below) and fits all the Expo activities under one roof. It is estimated that the total cost of the project—designed by Yeang's firm, T. R. Hamzah & Yeang, in conjunction with project leader Kiyonori Kikutake and Shizuo Harada—would approach $1.4 billion.



Environmental concerns are part of Yeang's concept; he finds it ironic that an event whose theme is "Rediscovering Nature's Wisdom" would likely develop some 350 acres for horizontal facilities. A single tower, he reasons, would cause less damage to the immediate environment and occupy a footprint of slightly over seven acres.

Yeang also proposes solutions to the logistical problems that would stem from holding such an event in a single tower. Transportation, housing, and mechanical functions for the international displays all had to be considered. Among the more striking proposals is a dual-track, monorail train system that would spiral around the exterior wall, taking visitors up or down to their desired locations in a rather breathtaking fashion.

The tower would also take advantage of environmental technologies such as solar heating and natural ventilation. And it wouldn't be unoccupied after the Expo has gone—it could be redeveloped to include housing, shops, offices, and factories. Whether to go horizontal or vertical is in the hands of the Exposition Committee, which is now mulling its options. *S.L.*

CHARLESTON'S MARITIME JUXTAPOSITION In the midst of its historic district, Charleston, South Carolina, has constructed a Maritime Center with a contemporary look. The architects, Sasaki Associates of Watertown, Massachusetts, have designed several other Charleston projects, but their prior efforts have had a traditional look, as required by the City's Board of Architectural Review. This time, Sasaki (with Larry R. Young as principal-in-charge) successfully argued that the forms, uses, and materials of nearby structures indicated the most contextually appropriate building would have a Modernist design.

The immediate context was clearly nautical, but two other factors came into play. First, the many metal warehouse and industrial buildings nearby determined the choice of steel frame, metal wall panels, and metal roof. A second, if less obvious, inspiration came from a traditional form that has been built in all eras and parts of Charleston, going back to the 1730s: the "single house," a narrow, one-room-wide building with windows on both sides, high ceilings, and a broad covered porch, known locally as a "piazza."

The 7,400-square-foot Maritime Center serves both industry and recreation. The ground floor is devoted to fishing-related uses; its main space is a large workroom for fish packing and sorting. Overhead industrial doors open the entire east and west walls to allow full access to fishermen from the waterside and refrigerated trucks on the land side.

A retail space for selling fish is located at the north end of the building, while the second floor contains a gift shop, multipurpose community space/conference center, and marina offices.

In addition to the building, the center includes two new piers—one commercial and one recreational—as well as a one-acre waterfront park. The new facility allows Charleston to host a variety of maritime events ranging from fishing tournaments to tall ship tours. ***Jonathan Hale***

NCARB'S LATEST RESOLUTIONS DIFFER FROM AIA BOARD'S VOTE

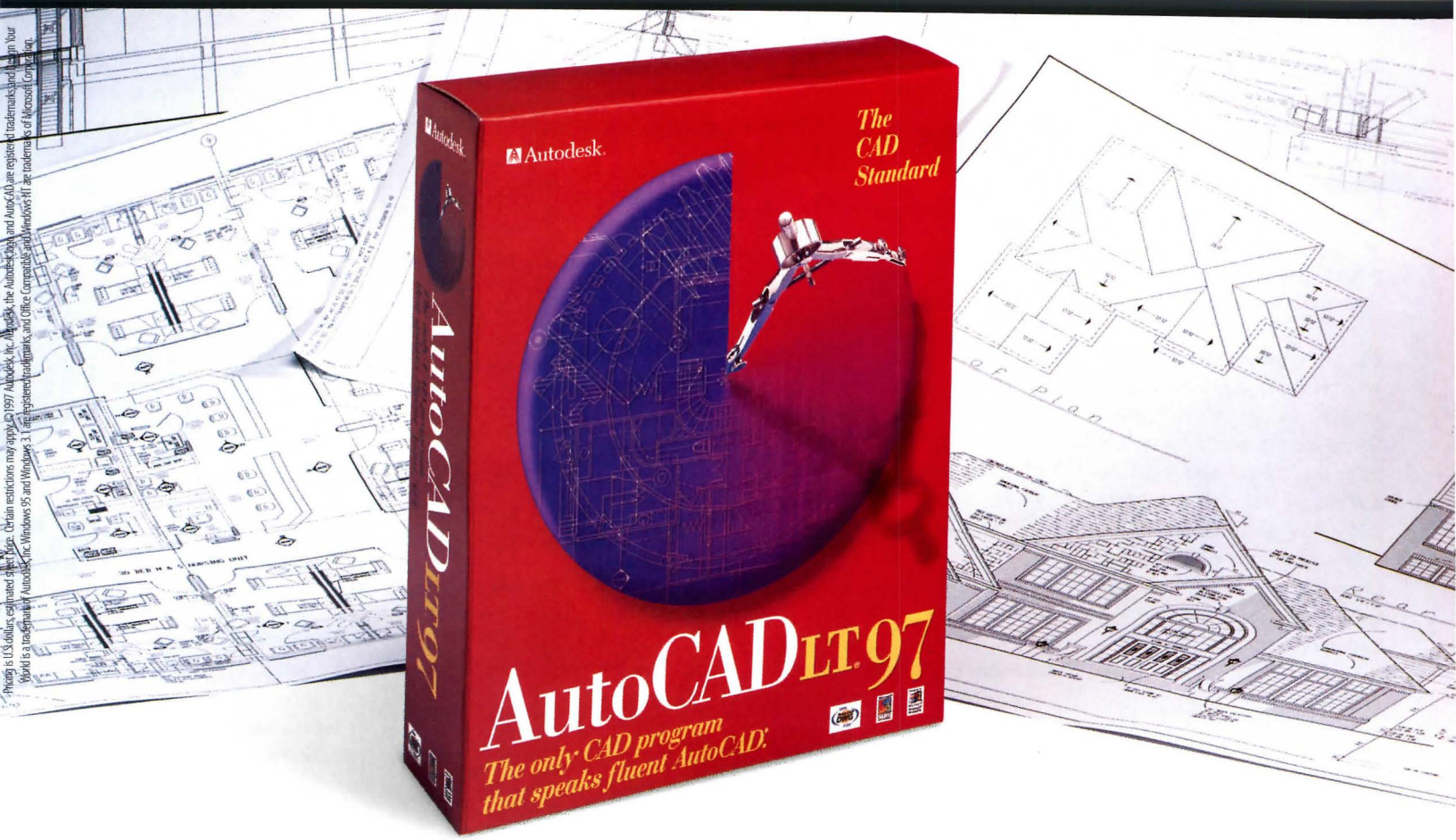
When the National Council of Architectural Registration Boards met in San Diego in June, delegates passed two resolutions that could affect architectural practice, one dealing with liability, the other with licensing. In doing so, they broke with the AIA's board of directors, which recently voted down similar measures.

First, NCARB's new model rule of conduct protects *everyone who works* in architecture firms by upholding fair labor standards and antidiscrimination laws. NCARB and its member boards aren't obligated to police conduct, but they wanted to send the message that it is unethical to have interns work for little or no pay. If a state board finds a firm in violation, it may refer the case to NCARB's professional conduct committee—which might revoke the certification of all principals of a firm found guilty of unfair labor practices.

The AIA board concurs that interns should be fairly compensated, according to an AIA spokeswoman, but rejected this rule because it makes all of a firm's principals liable for the actions of, perhaps, one principal or a few.

Some confusing wording in the second resolution may account for its rejection by the AIA. The amendment is intended to close a loophole in the model law for architectural licensing that NCARB promotes among state legislatures. AIA board members reportedly interpreted it as broadening the scope of work an unregistered architect may undertake. In fact, NCARB officials said, the amendment tightens controls on unregistered architects, who may provide design services if a building permit is not required and if structural and other life safety features are of no concern. The model law previously addressed only alterations and renovations, but the controls now extend to "any construction." *Ann Jarmusch*

PHOTOGRAPHY: © T. R. HAMZAH & YEANG (TOWER); SASAKI ASSOCIATES (CHARLESTON)



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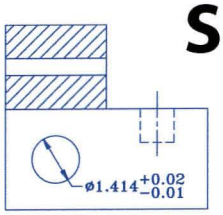

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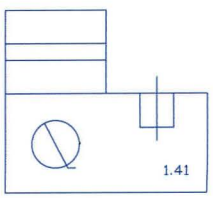

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NEWS BRIEFS

Presidential approval The Pritzker Prize, the architecture world's most prestigious award, got some presidential attention in June when the Clintons hosted a ceremony in the White House to honor this year's recipient, Renzo Piano. In front of a gathering of the field's luminaries, including I. M. Pei, Frank Gehry, and last year's winner, Sverre Fehn, Bill Clinton spoke of how "all politicians have tried to convince people they were architects. If you listen to them speak long enough, you would be convinced that we were all born in log houses that we built ourselves."

Hillary on tour Hillary Clinton didn't stop with the Pritzker dinner. Last month, she took a history tour and launched a preservation pledge drive, visiting George Washington's headquarters in Newburgh, New York, as well as a dilapidated theater, an Indian archaeological site, Thomas Edison's laboratory, and landmarks devoted to women's rights and African-American history. The sites included federal, state, and privately financed landmarks, all with expensive wish lists; the National Park Service alone has a $1 billion backlog in historic structure repair. The President's budget request of $50 million for the preservation program has yet to be approved by Congress.

The first couple with Cindy and Jay Pritzker and Emilia and Renzo Piano.

Libeskind's first While much has been made of Daniel Libeskind's first major commission, the design of the Jewish Museum in Berlin, the Felix Nussbaum Building in Osnabruck, Germany, turned out to be his first completed building. The museum, which houses work by Nussbaum, a 20th-century artist, opened late last month. The design uses a system of interrelated lines to symbolize Nussbaum's restlessness and search for orientation.

Seoul music ID8, the entertainment design studio of RTKL Associates, has completed its design for CoEx Plaza, a huge 1.02 million-square-foot underground entertainment center that will link directly to the Korean World Trade Center in Seoul. The concept is akin to a flowing river, according to the firm, and encompasses a cineplex, an aquarium, indoor golf, themed restaurants, and a mix of retailers, with subway stops at each end. Completion is slated for January 2000.

Concrete solutions Students from the University of Alabama–Huntsville triumphed at this year's American Society of Civil Engineers and Master Builders national concrete canoe competition. Along with winning a race, the team had to

PHOTOGRAPHY: © REX STUCKY

make written and oral presentations of its concrete canoe's design, and had to pass a test in which a submerged canoe pops up and floats.

The Cartier's troubles Last December French papers reported an evacuation of the Fondation Cartier in Paris, the four-year-old transparent glass building designed by Jean Nouvel. In March, it was announced that structural experts, called in by the building's owner, confirmed a "danger of collapse" in high winds. Nouvel denied a problem, but a secretive plan to reinforce the glass skin was then undertaken. Today, the building and its galleries have reopened, after much embarrassing press for Nouvel and aggravation for Cartier.

Gehry goes again Gleaming ribbons of metal, undulating solids, soaring atriums . . . the Guggenheim Bilbao? No, Frank Gehry's new home for the Weatherhead School of Management at Case Western Reserve University in Cleveland. The $33 million, 143,000-square-foot school is a multistory structure consisting of two curved, connected red-brick units topped by the flowing patterns of shining metal. The waterfall-like forms wrap around two towers that contain lofty atriums. Construction is expected to begin next spring.

Gehry's Case Western design.

Relief effort The Sho-Hondo, a monumental temple that sits at the foot of Mount Fuji, has been ordered destroyed by the chief priest of the resident Buddhist sect (who was apparently a rival of the priest who had it built). As a result, a wide-ranging group of architects and preservationists around the world has established the International Committee to Save the Sho-Hondo. The Sho-Hondo is "one of the finest representatives of postwar architecture in Japan," according to ICSS chairman David Anthone. The building, constructed in 1972 for around $100 million, features a suspension roof designed to symbolize a crane in flight and a fountain plaza that can accommodate 60,000 people.

Designer ties Civitas, a two-year-old company founded by two architects, is paying homage to urban design through fashion. The firm has created a line of ties printed with roadmaps of such cities as Rome, London, and New York, with scarves to come later.

Koolhaas's next act Rem Koolhaas is headed for Times Square. The Dutch architect, in association with New York–based Richard Gluckman, is designing a new theater for the Second Stage troupe. The 299-seat house is slated to open next February in what had been a bank building. The architects incorporated the existing structure in several ways: 20-foot-high windows will run behind the stage to create a real Manhattan setting, while the vault is being reused as a box office. ■

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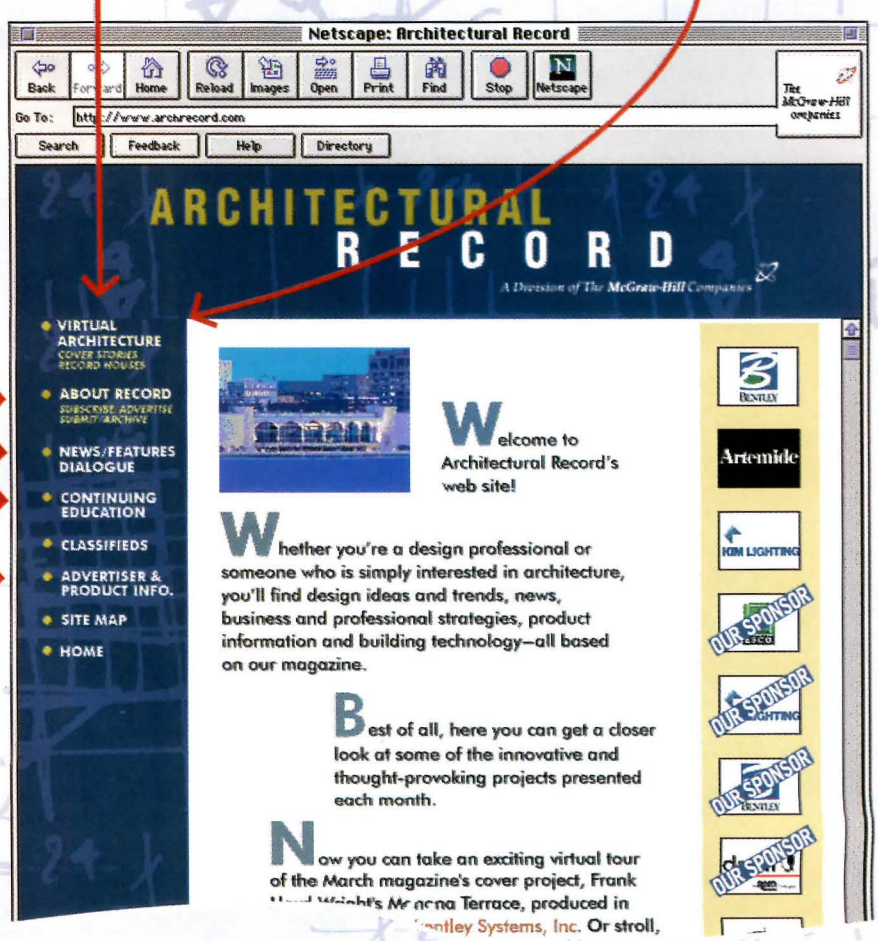

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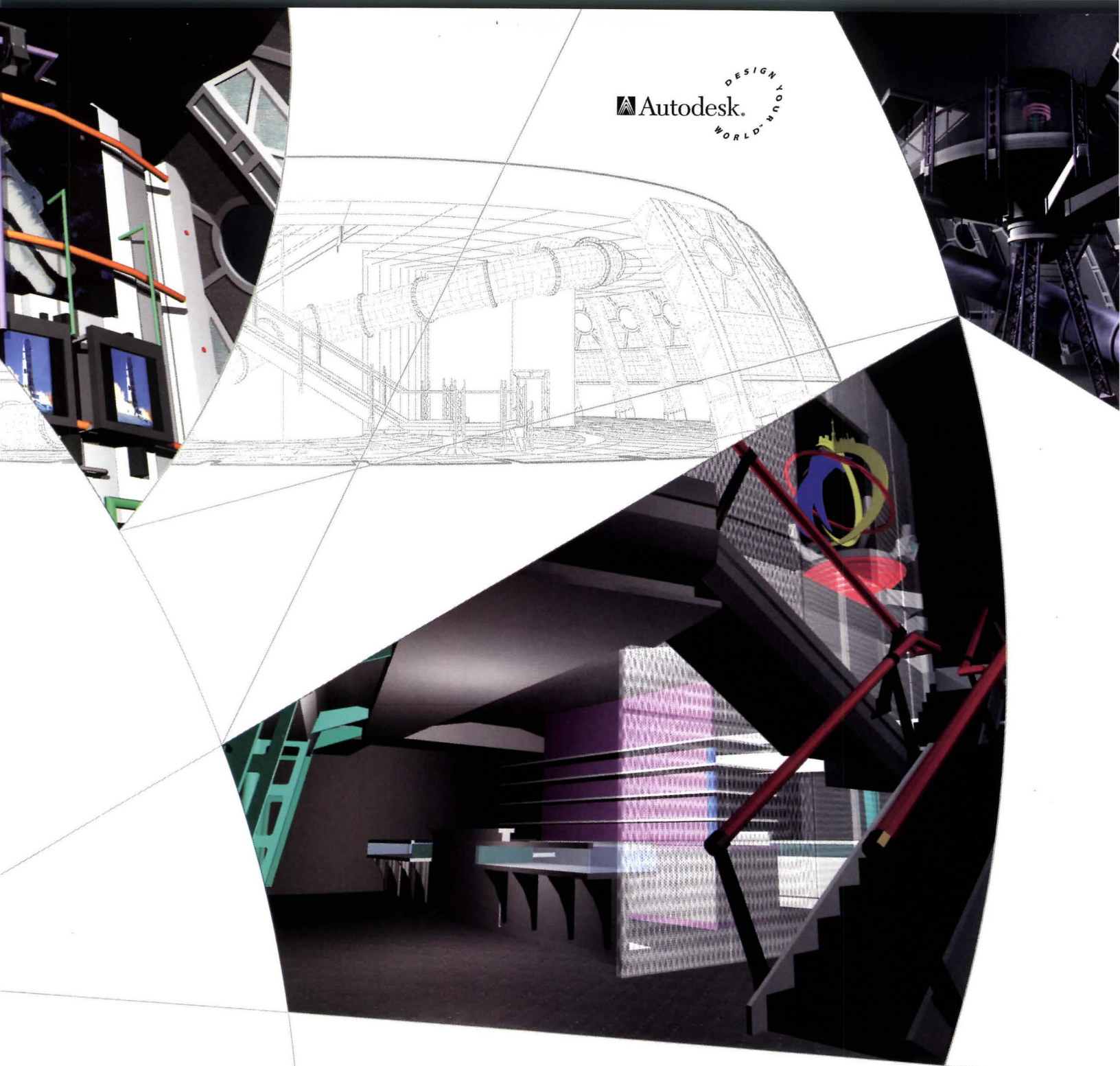

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DOES SIZE MATTER? A SURVEY OF "VERY LARGE" FIRMS INDICATES THAT ECONOMIES OF SCALE NEED TO BE BALANCED WITH CREATIVE MANAGEMENT PRACTICES.

by Philip Langdon

You can sense the discomfort in some circles whenever the subject comes up: big firms and their growing share of the profession's work. American architecture, as a segment of the arts, has always venerated resourceful, brilliant (and, when necessary, stubborn) individuals: Richardson, Sullivan, Wright. They, not their firms, are the heroes we revere. But American architecture is also a business, and an increasingly collaborative one. No matter how often critics may present the inspired individual as the source of lasting architectural achievement, the reality is that American architecture is increasingly the province of very large firms—those with 200 to more than 2,000 employees and billings in the tens or even hundreds of millions of dollars.

The AIA Firm Survey hints at the change. "The proportion of AIA member firms with 20 or more employees has almost doubled since 1990," says Kermit Baker, the AIA's chief economist. "In 1996, for the first time, we had enough firms of 50 or more employees to break them out as a separate category." Firms with 50 or more employees, which comprise 2.5 percent of the nation's architecture firms, now collect over 38 percent of the profession's billings. Billings per employee are much higher in big firms than in small ones. The average firm reports $65,000 of billings per employee; in firms of 50 or more, that figure shoots up to $95,000.

Though the AIA survey lacks a category for "very large" firms, it is these that seem to be expanding the fastest, and becoming an increasingly powerful segment of the profession. "Over the course of a century, large firms are getting larger, and there are more large firms," says Robert Gutman, Princeton University's longtime analyst of architectural practice. "McKim, Mead and White was a very big firm at the turn of the century, when it had about 100 people. Albert Kahn had 200 to 300 in the 1920s." Today, according to figures supplied by the firms themselves, Hillier Group, A. Epstein & Sons International, and HKS each have about 400 employees, DLR Group has about 500, RTKL has nearly 600, SmithGroup has over 600, NBBJ, Ellerbe Becket, and Leo A Daly over 700 each, SOM about 800, Gensler over 1,400, and HOK and HNTB over 2,000 employees each. The degree of concentration on architecture ranges widely. HNTB says 206 of its employees are architects, while Gensler has 410 architects; HOK employs the most architects of any U.S. firm: 842.

Philip Langdon is the author of A Better Place to Live: Reshaping the American Suburb, *among other books. He is writer/editor for the Connecticut Conference of Municipalities and associate editor of* The American Enterprise.

Fewer and larger practices

"Architecture still doesn't have a Microsoft equivalent or a General Motors equivalent," says Ed Friedrichs, president of Gensler, the San Francisco–based architecture and interiors firm. Nor has architecture achieved the concentration of a profession like accounting, with its "Big Six." But the design field is gravitating toward fewer and larger practices. "You could equate us more to law firms," offers Friedrichs, noting that "there's been a lot of consolidation in that profession." "The big firms are gobbling fast," says Herbert McLaughlin, a partner and director of design for Kaplan McLaughlin Diaz, a 190-person firm in San Francisco. When a firm's leaders or founding principals are in their 60s, he observes, it may be easy pickings for a bigger firm that has both the wherewithal to make an acquisition and a desire for the greater geographical reach or additional forms of expertise that an acquisition can bring.

Some, like DLR (founded in Omaha in 1966 as Dana Larson Roubal & Associates), have acquired firms in other cities and allowed those offices to operate as relatively autonomous enterprises. It was only last year that all 15 offices under the DLR Group umbrella changed their names to that of the holding company. Other firms have steered more in the direction of HOK's "one-firm philosophy," attempting to shape their acquisitions into a single, highly integrated organization.

Acquisitions and mergers are just one source of the profession's growing concentration. "Gensler has never acquired a firm," says chairman and CEO Art Gensler Jr., FAIA. "We've grown internally." Some

NBBJ: THE NEW PLAYER IN SPORTS

Four years ago NBBJ Architects had little involvement in one of the big growth areas of architecture: sports and entertainment facilities. Today the Seattle-based firm of more than 750 people ranks third nationally in that field, behind two longer-established leaders, HOK and Ellerbe Becket. The story of how NBBJ got to be a member of the sports-design elite illustrates some of the advantages of very large architecture firms.

NBBJ reassesses its goals every year, and had wanted for some time to expand into sports facilities. In 1995 it got the chance when a group of principals in Ellerbe Becket's sports group in Los Angeles decided to split from their Midwest parent and pursue a quintessentially 1990s concept: "sports as a subset of entertainment."

Michael Hallmark, one of the Los Angeles principals (and earlier a founder of Ellerbe Becket's sports practice in Kansas City), says his group considered establishing an independent new firm but decided that was impractical. To succeed at complicated, highly technical sports projects, which often take several years to come to fruition, it's advantageous to be part of a large firm, according to Hallmark. "For us, bigness was important," he says. "The scale of the projects meant we felt we needed to be big from day one. We needed the resources: a vertically integrated group of specialists."

By becoming part of the corporate network of NBBJ, Hallmark and his colleagues were able to assure themselves access to experts on matters such as project management, graphics, and foreign cultures, and to guarantee themselves the capacity to handle highly technical issues, such as retractable stadium domes.

"We toyed with the idea of being a design firm and, when assistance was needed, having an associate architect," Hallmark says. "The problem is, the projects are very technical. You can't associate with just any architect, even a good one, and expect the follow-through to be there."

The addition of the sports group, which now employs nearly 90 architects, has helped NBBJ fulfill what its managing partner, James Jonassen, identifies as a vision of being "a multi-building-specialty firm—experts in a number of building types." The sports group has contributed in other ways, such as "opening our eyes to the ability to communicate with video." The group uses tools of Hollywood moviemakers, such as Silicon Graphics workstations, which aren't normally within the domain of architects. Of that particular tool, Jonassen says, "It was technology we would never have thought was worth the cost." To his delight, it enables the firm to "tell a very complex story in a way that satisfies very short attention spans."

NBBJ prides itself, Jonassen says, on being extremely "studio-focused. There are no layers of management. The unit of delivery of services is the studios. They are almost autonomous." The combination of having studios concentrate on projects and having firm-wide resources such as digital technology, economic analysis, and "experience with alternative delivery approaches, from fast-track to design/build, to bidder design," are key, in Jonassen's view, to how a big firm can prosper and continue to grow.

NBBJ REASSESSES ITS GOALS EVERY YEAR, AND HAD WANTED FOR SOME TIME TO EXPAND INTO SPORTS FACILITIES. IN 1995 IT GOT THE CHANCE.

The members of NBBJ Architects sports group.

Total Number of Employees	Number of Architects	Number of Offices
750+	600	9

Locations: Columbus, Ohio; Los Angeles; New York City; Research Triangle Park, N.C.; San Francisco; Seattle; Oslo; Taipei; Tokyo.

GENSLER: "A LEARNING ORGANIZATION"

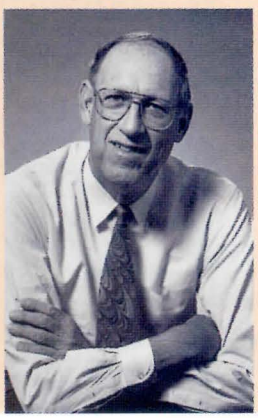
"In the past we focused on our clients' projects one at a time," says Ed Friedrichs, president of Gensler. "They each had a beginning and an end." Today the San Francisco–based firm, best known for its interiors work, finds that its assignments tend to flow together and stretch far into the future. The clients, many of them companies occupying buildings not only in the United States but throughout the world, are erecting, altering, and updating facilities continually; they want Gensler to help devise an overall strategy for handling their needs. The organization, Friedrichs explains, sees itself as a partner with the big businesses it serves. Its work, he adds, has gone from being "transaction-driven" to being "relationship-driven."

Since its start as a three-person practice in San Francisco in 1965, Gensler has grown into a 1,450-person firm with 13 offices in the United States (from Los Angeles to Boston), as well as offices in London, Hong Kong, and Tokyo. "Being diversified geographically means we don't have to bet the company on one city or one location," says chairman and CEO Art Gensler. "There have been times when one office went well and another office went in the tank. We share work."

Repeat work for big clients is a major source of Gensler's billings, which reached a record $170 million in 1997, up 30 percent from the year before. Sony, for example, has had Gensler work on a new studio in Culver City, California, an urban entertainment center in San Francisco, a 13-screen theater complex near New York's Lincoln Center, and small screening theaters (for Sony's corporate review of movies) in Tokyo. Gensler's work for the clothing retailer Gap, Inc., has gone on for three decades. "Our relationships," Friedrichs says, "have really facilitated our growth."

Projects are typically handled by "studios"—groups of as few as 12 to 15 staff members or as many as 30 to 50, who work together on a variety of projects. The premise of the studio system, Friedrichs explains, is that "people who know one another well are likely to produce better results for a client." Kevin Hart, a director of design in the San Francisco office, points out an additional advantage: "Studios are very helpful at making large firms easier to handle for young employees and new employees. If you came to Gensler, you would be joining an office of more than 200 but a studio of 20 to 30. That's your 'home room.'"

M. Arthur Gensler Jr., FAIA, chairman/CEO



Total Number of Employees	Number of Architects	Number of Offices
1,450	410	16

Locations: Atlanta; Boston; Chicago; Denver; Dallas; Detroit; Newport Beach, Calif.; Parsippany, N.J.; San Francisco; Washington, D.C.; Hong Kong; Tokyo.

growth is the result of opening multiple offices across the U.S. and overseas. More and more architecture firms have "not three or four offices" but "six or eight or ten," says Jerome Sincoff, FAIA, president and CEO of HOK. "That in itself makes firms larger." HOK now operates 15 offices in the United States and nine in other countries.

Firms establish multiple offices not only to get business in new territories but also because their clients have far-flung operations and want their architects close at hand. Larry Self, HOK's executive vice president, says, "Our clients want the comfort and confidence of knowing that their American architect is going to provide the same quality service in Prague or Shanghai—or any point on the globe—that they get in the U.S."

Going global

The globalization of trade, which has been official U.S. policy in Republican and Democratic administrations alike, has also spurred consolidation in the architectural profession. Most small firms cannot afford to pursue overseas work; this is mainly the big firms' turf. The AIA found in 1996 that international work, which had risen to $625 million annually, was being done by just under 10 percent of American firms. But international work was being carried out by more than 50 percent of firms that had 50 or more employees. Many businesses, in fields ranging from publishing to automaking, are evolving into "boundary-spanning" organizations that have enormous appetites for construction, renovation, and management of facilities—propelling the growth of big firms. "If you're any good at all at what you do and you work for large clients who are at the top of their businesses, it's almost inevitable you will grow," explains Paul Nakazawa, a management consultant with Pearson Egan Nakazawa in Wellesley, Massachusetts.

From a big-business perspective, it's easier to work with one very large architecture firm than with several smaller ones. Large firms tend to have a businesslike attitude, substantial liability coverage, and a high likelihood of remaining in existence from one decade to the next. Conversely, the smaller the firm, the greater the chance it will disappear. From 1990 to 1996 the number of AIA member firms declined to 15,000 from 17,000.

As a firm becomes large, it can afford state-of-the-art technology and experts, reinforcing its power to outdistance the majority of small to midsize competitors. Architectural information system managers, who run highly sophisticated, interlinked computers, command "very high salaries," says Robert Hillier, head of the 400-person Hillier Group in Princeton, New Jersey. So do top human resources directors. Money is available at big firms, and so are large-scale projects, which can make effective use of specialists. "You have people whose lifetime career is to research building materials and write about them," Hillier emphasizes. "In a large firm, that person has a real place and a real job."

LEO A DALY: BUILDING FROM TECHNICAL SKILLS

"We speak the language, we understand the language of the project type: the airport," LaVern Rollet says when asked to explain how the firm he works for, Omaha-based Leo A Daly, came to collaborate with Cesar Pelli & Associates on the new south terminal of Washington's Ronald Reagan National Airport. Earlier, Rollet had led a team from Leo A Daly working on an international arrivals building (unbuilt) at Honolulu's airport. He's been working on aviation projects since 1979, when the firm dispatched him to renovate terminals at Los Angeles International Airport.

Leo A Daly III, FAIA, chairman and president

Daly, the largest privately held architecture firm in the United States, with some 750 employees, about 230 of them architects, has based much of its success on an ability to carry out highly technical projects such as airports, laboratories, hospitals, and educational facilities. Leo A Daly III, FAIA, chairman and CEO of the firm his grandfather founded in 1915, says clients are drawn to the firm in large part because of their belief in the value of experience: "Hospitals want to talk to people who have done a number of hospitals before. They want someone who is coming off a very similar one."

Along with technical expertise, Daly is known for its willingness to open new offices—and on occasion buy established firms—that can broaden its geographic reach and technical skills. "When a bank comes to you and says, 'We want to build 1,000 offices spread throughout the U.S.,' you need to have offices in those areas," Leo Daly observes. The firm's 1991 acquisition of Lockwood Andrews Newnam, the largest civil engineering office in Texas, is part of a strategy aimed at expanding into Texas and Mexico while simultaneously gaining new expertise in environmental and civil engineering. Daly now has 15 offices, four of them in the Far East, the Middle East, and Europe.

The firm's reputation for design has not been as strong as its technical skills. This may help explain the enthusiasm voiced over the hiring, three years ago, of Richard Clark, formerly at Kohn Pedersen Fox, as corporate head of design and as director of design for Daly's 125-person Washington office. Clark, who reports being given "pretty much a free hand," has allowed design to stay with a project longer, as part of a team, instead of having designers quickly turn the project over to production.

DALY, THE LARGEST PRIVATELY HELD ARCHITECTURE FIRM IN THE U.S., HAS BASED MUCH OF ITS SUCCESS ON HIGHLY TECHNICAL PROJECTS.

Total Number of Employees	Number of Architects	Number of Offices
700+	230	15

Locations: Atlanta; Council Bluffs, Iowa; Dallas; Honolulu; Houston; Las Vegas; Los Angeles; Omaha; Phoenix; San Antonio; Washington, D.C.; Berlin; Dubai, U.A.E.; Hong Kong; Madrid.

Above: Generations of Dalys have worked in the firm. Left to right: Leo Daly Sr., William T. Daly, AIA, and Leo A Daly Jr., FAIA.

PHOTOGRAPHY: COURTESY LEO DALY

RTKL: Going International

"We're in a shift," says Lisbeth Quebe, the head of firm-wide marketing for Baltimore-based RTKL. With her health-care specialist husband Jerry Quebe and corporate practice specialist James C. Allen, Quebe left Perkins & Will to open a Chicago office for RTKL in 1996. She observes that in the past RTKL "had always expanded geographically. It was a way to be closer to our clients."

Today RTKL is expanding in a different fashion, concentrating not only on being physically near its clients but also on pursuing "a sector approach." That means building the firm's strength in its core markets of retail, entertainment, hospitality, health care, corporations, and government. Clients increasingly expect expertise from their architects, and RTKL believes that firms must deepen their knowledge of client issues in order to develop, rather than simply respond to, the next generation of ideas.

Disciplined, rational plotting of the firm's direction is one of the things that makes RTKL "a very strong company," according to Mark Zweig of Zweig White and Associates management consultants. In 1967 RTKL, with four principals and 45 employees, was one of the first architectural practices to decide it needed a leader who would concentrate on management.

The partners who reached that decision brought in a young manager, 28-year-old Harold Adams, who had gained high-level corporate and governmental exposure at John Carl Warnecke, working on projects with President Kennedy and his Cabinet, among others. Thirty-one years later Adams remains in charge, leading an organization that has grown to nearly 600 employees, with 309 architects, and has become increasingly international in its ambitions.

"We manage our affairs in a pretty conservative, businesslike way," Adams says. "While we take risks, it's all studied risk." Two of Adams's chief responsibilities are identifying market sectors where a major investment of money and personnel is likely to pay off in the long haul and going after international work, which now accounts for more than a third of RTKL's revenue.

Design and production, Adams says, is best done by "teams that have worked together repeatedly." He notes, "Over the years, we've broken our office down into studios. Those studios are concentrated on a specific project type." Studios allow RTKL to amass in-house expertise, which has become critical as the pace of decision-making has accelerated. Today, he says, "you need expertise *now*. If you don't have it, you will miss a market opportunity."

John Gosling, a vice president and urban designer in the Washington office, observes, "Once you get an expertise, you tend to attract the larger projects. You get 10- to 25-acre urban renewal properties, as opposed to one or two acres." A firm can also export the expertise and even "re-import" it later, as in the case of high-rise office building technology or housing.

In five decades RTKL has taken a local practice regional, then national, and finally global. Its most recent transformation, still in progress, involves going from being a large national practice doing business overseas to becoming a truly international practice. There was a time, Gosling says, when the firm "had some difficulty promoting people who did not grow up in the mother ship"—the Baltimore office. But now the firm has principals born in Britain, Argentina, China, and India. The direction is unmistakable.

Harold L. Adams, FAIA, chairman and CEO

TODAY, RTKL IS EXPANDING IN A DIFFERENT FASHION, BUILDING ITS STRENGTH IN ITS CORE MARKETS.

RTKL's board of directors. Back row, left to right: Kenneth V. Moreland, Paul F. Jacob III, AIA, Lance K. Josal, AIA, Paul G. Hanegraaf, AIA. Front row: Todd C. Lundgren, AIA, David I. Brotman, FAIA, Harold L. Adams, FAIA, David C. Hudson, AIA.

Total Number of Employees	Number of Architects	Number of Offices
574	309	8

Locations: Baltimore, Chicago, Dallas, Los Angeles, Washington, D.C., Hong Kong, London, Tokyo. Affiliates: Cologne, Guadalajara, Shanghai.

PHOTOGRAPHY: COURTESY RTKL

A firm that establishes expertise in rapidly expanding sectors, such as sports facilities or criminal justice facilities—two specialties in which HOK is strong—gathers tremendous momentum. At some point, the best such firms learn that the objective, as Nakazawa explains it, is not just to be "in a market," it is to "lead the market." That's what generates continuing rewards and keeps a staff excited. The leader of a market sector can ride its position to worldwide success.

Often, success in the United States leads to success overseas and then back again. RTKL used its decades of experience in designing American shopping centers to win big retail assignments overseas. And the foreign work, some of it on a larger scale than in the United States, has inspired the firm's designers. A retail specialist in RTKL's Baltimore office marveled at a Japanese mall with a ski slope in its core. International work has set the firm thinking about new ways for retail complexes to captivate the public. The "ID8" section of RTKL, with its eclectic mix of architects; interior, graphic, and industrial designers; and people from television, is dreaming up not just buildings but the entire shopping-cum-entertainment experience.

Every big-firm leader attributes some of the rise of the very large firms to changes in the nature of building design. "Projects have gotten larger and more complex, and clients want them done faster," Hillier observes. The first corporate headquarters Hillier produced, a 500,000-square-foot facility done 15 years ago for Beneficial Corporation, took four years from start to finish; by contrast, Hillier's latest headquarters, 890,000 square feet for Bristol-Myers Squibb, was done in 15 months. Big architecture firms typically understand alternative delivery methods, such as fast-track construction and design/build. Most big firms can also spread the work across more than one office. When RTKL's Dallas office landed a three-hotel commission in the Bahamas, the project was shared with the Chicago and Los Angeles offices because of the need for speed.

One of the motives for continually growing is the desire to attract and retain talented younger people. That's accomplished, in part, by providing opportunities for promotion. "A lot of it boils down to statistics," says Hillier. One principal per 10 to 30 employees is an economically reasonable ratio, he calculates; therefore, "a firm has to grow by another 30 people before it can add another principal." If growth stops, the best staff members on the way up may depart.

For the foreseeable future, bigness in architecture seems likely to keep ratcheting upward. The consolidation occurring among corporate clients shows no signs of abating, and those mergers and acquisitions will spur demand for more unified architectural services, Nakazawa believes. "If BankAmerica and Nationsbank merge, they're going to want fewer relationships—and more from the ones they deal with. How many people do you want to educate?"

"We're at a real turning point in the profession," says Harold Adams, chairman of RTKL and of the AIA's Large Firm Roundtable. (Twice a year the roundtable convenes the heads of big firms—those with at least 50 registered architects who are AIA members—to discuss concerns such as insurance, architecture education, and legal questions.) "With the globalization of architecture, we will see some big mergers," Adams predicts. Will those mergers be "within countries," he asks, or will they be "across borders"? He answers his own question: "Both."

Is this the death knell for small firms? Although AIA surveys indicate that from 1990 to 1996 many two- to four-person firms disappeared, everyone interviewed for this article agreed that there will always be a place for small firms, which have lower overhead and the ability to give each client a principal's full attention. There will also be room for smaller firms that focus on artistic innovation. "Design firms" like Cesar Pelli & Associates and Kohn Pedersen Fox also seem to have a tight grip on certain clients looking for distinctive design. Indeed, design firms with prestigious names coexist amicably with very large firms, teaming up with them to carry out big, complicated projects both here and abroad.

It's at some in-between size, where the principals' involvement diminishes but the economies of scale are not yet present, that the crunch will be felt, according to the apostles of bigness. "The firm that's really problematic," says Hillier, "is the 20- to 50-person firm that does midsize office buildings, firehouses, canned stuff you can take off the Internet and customize." Maybe. But Gutman notes, "There still are regional firms in many parts of the country that do pretty well because there's a preference in many quarters for local firms that can be contacted readily. The problem many big firms have is that they're regarded as impersonal and distant."

Does design suffer?

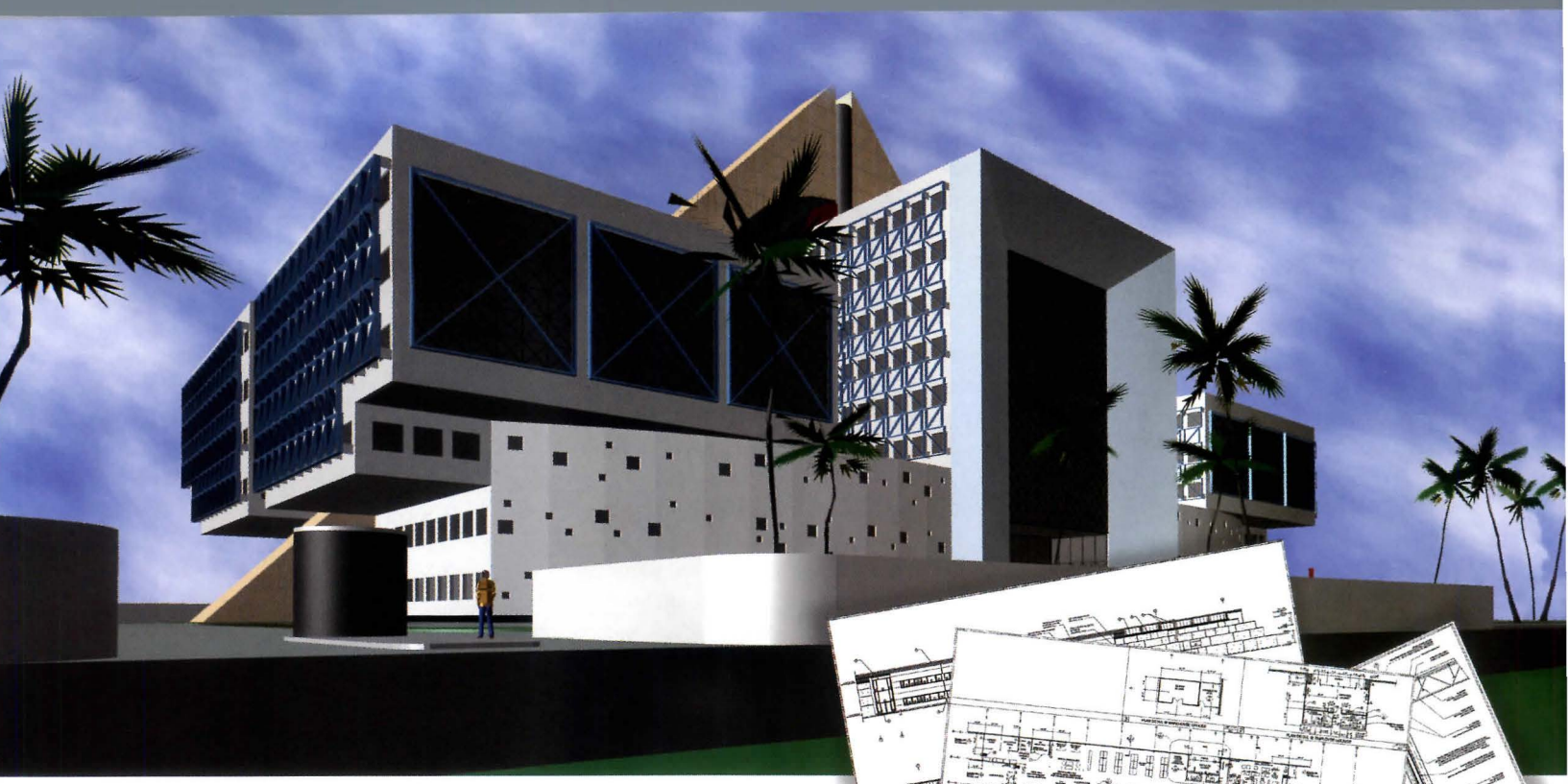
Another analyst of architectural practice, Dana Cuff at UCLA, says large firms are always confronted with the question, "How do you maintain design quality?" Currently the very large firms deal with that issue predominantly by breaking themselves down into "studios"—groups that are large enough to handle all the components of a project and small enough to operate as a team. This arrangement works best, says consultant Weld Coxe, when the studio is headed by a principal who brings in work and has the authority to commit the firm. If studio heads have to go higher in the hierarchy for decisions, clients quickly become dissatisfied, Coxe says.

With a studio-based organization, "the same people can follow the project all the way through," says Bruce Fowle, senior principal at New York's Fox & Fowle. Such follow-through has become more critical, Fowle adds, as "integration of plumbing, mechanical, fire control, communication wiring," and other elements of buildings has grown in complexity. The practice that some big firms used to employ—that of generating a design and then handing it off to the production department—is on the wane. This is welcome news both for design quality and for the morale of lower-echelon staff members, many of whom were once consigned to monotonously repetitive tasks. (Another reason for the rise of the studio-based structure is that corporations have shifted much decision-making downward, from the top executive to vice presidents or managers, who are more comfortable dealing with studio heads. To make the client comfortable, the organization of a big architecture firm must mirror the current fashion in corporate hierarchies.)

How well a firm with a slew of offices can deliver on design quality is subject to debate. A. Eugene Kohn, a senior partner at Kohn Pedersen Fox, says his firm's decision to "concentrate our design and technical skill in two places"—a Manhattan office with about 170 employees and a London office with about 80 employees—has enabled the firm to maintain a consistent level of quality. Bruce Fowle sees another hazard in bigness: "The larger it gets, the more it becomes a business, where there's a greater concern for the bottom line and all the things that go with it."

Bigness is good for clients, employees, and projects in some respects and bad for them in others. Those who run big firms are aware of the dangers, and many invest in abundant travel, conferences, educational programs, and other efforts aimed at keeping their organizations attractive to employees and to clients. They've heard E. F. Schumacher's memorable phrase, "Small is beautiful," and they know that misgivings about bigness run deep. Size cannot be safely touted in all quarters.

"When we go in to see a client, we don't talk about size," Hillier says. "Architecture is still a personal business. It's still a service that's delivered one-on-one. So many clients talk about 'their architect' and not about 'their architecture firm.'" ■



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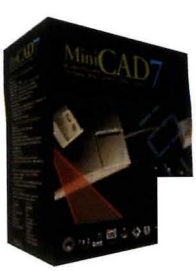

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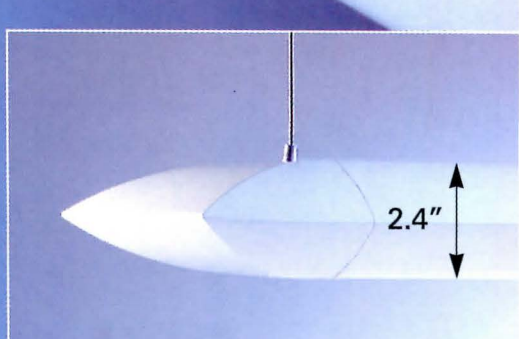

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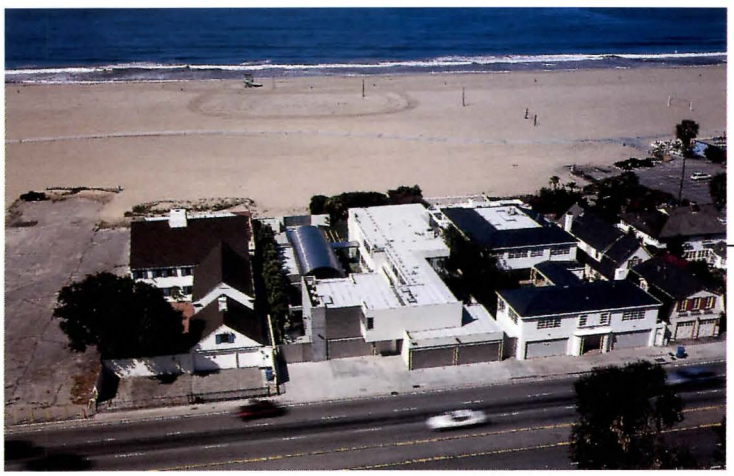
The pool pavilion sits on land acquired by the current owners. The new street facade (opposite right) has a garage and upstairs bedrooms.

CRITICISM: Adding to Neutra's famous LEWIN HOUSE, Steven Ehrlich designed a beautiful pavilion. But is it a happy marriage?



by Thomas Hines

In Charles Reznikoff's Hollywood novel, *The Manner Music*, a noted film director builds a splendid house on the Santa Monica beach, designed by a famous Modernist architect. The real-life prototypes for the novel's protagonists were Reznikoff's friend, the director Albert Lewin, and the architect of Lewin's beach house, Richard Neutra. Since its completion in 1938, Neutra's fabled Lewin House has undergone two major renovations, one in the early 1980s by Gwathmey Siegel & Associates and a recent transformation by its current owners, who have nearly doubled the size of the property and commissioned large additions by Steven Ehrlich Architects.

Built on a long, narrow slice of beachfront property, the Neutra-designed house is entered on one of its long sides, down a walk that runs nearly its full length to a handsomely overscaled front door. A library and a living room occupy the west half of the house, from which a prowlike glazed extension looks to the ocean. On the east, toward the street, lie a kitchen, service areas, servants' quarters, and garages. From the entry hall, a sensuously curving, minimally detailed staircase leads to five bedrooms and a study/sitting room. Atop the curving glass bay of the living room, the master bedroom opens to a private balcony, affording salt-air breezes and sweeping views of the coast. With its flat roof, its long lines of ribbon windows, its off-white stucco, and its navy blue trim, the house assumed an appropriately nautical ambience when it was built.

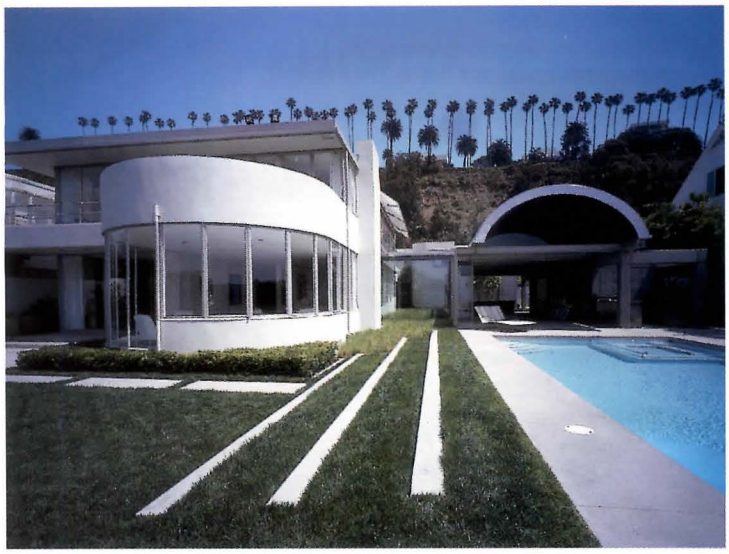
Neutra's design sensibilities grew out of the time he spent in the atelier/salon of the minimalist pioneer Adolf Loos in Vienna in the 1910s. A staunch Amerophile, Loos turned his disciples to the New World, where Neutra moved in 1923 after working in Berlin for the Expressionist master Erich Mendelsohn. In 1924 Neutra worked in Chicago for Holabird & Roche and in Wisconsin for Frank Lloyd Wright. Since most of Wright's work was then in Los Angeles, Neutra was encouraged to establish his practice there. His "Health House," designed and built from 1927 to 1929 for the physician Philip Lovell in the Hollywood Hills, became one of the Modern movement's most celebrated structures.

Neutra's career was greatly enhanced by connections with important movie clients. The movie industry, which not only survived the Depression but thrived on America's need for escape, provided major support for Neutra's work in the 1930s. His major commissions from the era include the Laemmle Building for Universal Pictures at Hollywood and Vine (1933), a house for the actress Anna Sten in Santa Monica Canyon (1934), and a grand villa in the San Fernando Valley for director Josef von Sternberg (1935). In those flat-roofed, elegantly minimal residences, Neutra combined his penchant for crisply detailed orthogonal geometry with dramatically curving surfaces. Much of this spirit made its way into the Lewin House.

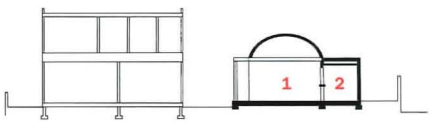
Educated at Harvard, Albert Lewin moved to Hollywood in 1924 to join Metro-Goldwyn-Mayer, where under Irving Thalberg he became head of the story department and directed such "surrealist" films as the first screen version of Oscar Wilde's *The Picture of Dorian Gray* and *Pandora and the Flying Dutchman*. Lewin, observed critic Maurice Zolotow, was "one of the small number of Hollywood literati who wished to raise the cultural level of pictures." He was highly attuned to the visual arts and owned a famous collection of paintings, which included works of Surrealists such as Man Ray and Max Ernst. Lewin was also keenly interested in Modernist architecture. Knowing the Sten and von Sternberg houses, he eagerly turned to Neutra for his own house.

Project: *Addition to 1938 Lewin House, Santa Monica, California*
Architect: *Steven Ehrlich Architects—Steven Ehrlich, FAIA, principal-in-charge; James Schmidt, AIA, project architect; Nick Seierup, AIA, Brent Eckerman, Tim Champ, Supachi Kiatwankul, Pierre Paley, Troy Williams, Jonathon Riddle, Todd Flournoy, Juergen Zimmerman, Tina Hollenbacher, design team*
Contractor: *Lautenschlager, Inc.*

Thomas Hines is a professor of history and architecture at UCLA. He is the author of Richard Neutra and the Search for Modern Architecture *(1982) and* Irving Gill and the Architecture of Reform, *set to be published in 1999.*



1. *Entertainment*
2. *Kitchen*
3. *Barbeque*
4. *Garage*



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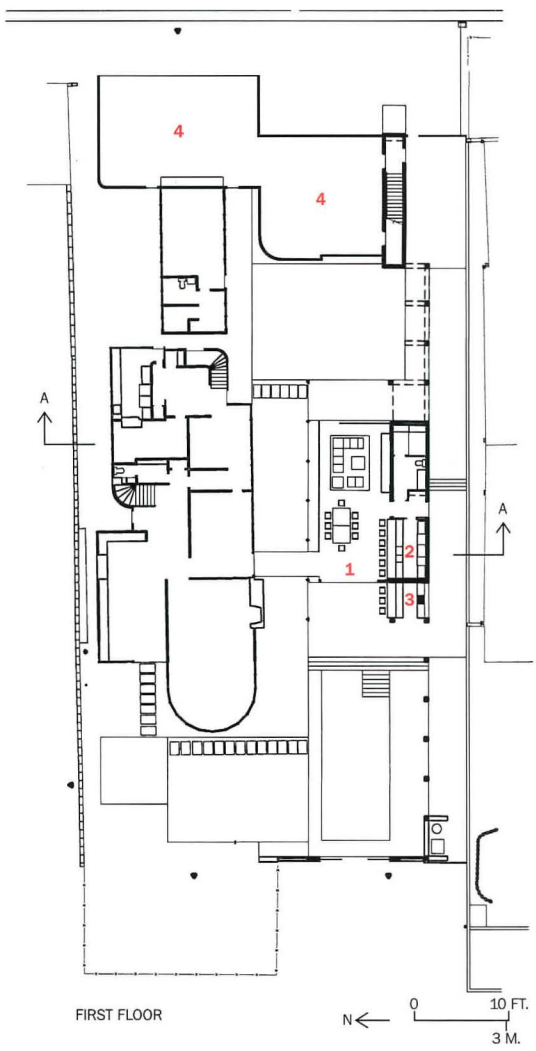
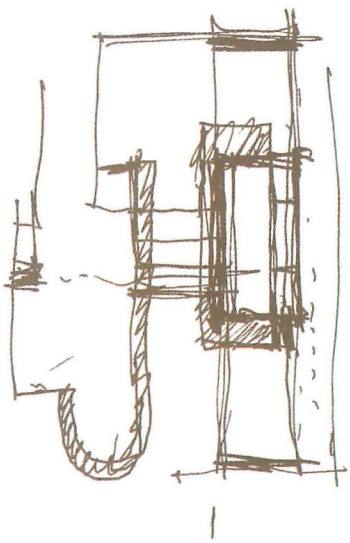


FIRST FLOOR

In 1938 the Lewin House sat in splendid isolation (below). Ehrlich picked up the curve of the existing house's prowlike living room as well as the "outrigger" framing of later Neutra houses and applied them to his pool pavilion (top). A glass link between the house and the pavilion preserves views to the ocean (opposite). Pavilion, house, and garage wing occupy the site (above).



PHOTOGRAPHY: LUCKHAUS STUDIO/UCLA SPECIAL COLLECTIONS (OPPOSITE BOTTOM)

After his retirement from motion pictures, Lewin and his wife returned to New York. Their house went through a succession of owners, attentive and otherwise, including the legendary Mae West, who allowed the dwelling to be badly abused by her menagerie of pet monkeys. Once, after a visit to his celebrated "client," as Neutra liked to refer to all users of his buildings, he described her decorative style as "Mae West Baroque."

Changing a Modernist landmark

Years later, the house was purchased by François de Menil, who commissioned Charles Gwathmey to renovate the structure with minimal alterations to Neutra's design. One of Gwathmey's small but effective changes lay in his realization that while the master bedroom opened onto an appealing curving deck, there was no such amenity in the adjacent guest room. So Gwathmey created a smaller, rectilinear guest room balcony on the cantilevered overhang that Neutra had intended solely as a shading device for the library beneath. A sympathetic new door and railing made the converted balcony read as a thoroughly rational and integrated part of the original design.

The only disappointing note in Gwathmey's sensitive renovation was his decision to change the exterior colors from the original off-white and navy blue to light gray trimmed with darker gray, thus losing the crispness of Neutra's colors. More successful was his use of rich pastel colors on Neutra's original white interiors. These colors served as an ideal background for the client's collection of 20th-century art, including a painting by Max Ernst, an appropriate echo of the artist's visits to the house.

Recent renovations and additions by Steven Ehrlich have affected the Lewin House more palpably. An architect who cultivates his affinities with previous generations of Southern California Modernists,

TAKEN ON ITS OWN, THE PAVILION IS A FINELY EXECUTED STRUCTURE, IMMACULATELY DETAILED.

Ehrlich had earlier designed an effectively detached guest house addition to Neutra's Loring House in the Hollywood Hills, a classic example of the late architect's increasingly relaxed work of the 1950s.

In the Lewin project, Ehrlich has returned the stucco to its original off-white but retained the muted gray that Gwathmey had painted the trim. Most of Ehrlich's changes in the original structure have been minor. His major impact has come in his additions to the house.

Designed for entertaining and enjoying access to the outdoors, the pool pavilion has a kitchen, a dining counter, and a barbeque area. Steel framing that reaches beyond the glass walls of the pavilion refers to "outrigging" that Neutra used in houses from the 1940s and 1950s (opposite).

The current owners are a couple—a real estate developer and a political consultant—with one child. After acquiring the adjacent vacant lot to the south, they commissioned Ehrlich to enlarge one of the five upstairs bedrooms, to design an attached, streetfront two-story guest house and servants' quarters, and to construct a large, glass-walled pool pavilion in the space between that addition and the beach. With the additions, the house's original area of nearly 7,500 square feet has been increased to almost 11,000. New garages facing the street contain spaces for eight cars. The clients express great happiness with the results.

Taken on its own, the pavilion is a finely executed structure. East, west, and north walls are of fixed and sliding glass, connected on the north to the original house by a glazed, covered passageway. Pushed to the property line, the south side of the pavilion, with kitchen, bar, and bathrooms, is made of contrastingly heavy concrete. Particularly effective are the sensuous fixtures and immaculate detailing of these spaces. The pavilion is topped by a handsome, steel-roofed, cycloidal vault that rests on a structure of exposed steel posts and beams.

The chief flaw of the pavilion is, ironically, an element that Ehrlich designed as a well-intentioned gesture to Neutra: something Neutra called "spiderleg outrigging." Neutra mainly employed the minimalist "outrigging" in his orthogonal, flat-roofed, one-story structures of the late 1940s and 1950s to suggest the figurative extension of the roofline to infinity and a simultaneous anchoring of it back into the earth. He never used it in the 1930s, when the Lewin House was built.

Though Ehrlich's neo-spiderlegs are extensions of his structure's steel supporting beams, they lose their meaning as props for the cycloidal vault, a crowning element that imparts to the one-story pavilion the effect of a larger structure. It is three-fourths the height of the two-story house next door. Because of its sheer girth and its siting close to the older building, the pavilion vault competes with the house's orthogonal leanness. While it might have been dazzling on another, detached site, the pavilion, despite its top-of-the-line detailing, crowds and overwhelms the original structure.

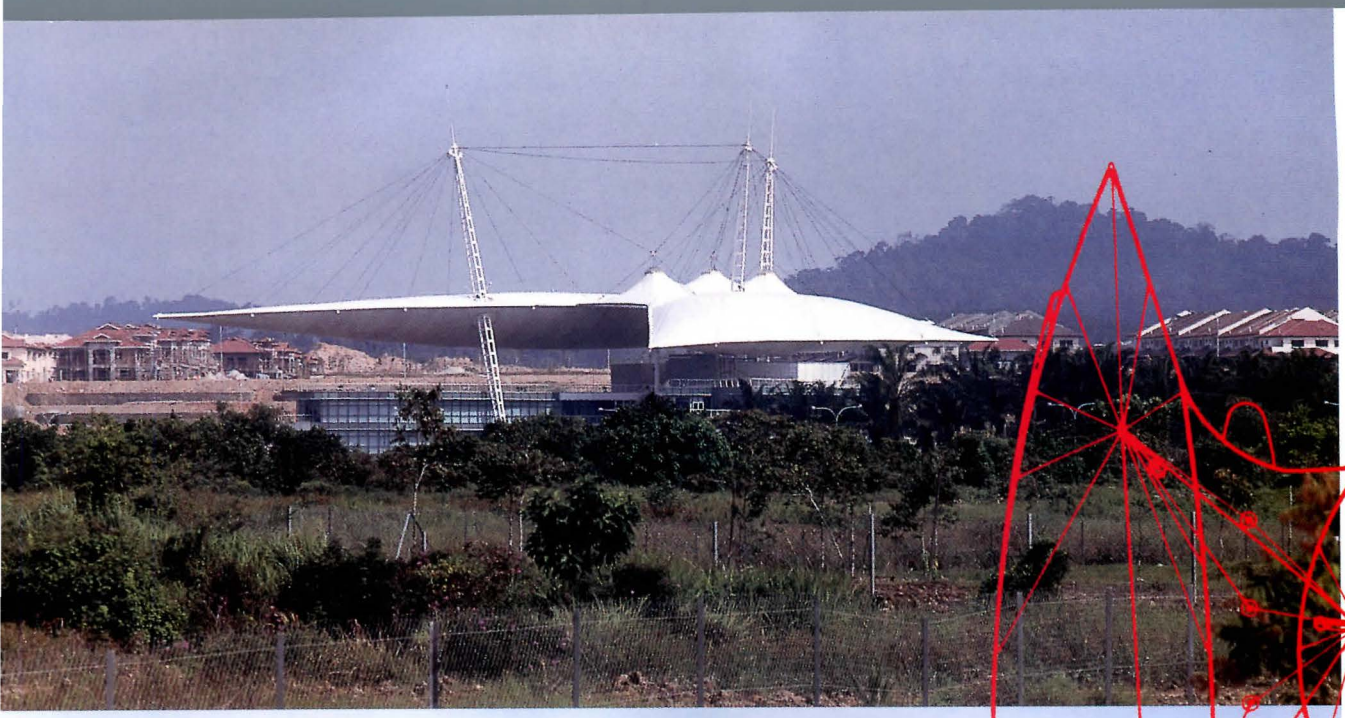
The same is true of Ehrlich's streetfront additions, though these elements lack the pavilion's relative lightness. With heavy segments of reinforced concrete and stainless-steel panels, they run counter to the sleek minimalism of the Neutra original, which, in any case, the new street facade totally covers from view. Partial glimpses from the public beach and a bird's-eye view from the distant palisades to the east are the only encounters the public now has with this significant example of Southern California Modernism.

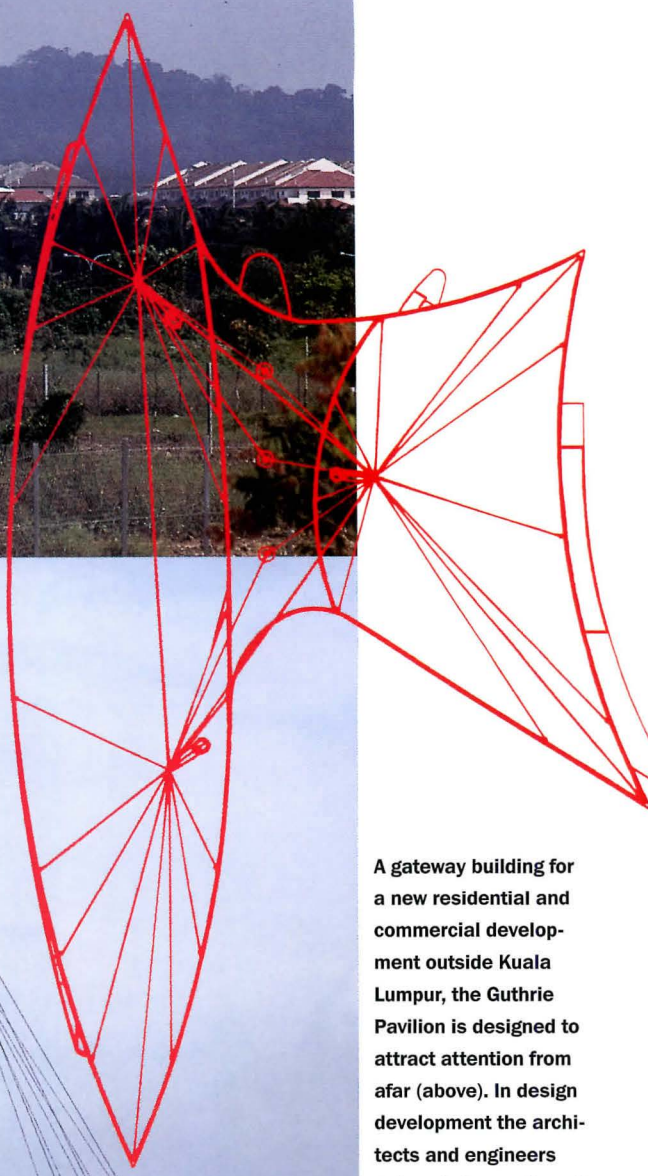
THE PAVILION'S CHIEF FLAW IS A WELL-INTENTIONED GESTURE TO NEUTRA.

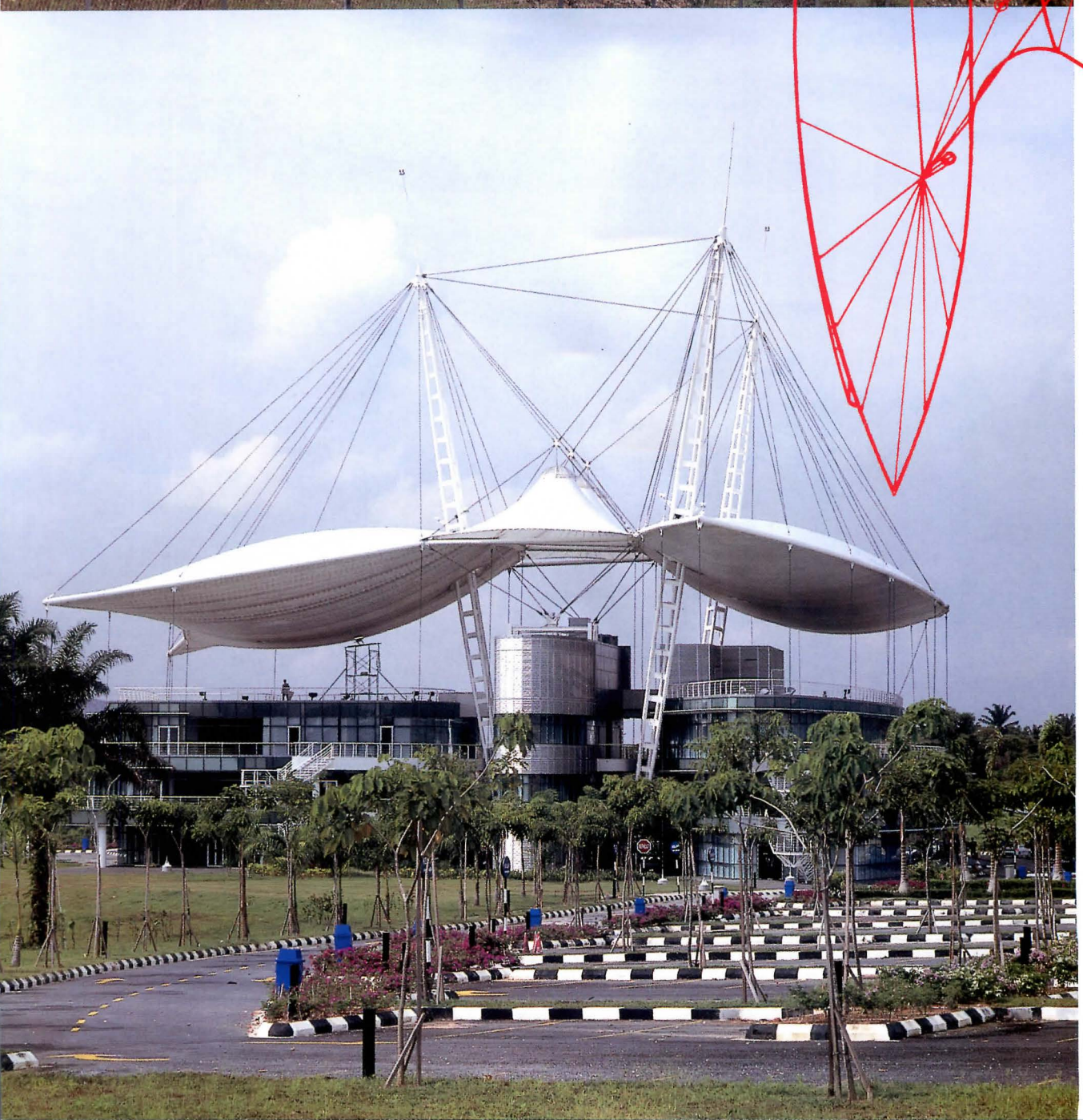
While the current owners might naturally state that it is no one's business but their own, why did they feel the need to add so extravagantly to their already large and remarkable house and, in doing so, damage its identity? With a successful practice in California and beyond, why did Ehrlich feel the need to assert his own style so forcibly that it overwhelms a now-compromised landmark? It is unfortunate that the current handlers of the Lewin House failed to exercise restraint in modifying this historically significant structure. ■

Sources

Tempered frameless glass: *Giroux Glass*
Brushed stainless steel: *Dorland Co.*
Aluminum windows and sliding pocket doors: *Fleetwood*
Pavilion cabinets: *Meyer & Reeder*
Pavilion kitchen: *Bulthaup*
Glass table in pavilion: *Knoll (Barcelona Table)*
Barstools in pavilion: *Warren MacArthur (c. 1940)*
Colored nesting tables: *Wor-de-klee*
Sofa: *Thomas Callaway Associates*
Double lounge on patio: *Walter Lamb (c. 1940)*







A gateway building for a new residential and commercial development outside Kuala Lumpur, the Guthrie Pavilion is designed to attract attention from afar (above). In design development the architects and engineers reduced the number of masts supporting the roof to three (left). The drawing shows the final roof plan.

Tensile technologies and irregular geometries turn Ken Yeang's GUTHRIE PAVILION into a tropical high-wire act.

The weave of the glass fiber used for the roof dissipates sunlight and glare during the day but catches light from spots at night.

by Clifford Pearson

Umbrellas have been shading people for hundreds of years, so it's not surprising that architects would borrow the idea to protect buildings from the full force of the sun. In the suburbs of Kuala Lumpur, Malaysian architect Ken Yeang has married the old-fashioned umbrella with the latest tensile and inflated-fabric technologies to shade the Guthrie Pavilion, a sales office and golf course clubhouse.

The project continues Yeang's career-long exploration of bioclimatic design—an exploration that has led him to use plantings and shaded "sky courts" in high-rise office buildings, to position service cores so as to block direct solar radiation, and to maximize natural ventilation in modern structures [RECORD Pacific Rim, March 1993, page 26].

The Guthrie Pavilion stands at the entrance to a new suburb being developed about 20 miles west of Kuala Lumpur by the real estate arm of an agricultural conglomerate. The company's plans for the area include houses, offices, light-industrial facilities, and a golf course. "The client wanted a landmark building to draw attention to the development," explains Yeang. "It's the first building you see from the highway, so they told us to make it visually stunning."

The 50,000-square-foot pavilion serves two primary functions. Half the structure is a showcase for selling houses and land in the development, while the other half is a clubhouse for the adjacent golf course. The idea is to use a round of golf and then a drink on the roof terrace to close business deals. Capturing the views and creating comfortable outdoor spaces are critical to the success of the building.

An idea brought back from the south of Spain

The client, Tan Sri Dato Abdul Khalid Ibrahim, the head of Guthrie Property Development, had returned from a visit to Expo '92 in Seville, Spain, impressed by the inflated-pillow roof on the German Pavilion. He was determined that the gateway building at his company's new development have a similar roof. While looking for a Malaysian architect for the job, Tan Sri Khalid heard about Yeang's firm and learned that the architect had been experimenting with fabric structures for years. Indeed, Yeang had used them as components of several larger projects—as a roof canopy on the 40-story Menara Budaya office tower in downtown Kuala Lumpur, as an entrance canopy for the Wirrina Cove Hotel in Adelaide, Australia, and as partitions in the Conoco offices in Kuala Lumpur.

While the inflated roof of the German Pavilion in Seville was circular in plan, Yeang realized that tensile technology allowed great freedom in terms of geometry. As long as it shaded the building and was properly secured, there was no reason the Guthrie roof couldn't employ irregular shapes. After working on several different schemes, Yeang and the client selected a design with two different inflated roofs connected by a trio of small, uninflated fabric cones. Each tensile structure covers a different portion of the building: there is a lozenge-shaped pillow over the office and exhibition wing, a trapezoidal pillow over the clubhouse, and the suspended cones over the service core.

Altogether the fabric canopy covers an area of 29,000 square feet, shading the three-story structure below and making the expansive roof terraces comfortable outdoor spaces. The building itself, while irregular in plan, is a conventional concrete-frame structure with aluminum infill panels and tempered clear glass. Thanks to the canopy and aluminum sunshades projecting from the east and west facades, clear glass could be specified without increasing solar-heat loads. Large expanses of it provide great views for people inside the pavilion and reduce the need

BY SHADING THE BUILDING, THE CANOPY REDUCES ENERGY CONSUMPTION AND CREATES COOL ROOF TERRACES.

Project: *Guthrie Pavilion, Shah Alam, Selangor, Malaysia*
Client: *Guthrie Property Development Holding Sdn. Bhd.*
Architect: *T. R. Hamzah & Yeang—Ken Yeang, principal-in-charge; Seow Ji Nee, project architect; Paul Mathews, Ian Morris, design architects; Idris Clywd, Michael Jamieson, design development architects; Richard Coutts, Anton Petschy, design team*
Engineers: *Tahir Wong (C&S); PCR (mechanical/electrical); IPL Radolfzell Ingenieurplanung Leichbau (canopy)*
Quantity surveyor: *Azhar Rouse & Hisham*
Fabric manufacturer: *Sediabena/Flontex JV*
General Contractor: *Syarikat Abdul Rahman-Sediabena JV*

PHOTOGRAPHY: © K. L. NG

By protecting the building from the full force of the sun, the fabric roof reduces energy consumption by an estimated 66,300 kilowatt hours each year. The canopy creates about 10,000 square feet of shaded outdoor spaces, including decks and roof terraces on several levels (above). Parking for more than 450 cars is provided by surface lots around the building (right).

On the west facade (above) and the east elevation, anodized aluminum sunshades project from the curtain wall and reduce solar loads. The curtain wall is made of tempered float glass and 2.5-millimeter-thick solid aluminum panels. Because it is shaded by the fabric canopy, the building can use more glazing than is typical in the tropics. The exterior stair (right) is galvanized steel.

for electric light. Though the building is air-conditioned, operable windows allow for natural ventilation in case of power failures or unusually cool weather.

The building's inflated roofs are made of glass fabric wrapped around tubular-steel frames that are supported by internal steel skeletons. The fabric's weave diffuses sunlight to prevent glare. It also has a nonstick coating and is totally inert so nothing can grow on it—important properties in a tropical climate where plants, molds, and fungi flourish. Microbes, however, can live on top of water trapped inside the inflated pillows, so the designers made sure the roofs are well drained.

How the roof is supported and steadied

The roofs are suspended by galvanized-steel cables hung from three angled steel masts and are steadied by vertical stressing cables running from the ground and, in some places, from the building itself. The masts, which are actually bundles of three seamless-steel tubes manufactured in Japan and welded together in Malaysia, taper at the top and bottom. "In the original scheme there were more masts," says Ian Morris, one of the design architects in Yeang's firm. "But we wanted to simplify it to make it as elegant as possible."

While earthquakes were not a major concern in the design of the roofs (Kuala Lumpur is not in a severe seismic zone), high winds and typhoons were. The engineers for the canopy, the German firm IPL, along with Wacker & Rau wind engineers, conducted wind-tunnel tests of the roof to make sure it could withstand gusts of up to 115 feet per second.

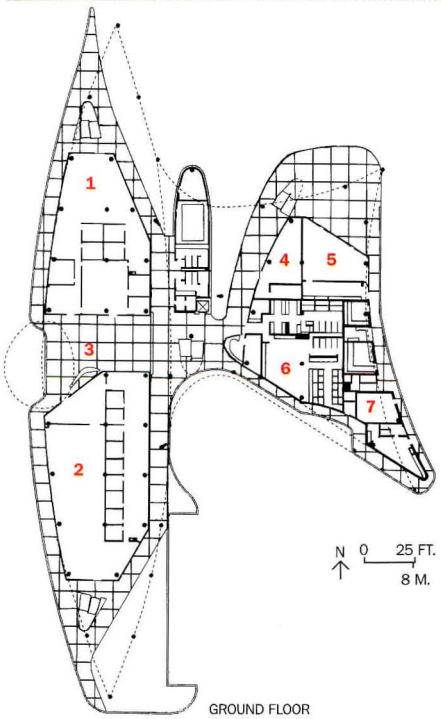
The roofs were constructed about 120 miles from the site by a German contractor in 32 weeks, so work on the building and the protective canopy could proceed simultaneously. The roofs were then transported in pieces to the building site, where they were assembled and the pillows inflated.

THE ROOF WAS DESIGNED AND TESTED TO WITHSTAND WINDS OF UP TO 115 FEET PER SECOND.

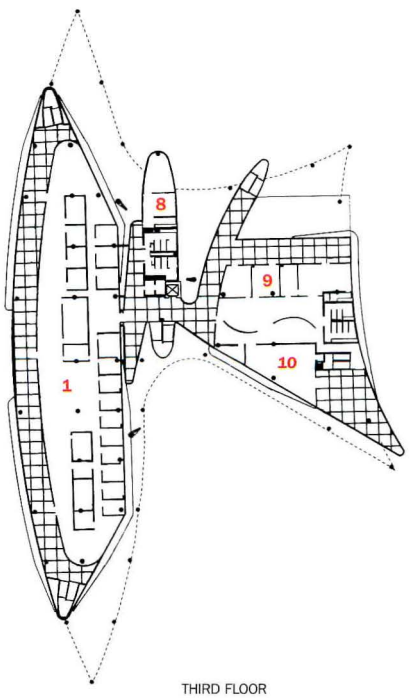
Though the Malaysian economy has been battered this past year following the collapse of the local currency, the Guthrie corporation has been buffered from the storm. Primarily an exporter of palm oil, it is paid mostly in foreign currencies. And while the price of foreign building products soared, that of local materials and labor went down. As a result, reports Yeang, construction of the Guthrie Pavilion and the surrounding development proceeded on schedule and on budget.

Although earthquakes are not a major concern in Kuala Lumpur, typhoons and high winds are. As a result, wind-tunnel tests were done to make sure the suspended roof structure could withstand winds up to 115 feet per second. The building's masts, cables, and tubular metal railings give it a vaguely nautical look (left and opposite).

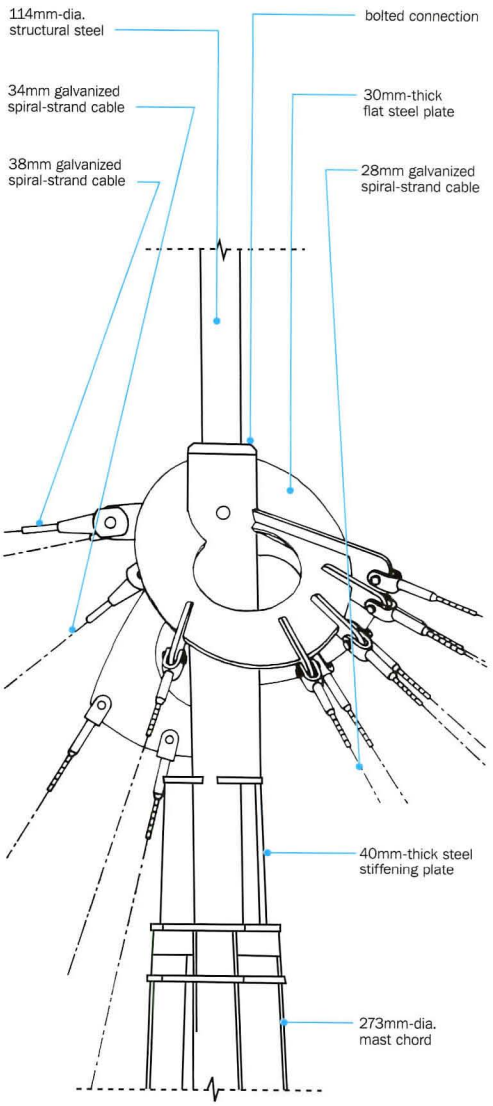
1. *Office*
2. *Office/exhibition*
3. *Reception*
4. *Pro shop*
5. *Cafeteria*
6. *Lockers*
7. *Caddy station*
8. *Prayer room*
9. *Executive office*
10. *Board room*



GROUND FLOOR



THIRD FLOOR



Completed in March, the pavilion has already become an attraction for groups of architecture students and even government officials. And while some members of the local architectural establishment shake their heads, says Yeang, others "think I'm a hell of a salesman to convince a client to do such a building." But the client loves the building, continues Yeang, seeing it as "his new toy." And why not? The toy is working fine, injecting excitement into what otherwise would have been a staid golf course development. With its inflated canopy lit up at night from below, the Guthrie Pavilion is a dynamic presence in the tropical landscape.

THE INFLATED ROOFS ARE SUSPENDED FROM STEEL MASTS AND STEADIED BY VERTICAL STRESSING CABLES.

Yeang's research for the Guthrie job has led him to further explorations of the uses of air in architecture. In recent projects, such as the 24-story UMNO Tower completed earlier this year in Penang, Malaysia, and a residential tower in Kuala Lumpur that is still on the boards, Yeang is investigating ways of using wind to reduce a building's mechanical loads. These projects incorporate "wing walls" that extend from the building envelope and direct wind inside, helping to cool interior spaces and increase fresh-air changes. He is also working on a residential tower in London, which will test his ability to adapt principles of bioclimatic design to a temperate region. ■

Sources

Aluminum cladding: *Pantech*
Tempered float glass and anodized aluminum louvers: *Malaysian Sheet Glass*
Glass-fiber roofing: *Flontex*
Galvanized steel cables: *Pfeiffer*
Interior hardware: *Newman Tonks*
Acoustical ceilings: *Daiken*
Aluminum suspension grid: *Donn*
Paint: *ICI*
Plastic laminate surfaces: *Formica*
Carpet: *Collins & Aikman*
Office furniture: *Haworth, Castelli*
Entrance downlights: *Erco*
Exterior lights: *Began, Sunlighting, Pluto, Hydrel*
Elevator: *Toshiba*

In the KIASMA MUSEUM OF CONTEMPORARY ART, Steven Holl creates a dramatic embrace of Helsinki's treasured architectural legacy.

by Karen D. Stein

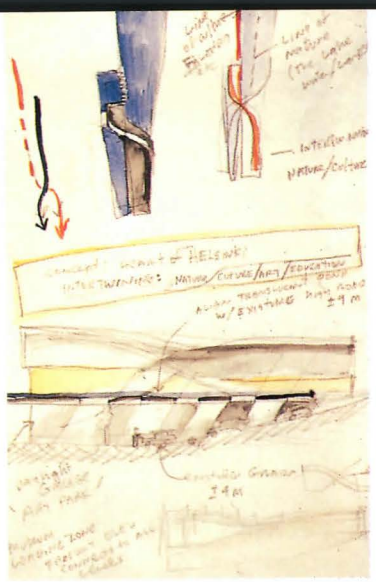
Steven Holl's design of the Museum of Contemporary Art in Helsinki was a long shot from the beginning. In 1992 the barely two-year-old institution, part of the Finnish National Gallery, decided to go out on its own. For its new home, it chose a hallowed site in the heart of the city at the foot of Töölö Bay. Situated between Alvar Aalto's Finlandia Hall, Eliel Saarinen's train station, and the behemoth neoclassical Parliament building, the open site was a centerpiece of a 1960s master plan by Finnish national treasure Aalto. His plan called, in part, for retaining conceptual if not actual sight lines to Lapland, the region above the Arctic Circle that is a scenographic touchstone of Finnish culture. Also to be respected was a statue of Finland's only nationally recognized war hero, Marshal Carl Mannerheim, on horseback.

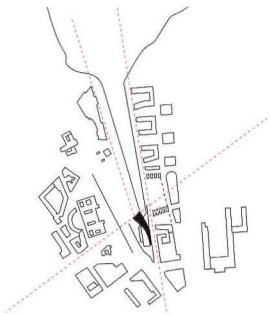
Grappling with these sacred spaces was one of the challenges of a museum design competition announced in September 1992. The competition included what its organizers, a group of city and state officials, called an "expanded Scandinavian" list of entrants. To promote good relations with neighboring nations, architectural firms in Latvia, Estonia, and Lithuania were encouraged to apply; and, perhaps as a metaphor for the institution's global ambitions, four international architects—Steven Holl of New York City, Coop Himmelblau of Vienna, Kazuo Shinohara of Tokyo, and Alvaro Siza of Porto, Portugal—were also invited to participate.

Of the 516 entries eventually received, 12 were disqualified for not meeting competition requirements. For those that did meet the requirements, Aalto's urban legacy proved so daunting that many local architects, who comprised the majority of entrants, were reticent to build

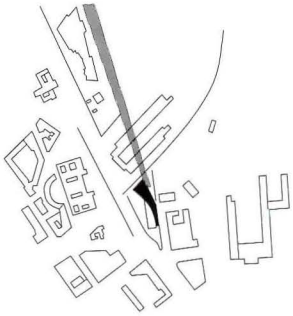
Project: *Kiasma Museum of Contemporary Art, Helsinki, Finland*
Owner: *Finnish Ministry of Education*
Architect: *Steven Holl Architects—Steven Holl, AIA, principal; Vesa Honkonen, project architect; Molly Blieden, Justin Rüssli, Tim Bade, Pablo Castro-Estévez, Janet Cross, Justin Korhammer, Anderson Lee, Chris McVoy, Anna Müller, Tomoaki Tanaka, project team*
Associate Architect: *Juhani Pallasmaa Architects—Juhani Pallasmaa, Timo Kiukkola, Seppo Mäntylä, Heikki Määttänen, Timo Ruusuvuori, Seppo Sivula, Meita Soini, project team*
Engineers: *Ove Arup & Partners—Guy Nordenson, Mahadev Ramen (structural/mechanical); Insinööritoimisto Matti Ollila & Co. (structural); Insinööritoimisto Olof Granlund (HVAC); Tauno Nissinen (electrical)*
Consultants: *L'Observatoire International (lighting); Teatek (theater)*
General Contractor: *Selcon*

PHOTOGRAPHY: © PAUL WARCHOL





INTERTWINING
engage geometry of the city



MASTER PLAN
open sight lines

Holl's sketch (far left) depicts the "intertwining" of the museum and civic monuments, including the neoclassical Parliament building (below). Diagrams (left) show how Kiasma engages the city's geometry and sight lines.

atop what the master had designated as a seemingly endless view corridor. "In the Finnish entries the buildings were mostly underground," recalls Pekka Korpinen, deputy mayor of Helsinki and one of the competition jury members. "Aalto's open esplanade, which is meant to extend to the sea, is such an essential element of our city's architecture that Finnish architects couldn't solve the problem."

Holl, who submitted his anonymous entry under the code name "Chiasma," which means an intersection or a crossing over, won for a scheme whose fractured masses were designed to intertwine with the

BURDENED BY AALTO'S LEGACY, FINNISH ARCHITECTS HAD TROUBLE SOLVING THE DESIGN PROBLEM.

geometry of existing civic structures, and whose views correspond to Aalto's Lapland sight lines. The associate architect for the project, the respected local firm Juhani Pallasmaa Architects, provided critical insight early on in the project, says Holl, who had envisioned an outdoor courtyard as the design's centerpiece until Pallasmaa explained its inappropriateness to the often harsh Finnish climate.

In its official announcement of the competition results, the jury called Holl's design of 25 interconnected galleries of different shapes and sizes "mysteriously sculpturesque." They praised in particular Holl's proposed "wall of ice," the west wall of glass that curved around the Mannerheim statue, which the architect moved 30 feet to the south, as if in gentle embrace.

But the citizens of Helsinki offered Holl's plan no similar embrace. In fact, the public unveiling of the winning scheme was followed by a months-long campaign against the project led by veterans who opposed moving the Mannerheim statue. Some 22,000 people signed a petition for a referendum to prohibit the construction of the museum—quite an accomplishment in a country with a total population of just over five million. The design itself was also criticized, its rounded, hull-like zinc forms alternately likened to a nuclear submarine and a metal pumpkin. Nonetheless, the Helsinki city council voted against the referendum and, after a two-year delay, proceeded with the project. As a concession to public sentiment, however, the statue was left in its original location.

Now with the building complete, public opinion is dramatically changed. Not only has the debate about the site been put to rest, but the finished museum has become the Helsinki gathering point that one imagines Aalto planned for his esplanade: during the days-long dedication last May, it was overflowing with visitors. Christened Kiasma, a Finnish extrapolation of Holl's competition-entry code, the museum has, in fact, become an intersection of time and place.

"It still somehow seems a miracle," confesses museum director Tulla Arkio, who has been involved with the project since its inception. "The discussions about the site and the Mannerheim statue have vanished." What's more, she says with a laugh, "'It's not so ugly, after all,' say the people who were against it."

For Holl, the controversy is less forgettable, if for no other reason than it jeopardized the realization of a project he has long considered his most important work to date. Interestingly, though, the

Holl describes the entry kiosk (above) as a sectional slice of the curved west facade's "wall of ice" (opposite). After much public debate, the statue of Marshal Mannerheim was left in its original position. Exterior cladding is aluminum panels and the vestibule is covered in a reddened brass to, says Holl, "make a dark moment of transition" from the perpetual summer light or snow-filled winter days.

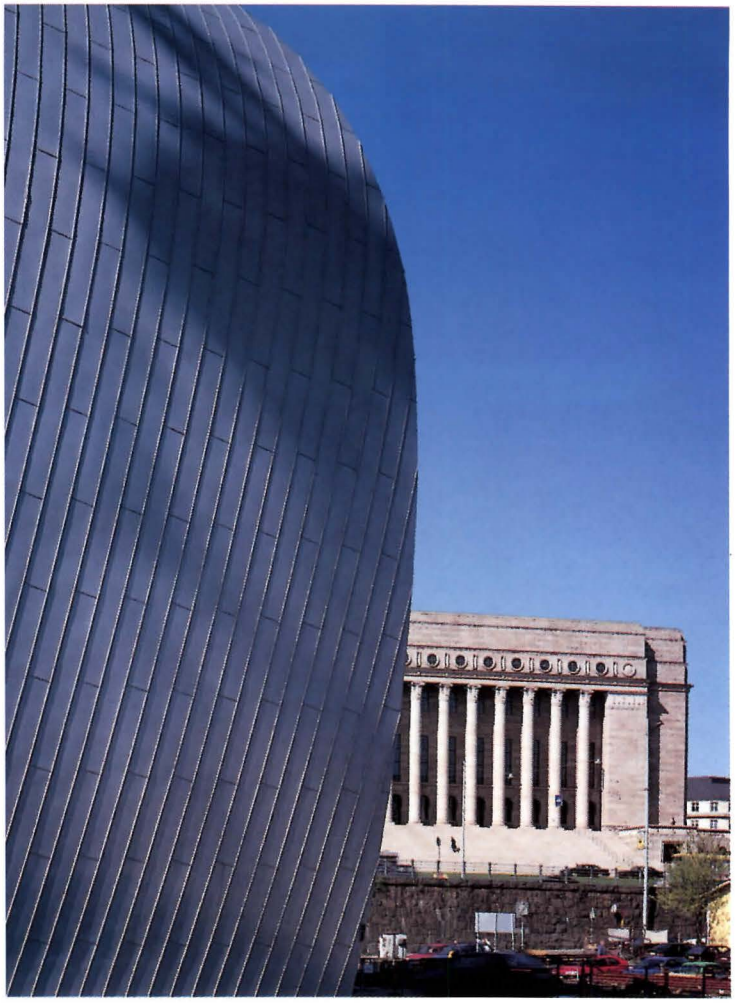
substantial changes made to the design after the competition were not prompted by the public debate. Those changes came during Holl's own development of the design, when, for example, he was asked to reduce the museum's size by 10,000 square feet to remain within budget. To do that, he literally shrunk the project by some 10 percent. "It was easy to do," explains Holl. "The drawings of the project were all on computer" and were scaled down accordingly.

SUBSTANTIAL CHANGES MADE TO THE DESIGN AFTER THE COMPETITION WERE NOT PROMPTED BY THE PUBLIC DEBATE.

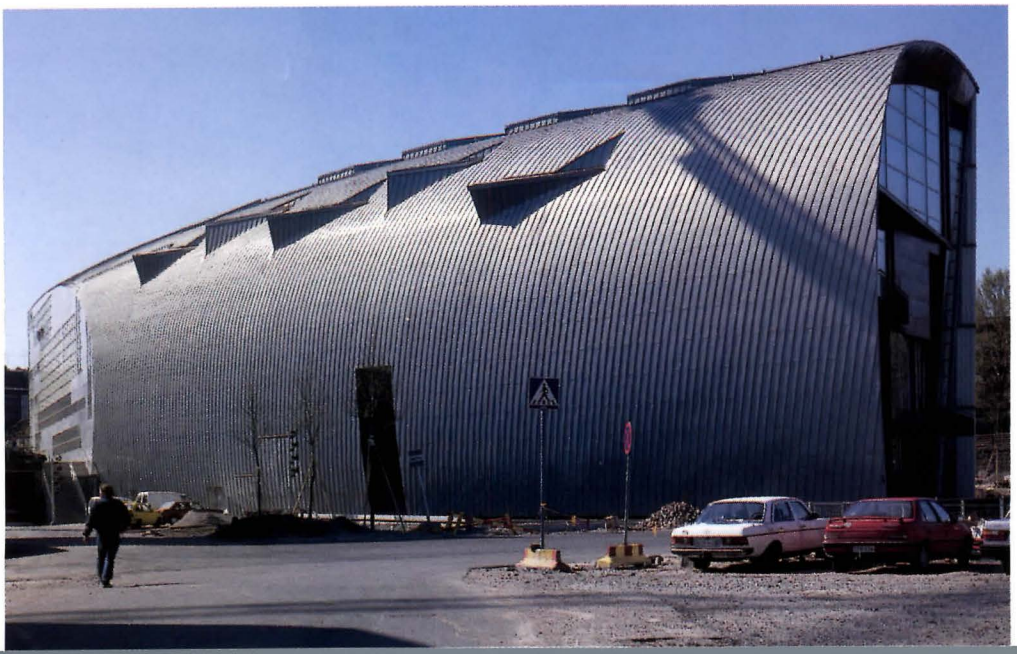
Now measuring approximately 130,000 square feet, the museum cost $41 million, slightly below the budget. The project was funded by the city in return for the gift of the property, which had been owned by the national government, says Korpinen.

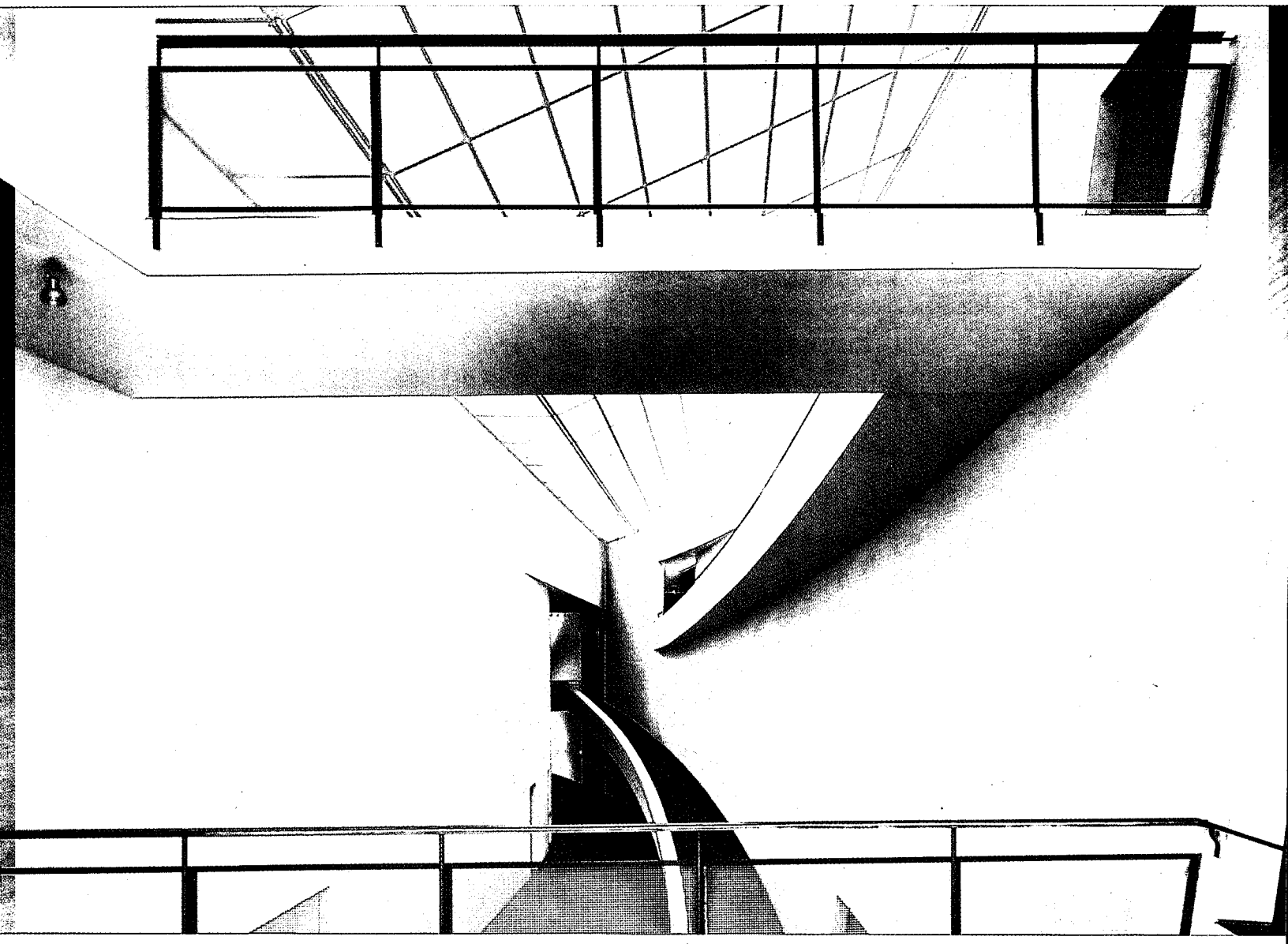
Other major changes occurred as construction systems and material selections were being developed. As depicted in the competition entry, the "wall of ice" was composed of overlapping sheets of glass. What Holl calls the "sketchy" nature of that aspect of the competition design was revised, partly because of the potential danger of fluttering panes. In addition, Holl and his team located an Austrian factory that made interlocking glass planks with a low ferrous oxide content, which diminishes the material's green cast and thus allows "as pure a natural light as possible," says Holl.

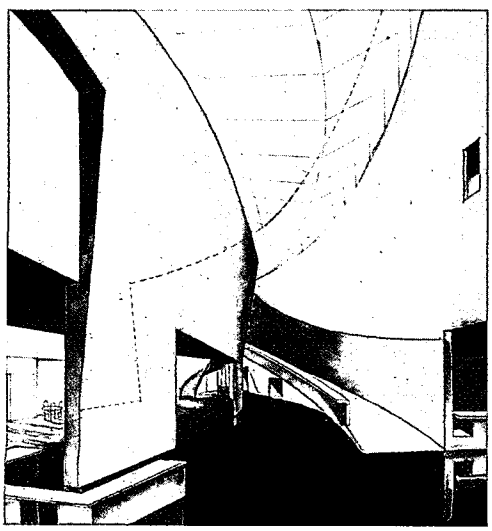
The most difficult technical challenge faced by Holl and his team was posed by the central spine of the museum: a 400-foot-long concrete wall that curves in two directions as it runs from the museum entry at the southern end of the site to the building's northernmost point. The first 200 feet of the wall lean eastward, starting out at an angle of 9.5 degrees and straightening at the wall's center point, which is marked by the elevator core. The second 200 feet gradually bend (*text continues*)



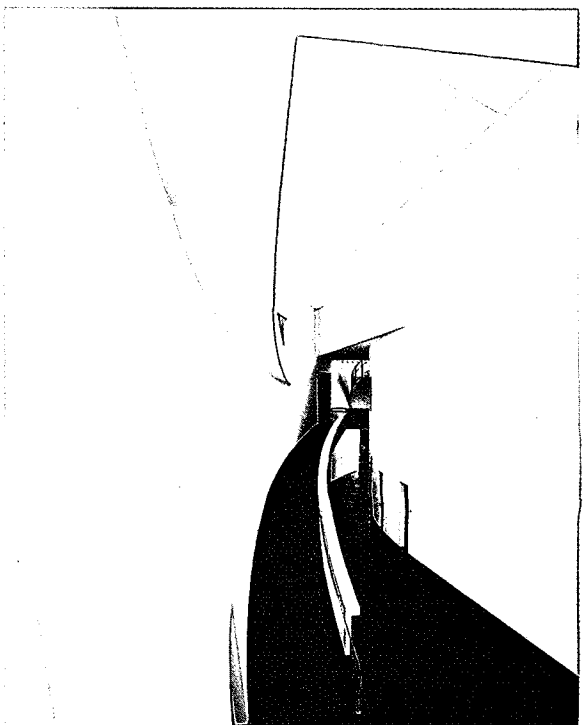
Skylights punctuate the zinc skin of the east facade (below), which offers a powerful contrast to the Parliament building across the street (above). At the museum's north corner, the glass wall leans 9.5 degrees westward (opposite).



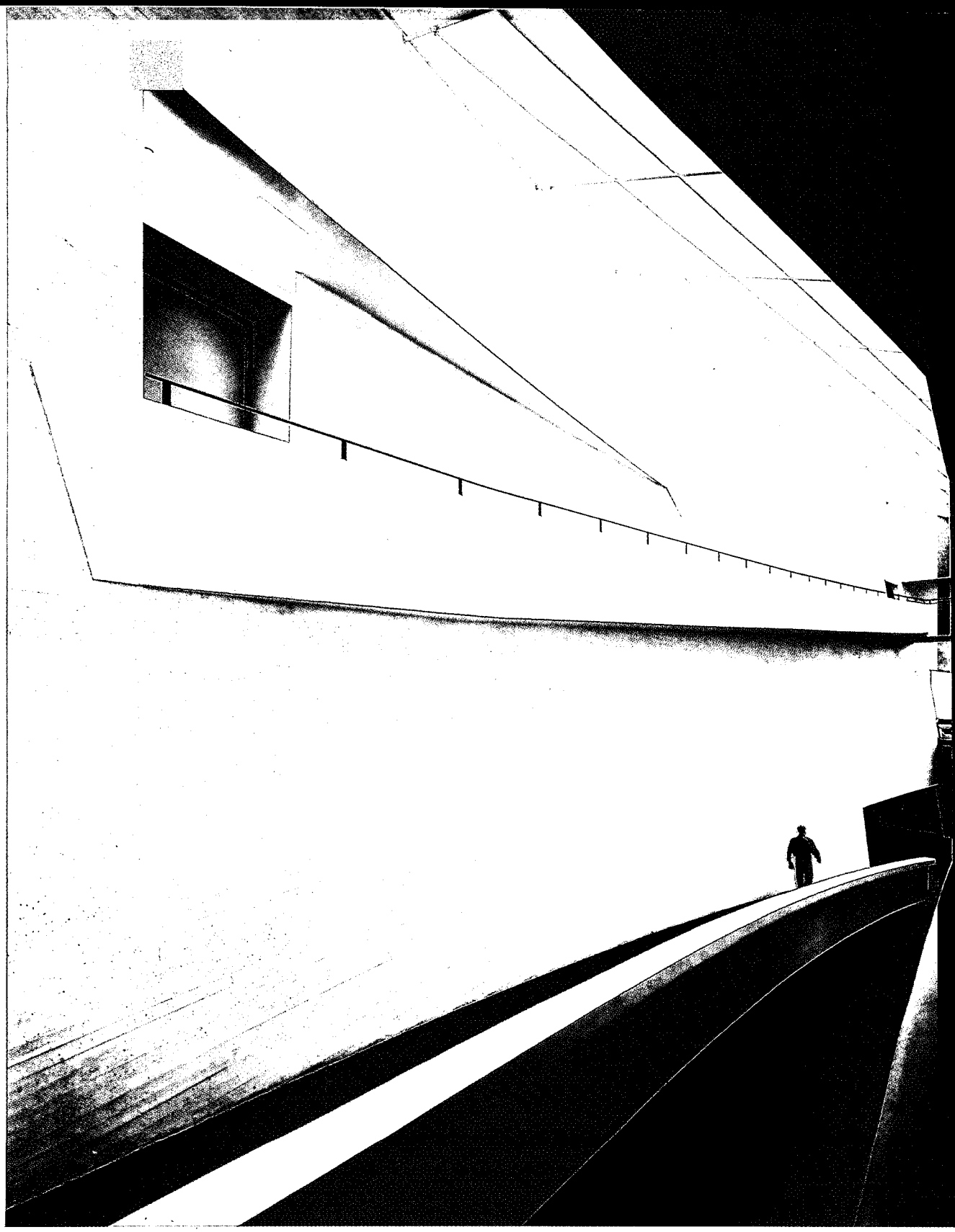




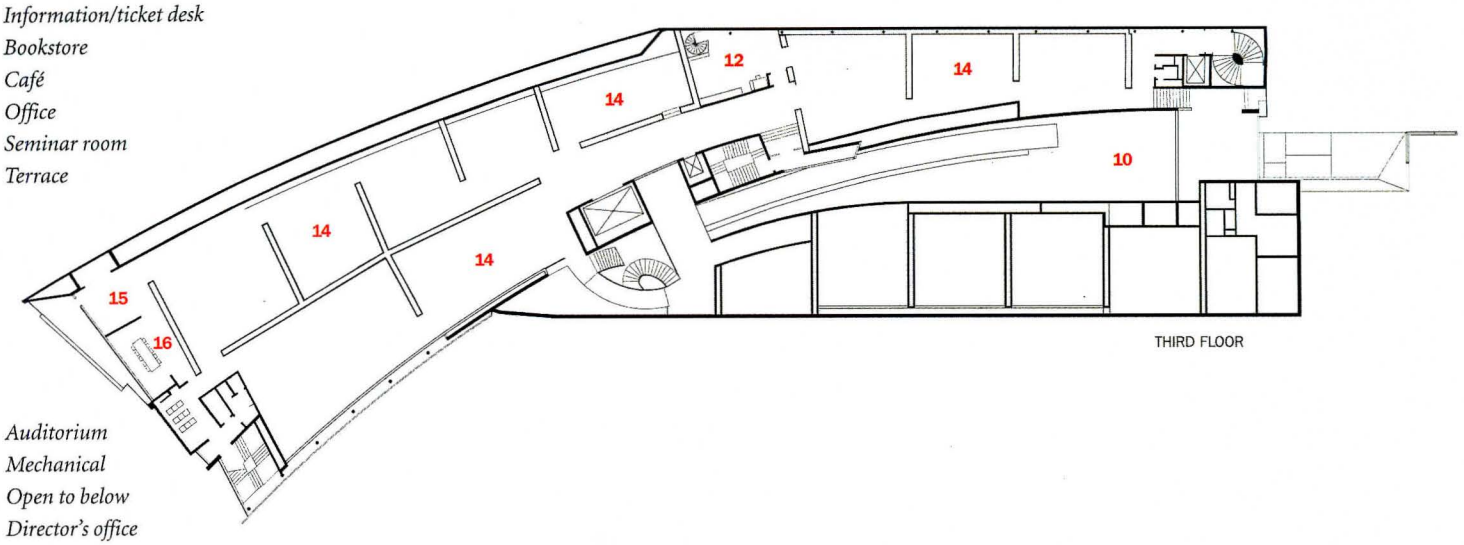
Holl's drawing of the project (left) resembles the completed project. For now, there are no plans to display art in the central atrium (above and right).



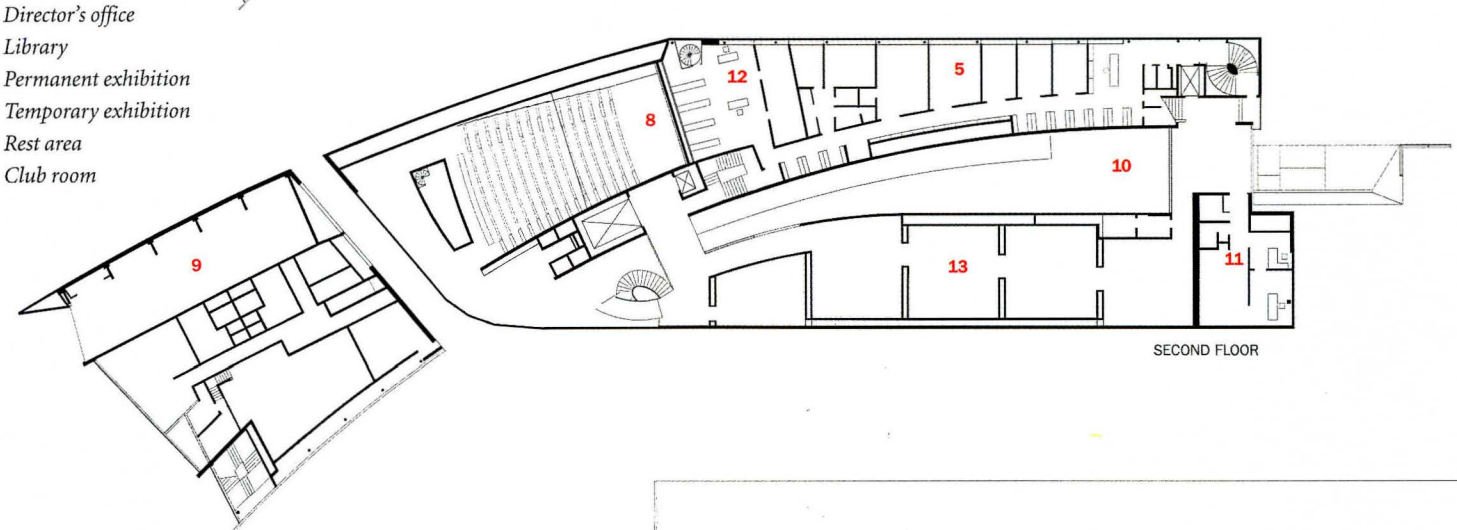
The central spine of the museum bears the horizontal lines of its construction process. In order to achieve the double curve along the 400-foot-length, the five levels of board-formed concrete were built successively. Skylights have sand-blasted glass. A ramp indicates the major circulation route through the galleries.



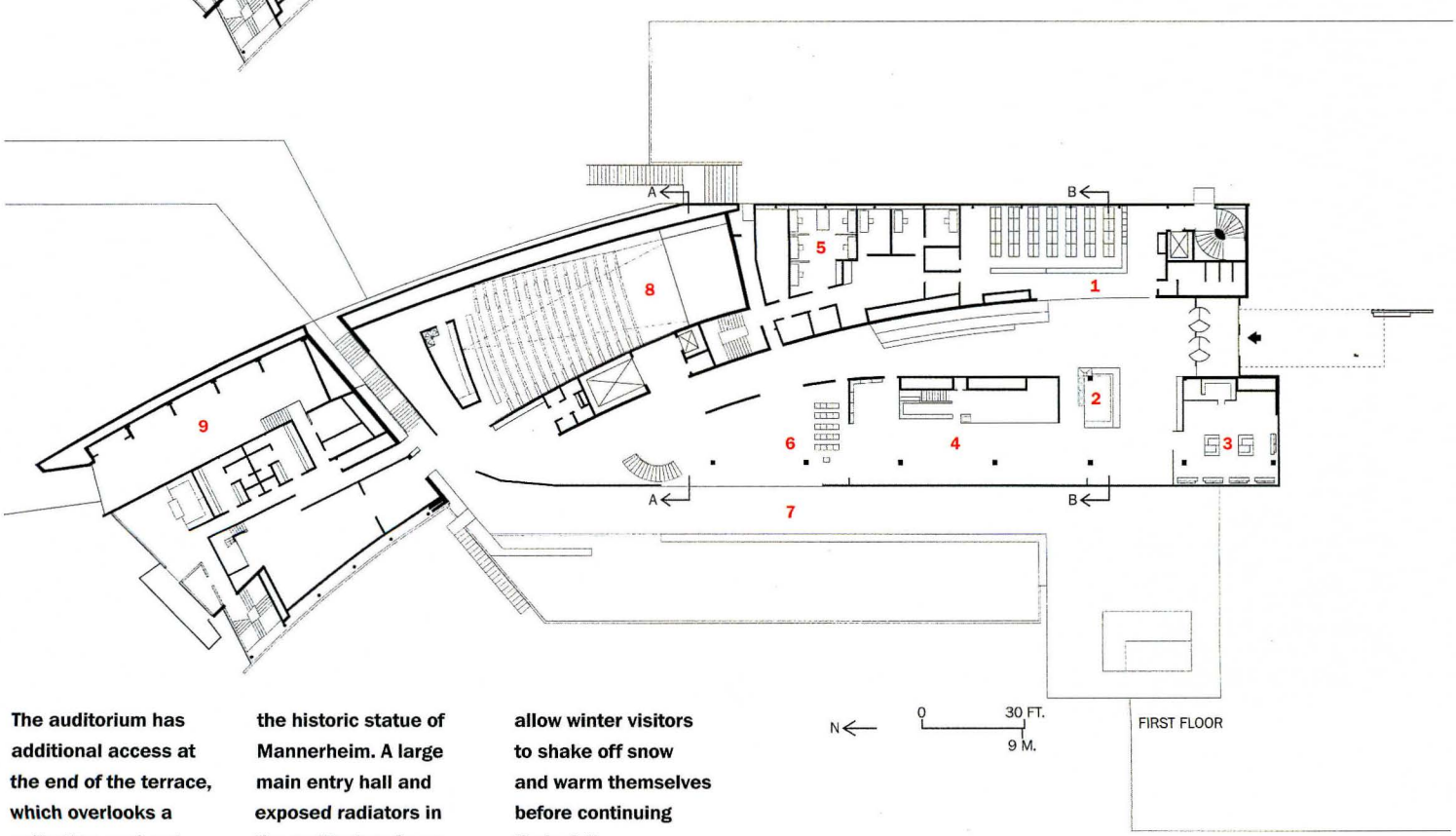
1. *Coat room*
2. *Information/ticket desk*
3. *Bookstore*
4. *Café*
5. *Office*
6. *Seminar room*
7. *Terrace*
8. *Auditorium*
9. *Mechanical*
10. *Open to below*
11. *Director's office*
12. *Library*
13. *Permanent exhibition*
14. *Temporary exhibition*
15. *Rest area*
16. *Club room*



THIRD FLOOR



SECOND FLOOR



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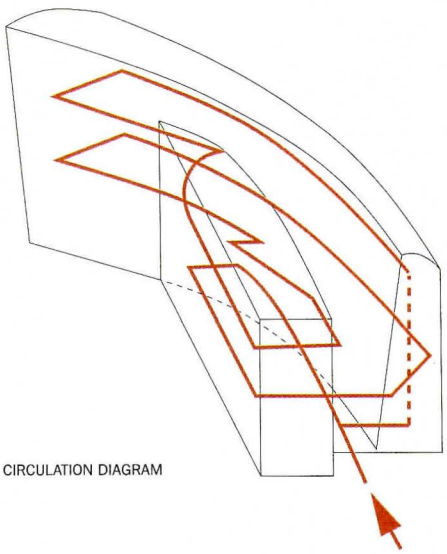
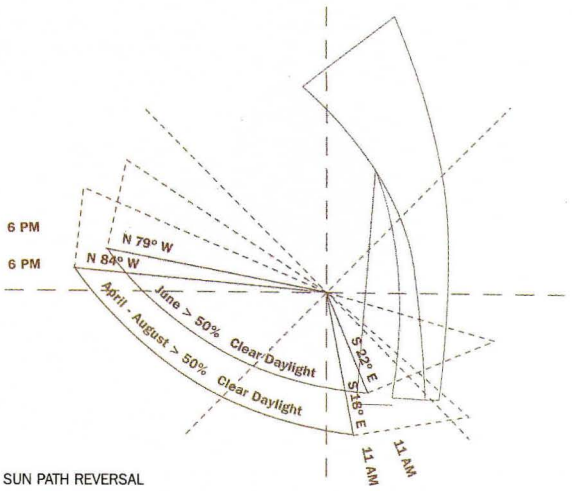
FIRST FLOOR

The auditorium has additional access at the end of the terrace, which overlooks a reflecting pool and the historic statue of Mannerheim. A large main entry hall and exposed radiators in the auditorium foyer allow winter visitors to shake off snow and warm themselves before continuing their visit.

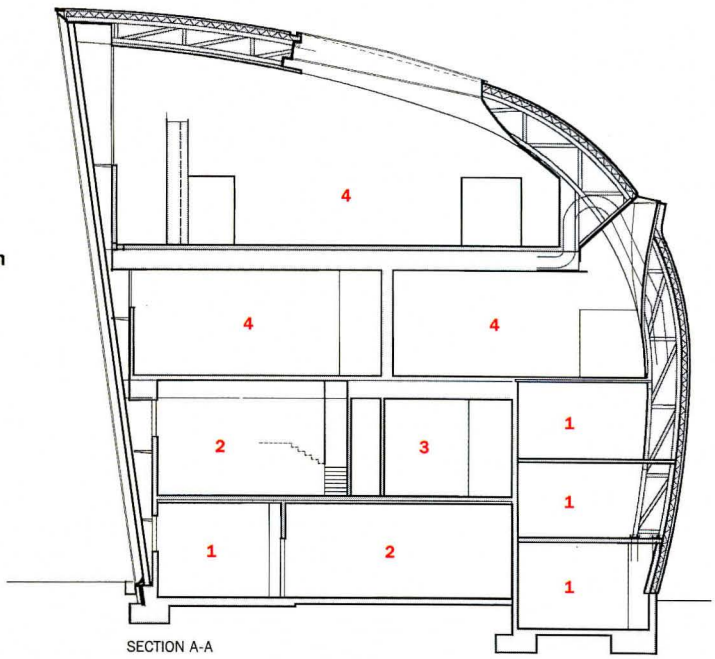


CIRCULATION DIAGRAM

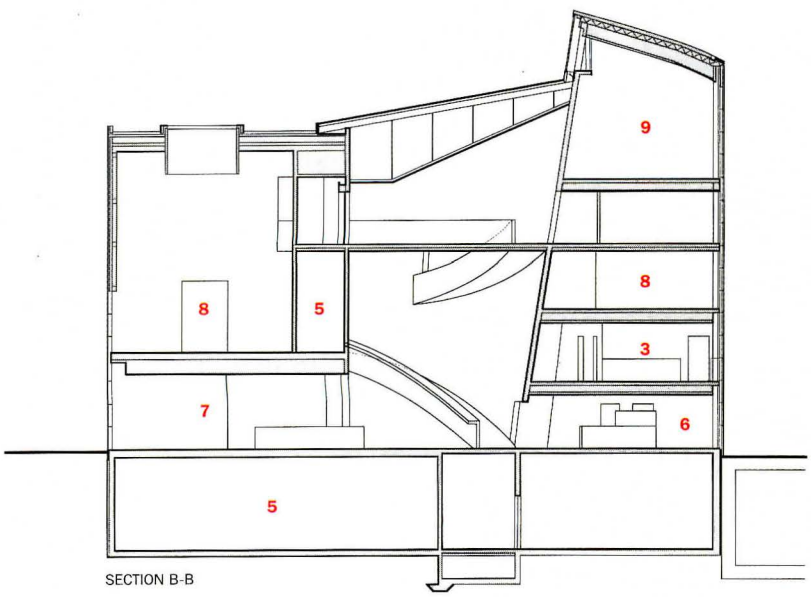


SUN PATH REVERSAL

A central ramp connects the galleries (above left). Stairs and elevators provide additional access. The museum's curved form is designed to exploit the quantity and quality of daylight available at a latitude of 60 degrees north (above right). The curved building section captures the warm light of a horizontal sun, which is diffused by carefully placed windows (drawing below), according to the architect. The space between the outer steel truss and the galleries' inner skin is a return air plenum (drawing right).

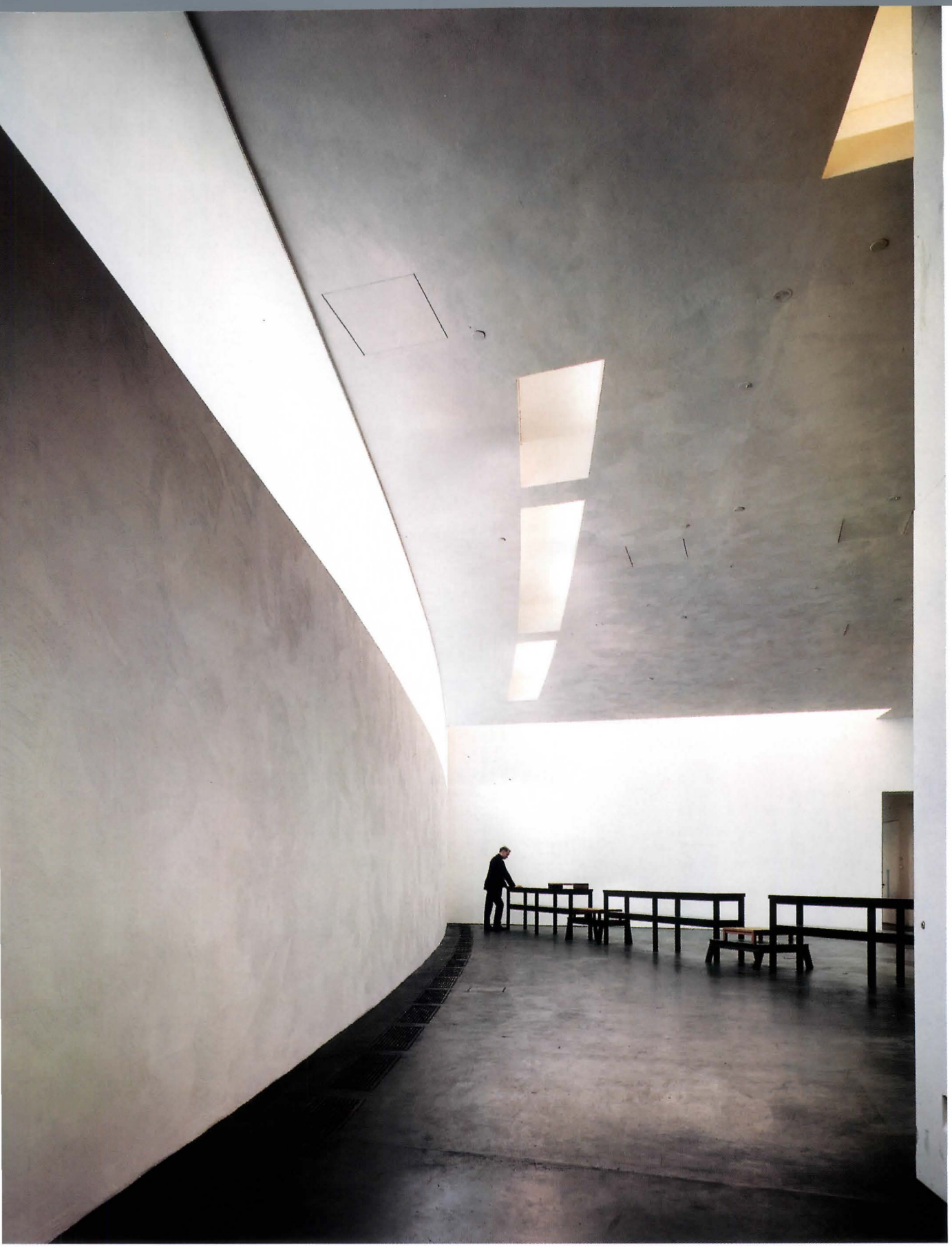


SECTION A-A



SECTION B-B

1. *Mechanical*
2. *Workshop*
3. *Staff facilities*
4. *Temporary exhibition*
5. *Art storage*
6. *Coat room*
7. *Information/ticket desk*
8. *Permanent exhibition*
9. *Workshop for children*



A telescoping series of openings between galleries enhances the elongated spatial effect of the plan (below). Among the 25 gallery spaces are rooms in a variety of sizes and shapes, allowing for a range of artwork (left and opposite). These photographs were taken in May, during the installation of the inaugural exhibition.

Bow-tie-shaped skylights bring daylight into upper-floor galleries (below).

A curved staircase provides access near the auditorium (left and above). The fifth-floor gallery (below and opposite), the largest in the museum, is for temporary exhibitions.

westward, to another 9.5-degree angle, explains Vesa Honkonen, Holl's Helsinki-based project architect. To avoid potential misalignment, the wall was built one level at a time, with a single story of wood formwork constructed atop each previous layer, allowing for shrinkage of the concrete as it dried.

According to Holl, the building was meant to be viewed not as a discrete object, but rather as a series of views and spatial experiences. "Contrary to how it was talked about, this building is really about partial urban views [from the outside and inside]. The excitement of this project is to see it in pieces," says Holl.

THE BUILDING WAS NOT MEANT TO BE VIEWED AS A DISCRETE OBJECT, BUT AS A SERIES OF VIEWS AND SPACES.

And if Holl wondered how his museum would be absorbed into the already rich architectural heritage of Finland, the question may have been partly answered even earlier than expected: four months before the museum's opening, he was awarded the Alvar Aalto Medal on what would have been Aalto's 100th birthday. "Modernism never lost its position in Finland," says Korpinen, describing the relationship between the two architects, generations apart, whose work now stands side by side. "Holl's building uses Modernism in a new way, but it is anchored in tradition, not in the latest fashion."

For Holl, inherent in the lessons of the Aalto legacy is a striking national attitude toward his profession. "Architects are very appreciated in Finland," explains Eva-Riitta Siitonen, Lord Mayor of Helsinki. "They have power." ■

Sources

Aluminum siding, zinc and copper roofing: *Peltisepänliike J. Huusok*
Zinc roofing: *H. J. Konito*
Glazing: *Lounais-Hämeen Iasipalvelu*
Curtain-wall metal structure/ exterior doors: *H. J. Tuominen*
Concrete floors: *Lattiavirines*
Terrazzo floors: *Suomen Massalattiat*
Cast-aluminum objects: *Jarmo Saarekas*
Brass panels, steel railings: *Levykaksikko*
Custom light fixtures: *Laaksonen & Poika, Valaisinpaja Idman*
Cast-iron floor grilles: *Metallivalimo Lahtinen*

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ARTS AND LEISURE

Taking Our Leisure

SPACES THAT CREATE A VISCERAL RELATIONSHIP WITH THEIR VISITORS CAN FOSTER INTERACTION AND ENTERTAINMENT BASED ON THOUGHT, NOT SPECTACLE.

by John E. Czarnecki

1

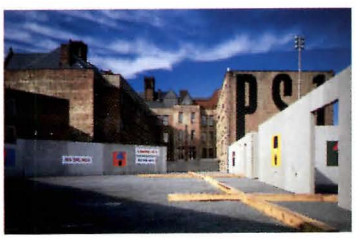
Lisbon, Portugal

Watching marine life is like watching music, thanks to Cambridge Seven's design, based on the idea that all of the world's oceans form one great sea.

2

New Brunswick, New Jersey

In revitalizing an old park and historic site, Parsons + Fernandez-Casteleiro creates structures that evoke the area's history while signaling its future.



3

Long Island City, New York

Across the river from Manhattan, Frederick Fisher + Partners redesigns an elementary school–turned–museum and creates galleries out of classrooms.

4

Elmhurst, Illinois

Moving a Mies house was the genesis for a community-based art museum by De Stefano + Partners that's inspired by the master's design philosophy.

Innovative place-making encourages people to explore and participate in their surroundings. The most engaging buildings are those that invite us to take part on many levels, that stimulate all of our senses as well as our intellect. Interaction doesn't mean we have to be bombarded by smells, loud music, brilliant colors, or video monitors. Rather, the best places invite us to think and propel us beyond what we encounter in our daily routines. At their most basic level, the following projects—an aquarium, a park, an exhibition space, and a museum—are purely recreational. But what makes these buildings succeed is the visceral relationship they foster between people and place. These are not static structures; interaction is implicit.

Enveloped by the marine life around them, tourists are earthbound interlopers at the Oceans Pavilion in Lisbon, Portugal. The aquarium clearly belongs to the fish, who, thanks to the cleverly designed tanks, seem to be simply going about their business while we look on.

At Boyd Park in New Brunswick, New Jersey, bridges act as sutures; visitors crossing them actively take part in the process of bringing a city and its long-neglected waterfront together. Other gateways, nodes, paths, and landmarks in the park welcome an interplay between people and object, as well as between structure and nature.

P.S.1, a center for contemporary art in Long Island City, New York, is not so much an exhibition space as a treasure hunt, a search for the next art experience. Art may appear in a utility closet, in the back stairwell or a restroom, or even on the broad entrance steps of this renovated building. Here visitors are both observers and participants.

A visit to the Elmhurst Art Museum offers a different kind of experience. Born of an active and committed local arts community, this museum, which integrates Mies van der Rohe's McCormick House, offers a place for the community and visitors to view, create, and learn about art. Imagine hearing a lecture on Modernism while seated in the former living room of the Mies-designed house, or studying a complex sculpture with a view of that incredibly simple structure just across the courtyard.

Beyond interaction, a sense of history sets these projects apart—each has a multilayered origin and unfolding story. Aquarium, park, exhibition space, and museum were once industrial waterfront, canal, elementary school, and house, respectively. Through their evolving histories, each place gains a new relevance that inspires participation. ■

John E. Czarnecki is a former editor of Crit, *the AIAS national journal.*

1 Oceans Pavilion Lisbon, Portugal

FOUR VERY DIFFERENT TYPES OF SEA AND SHORE ENVIRONMENTS ARE GATHERED UNDER ONE ROOF IN THIS AQUARIUM.

by Robert Ivy

Project: *Oceans Pavilion, Lisbon, Portugal (future Oceanário de Lisboa)*
Owner: *Parque Expo '98*
Architects: *Cambridge Seven Associates—Peter Chermayeff, FAIA, design principal; Peter Sollogub, AIA, principal-in-charge; Bobby Poole, AIA, principal; Ginette Castro, AIA, project designer/site project architect; Chris Farley, AIA, non-living exhibits; Lauren Dewey Platt, exhibit coordination*
Associate Architect: *Promontório Arquitectos Associados—João Perloiro*
Engineers: *Ove Arup & Partners—Alistair Guthrie, director; FISIA Italimpianti—Gianfranco Bellotti, engineering manager*
Design/build/start-up: *IDEA/Engil: IDEA—Fred Wales, manager; Michael Oleksak, on-site project manager; Engil—Ismael Gaspar, director; António Croft de Moura, on-site project manager*
Habitat builder: *David L. Manwarren Corporation*
Consultants: *Chermayeff & Geismar Inc. (graphic design); Quentin Thomas Associates (lighting); Jardim Vista (landscaping)*

Size: *215,000 square feet; four-story exhibit and maintenance space; two-story access bridge; one-story support building*
Cost: *$70 million*

A single idea, that all of the world's oceans form one great sea, is the theme and unifying element of the Oceans Pavilion, a primary attraction at Portugal's world exposition, Expo '98. A huge, 1.22 million-gallon tank, 110 feet square and almost 22 feet deep, lies at the heart of the pavilion, informing the architecture and organizing the aquarium around a central concept: the interrelationship of global waters. This force coincides with the exposition's theme, "The Oceans: A Heritage for the Future."

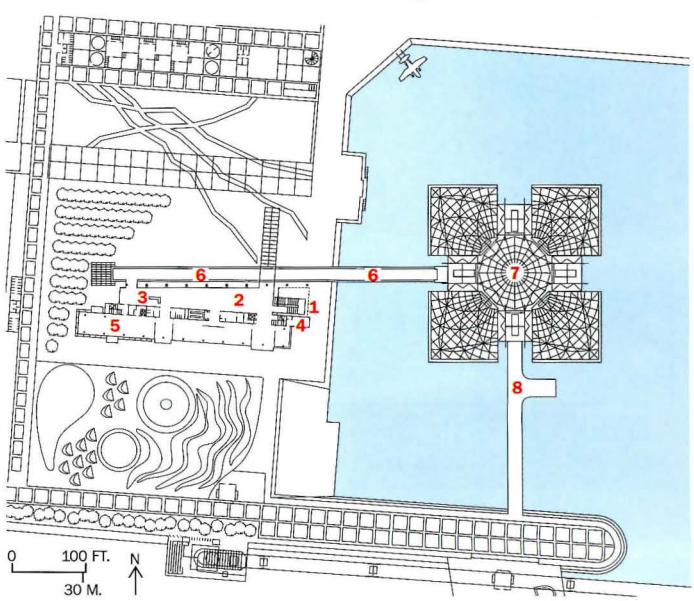
The new aquarium, Europe's largest, offers an emotional experience that's more theater than science. Peter Chermayeff, principal of Cambridge Seven Associates, which designed the aquarium, argues for the firm's approach. "The Oceans Pavilion may provoke controversy among those who will say this isn't a strictly scientific presentation. But we hope there will also be those who say, 'Yes, this is scientific. It makes a point about the unity of the Earth's oceans.'"

The aquarium as theater

As in contemporary theater, the interior architecture is intended to disappear, focusing attention on the internal sea. The visitor experiences immersion into a blackened box, illuminated by undulating, watery light and, most memorably, by the continual face-to-face encounter with an array of marine life. The experience is heightened by scale and by sleight of hand: improvements in technology allow for invisible seams in the giant acrylic walls, some of which weigh as much as 16 tons. As a result, there's no sign of separation between tanks, allowing diagonal views across multiple stretches of water. The effect is a sense of unity and infinity; this small, contained bit of ocean seems to stretch beyond all sight.

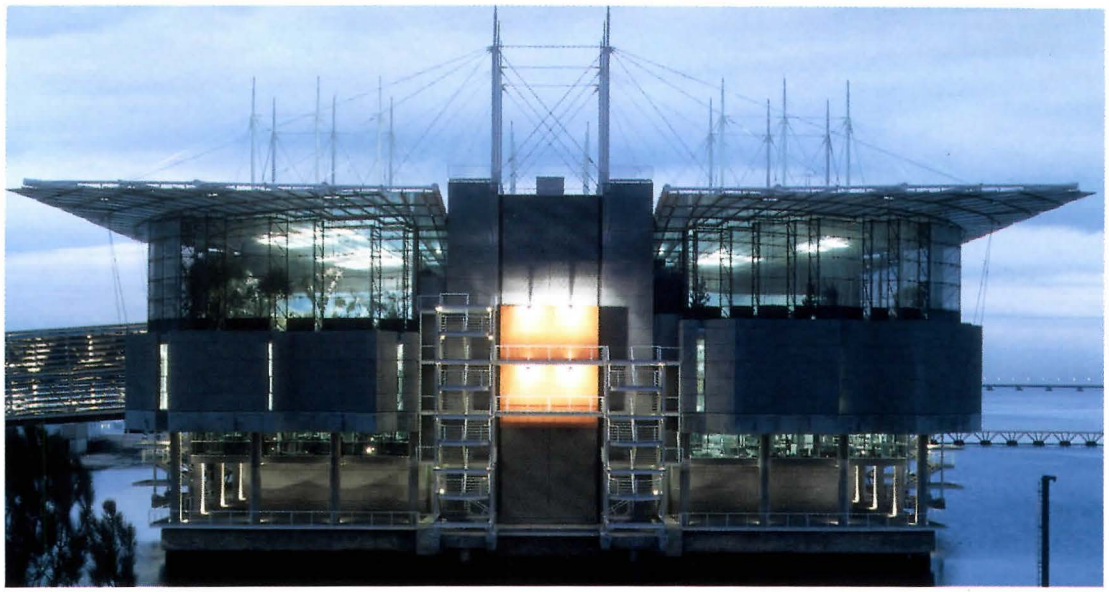
The main building, oriented to the compass points, rises on concrete piers above a protected basin known as Dock Olivais, where Pan American Clipper aircraft used to dock along the Tagus River. The building dominates its prominent location on the Expo's 150-acre site, a 3.1-mile stretch of reclaimed industrial property. The active exterior is made up of gray-green Portuguese stone and glazed walls, winding metal stairs, and a cantilevered, glass roof topped with trusses that resemble masts and rigging. The assembly suggests nautical or oil derrick analogies.

Visitors tour the aquarium building on a counterclockwise path.



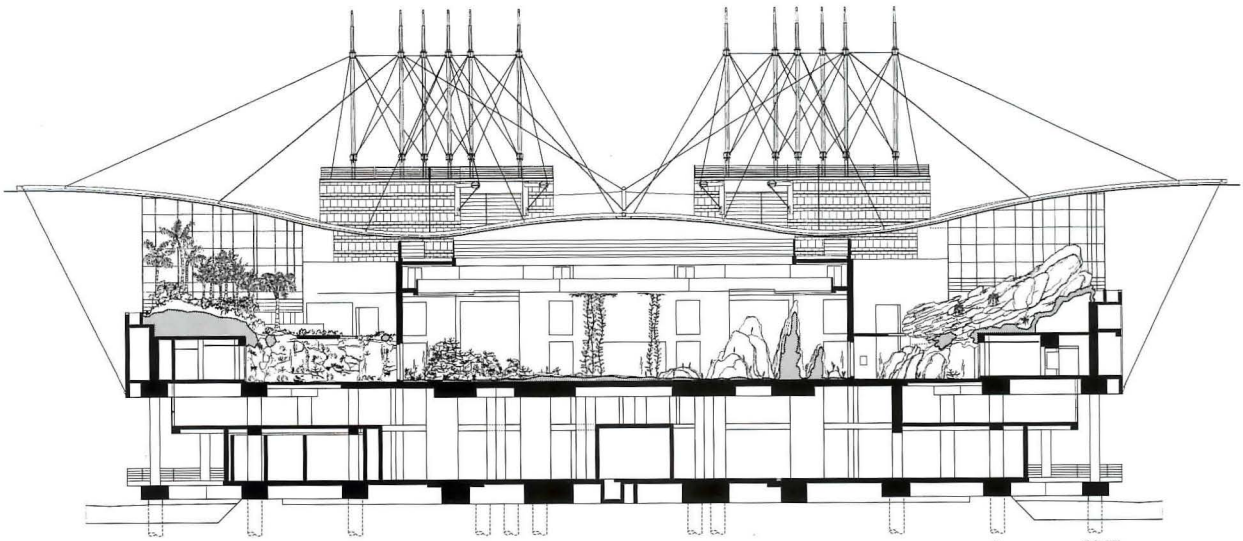
1. *Entry*
2. *Lobby*
3. *Ticketing*
4. *Conference room*
5. *Gallery*
6. *Bridge*
7. *Aquarium*
8. *Service bridge*

PHOTOGRAPHY: © HANS EGE LUZERN

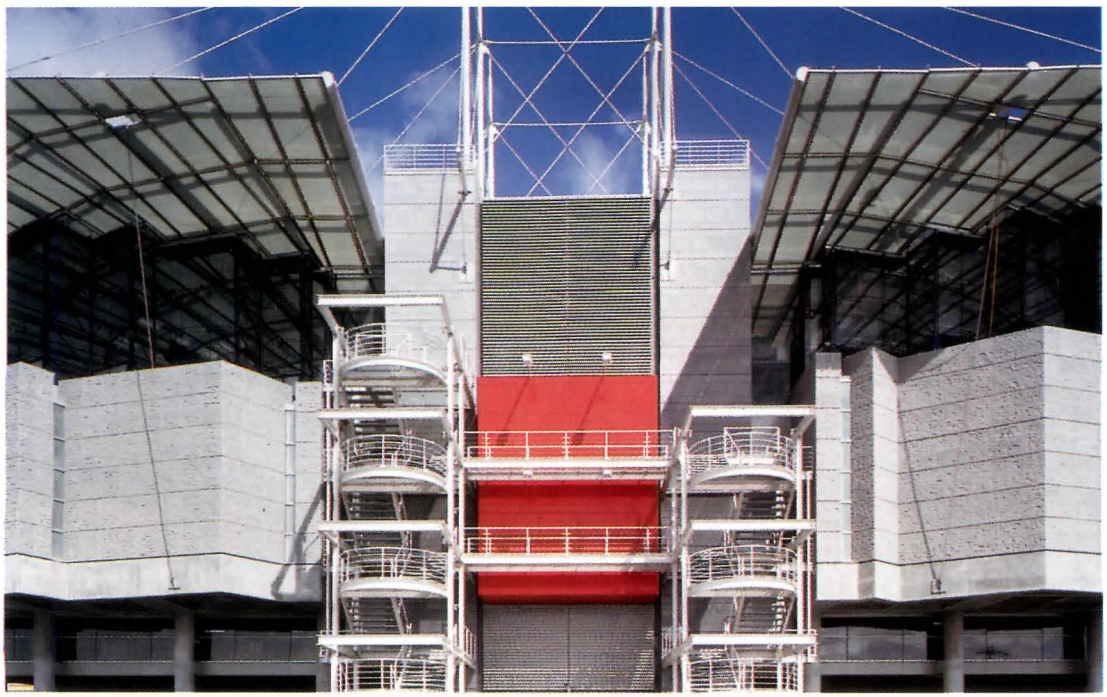


Rising from the waters just off the west bank of the Tagus River, the aquarium is the centerpiece of Expo '98, the final world's fair of the 20th century (left). The building, with its external truss system, stone walls, and metal stairways, resembles a ship or an oil derrick.

A cross section of the Oceans Pavilion shows the clear span provided by the external truss system. The topography of the ocean environments is also clear, with the shore structures tucked into the glass-roofed corners and the adjacent tanks.



A two-level bridge (right) connects the aquarium and the support building, where tickets are sold and groups congregate. Along the wall of the support building is an intriguing mural made of blue and white Portuguese tile. Metal stairways wind up the sides of the aquarium (below). Glass roofs and glazing at the four corners admit daylight.



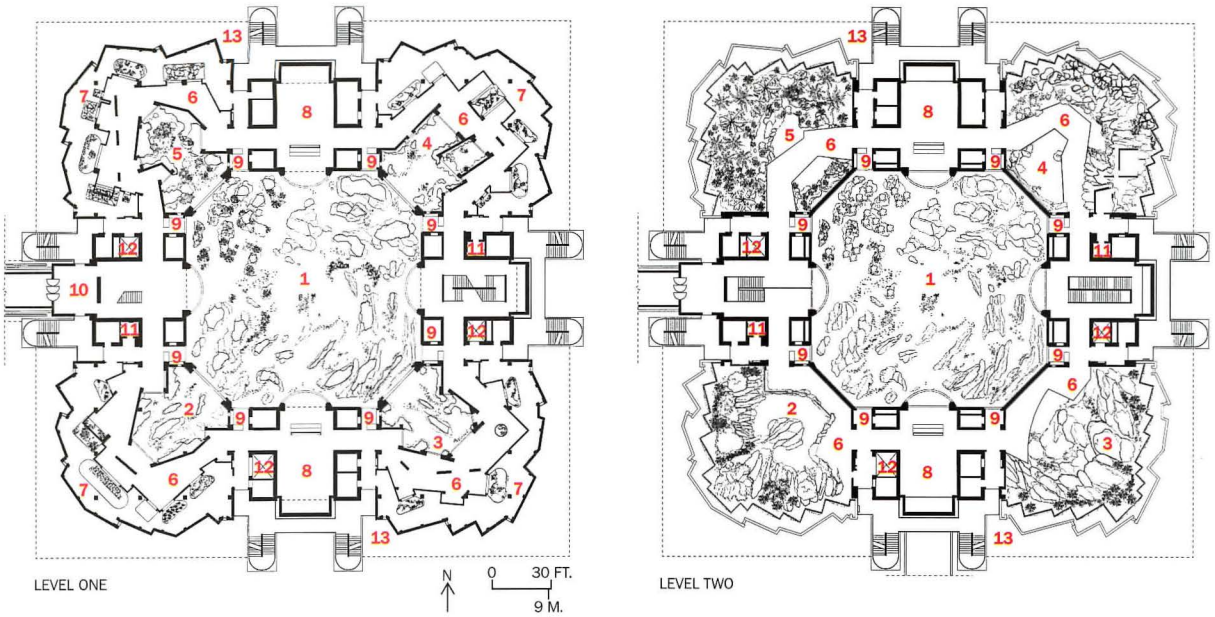
Though outsiders will see only two floors, the aquarium has four levels. A lower floor houses animal husbandry services and mechanical systems; the top floor gives the staff access to the tanks and the elaborate mechanical equipment required to sustain divergent, fragile life-support systems.

Passing the main tank on the upper level, tourists proceed into each of the building's four daylit corners, which combine terrestrial and marine habitats representing specific portions of the four major oceans: the North Atlantic near the British Isles, the Antarctic off the tip of South America, the Pacific near Monterey, California, and the Indian in the tropics east of Africa.

Light from the glass roof, which curves up at the corners, floods these end spaces. This gives visitors the impression that they are standing outside in some rarefied space as they watch the puffins, sea otters, razorbills, and penguins that occupy the corners sun themselves on rocks and then plunge into their pools. Fritted glass provides different light levels at each corner of the building. After a complete tour of the upper zone, the path drops one level to the ocean floor for submarine views of each of the four oceans, as well as the sharks, rays, sea turtles, mackerel, and other creatures in the main tank. Altogether, there are 8,000 specimens

Like a docked ship, the Oceans Pavilion is linked to the land by a dual-level bridge.

Four different habitats, including tanks and landscape, represent the Atlantic, Antarctic, Pacific, and Indian Oceans (right and below). These surround a larger central tank, which holds 1.22 million gallons of water. While the flora and fauna are authentic, much of the structure, including rocks and coral reefs, is manmade (opposite bottom).



1. *Open ocean*
2. *Atlantic Ocean*
3. *Antarctic Ocean*
4. *Pacific Ocean*
5. *Indian Ocean*
6. *Visitor circulation*
7. *Curatorial area*
8. *Mixed-media gallery*
9. *Contemplation rooms*
10. *Exit foyer*
11. *Restrooms*
12. *Elevator*
13. *Emergency exit area*

and 250 different species swimming in 1.56 million gallons of ocean water.

The lines between underwater life and the human realm are blurred. Remarkable optics, heightened by controlled internal lighting, allow clear views through the 12- to 14-inch-thick acrylic walls. As a result, fish from opposing oceans seem to coexist in a single visual field. The effect is surreal: cold-water sharks seem to glide by tropical fish in a seamless dance.

Plaques and descriptions of the marine life have been kept to a minimum; the pavilion is not overtly didactic. Instead, visitors experience the marine species in a series of meeting places. In the "contemplation rooms"—quieter, more intimate spaces with smaller, focused views, located on the lower level—visitors can concentrate on watching the graceful interplay of the schools of fish, an experience akin to watching music.

Visitors come and go via a covered ramp, a dual-level bridge that connects the water-surrounded aquarium with its land-based sister building. Ticket sales are housed there, along with shops, offices, galleries, and a conference area. Lining the long, high wall that organizes the support building is Ivan Chermayeff's giant mural of ocean life. High and low tech combine in the mural, which uses 60 variations of hand-painted blue and white Portuguese tiles to imitate a computer screen's pixels.

Creative construction

The $70 million Oceans Pavilion had an unusual genesis, the result of a unique design and construction collaboration that extends the understanding of the term "design/build." Chermayeff also serves as president of IDEA, Inc., a separate company that provides turnkey services beyond architectural design. IDEA produced feasibility studies and oversaw exhibit planning, construction (in collaboration with its partner, Engil, a Portuguese construction company), staffing and training for the aquarium, and even the choice of sea creatures. The partnership of IDEA and Engil set the budget and guaranteed a fixed price for construction.

According to Peter Sollogub, Cambridge Seven's principal-in-charge who worked on the project from the beginning, construction was complicated by the work habits of the Portuguese, which are different from those of American builders. "They really don't use shop drawings in Portugal," he says. "This building is the product of handcraft." But the team produced the project within its budget, and the aquarium was one of the first major structures ready for the exposition, which opened its doors in May.

Following the world exposition crush, projected to reach a peak of 80,000 visitors per day, the pavilion will be renamed the Oceanário de Lisboa and remain open as a public aquarium. One million people are expected to visit every year. Other significant infrastructure that will remain after the exposition closes in September include an 840-acre urban development project called EXPO URBE, which will combine 1,850 residential units, hotels, and office development. Rail lines, including a station designed by Spanish architect Santiago Calatrava, and a bridge across the Tagus River should encourage new horizons for Lisbon and for Portugal. ■

Sources

Curtain wall: *Bellapart*
Lobby lighting: *Poulsen*
Elevators: *Otis*
Lobby mural tile: *Ceramica Constancia*
Acrylic: *Nippura Co.*

2 Boyd Park New Brunswick, New Jersey

REDEVELOPING A 14-ACRE DOWNTOWN PARK LOCATED ALONG A HISTORIC CANAL LINKS A CITY'S PAST AND ITS FUTURE.

by Michael Chotiner

Project: *Boyd Park, New Brunswick, New Jersey*
Owner: *City of New Brunswick*
Architect: *Parsons + Fernandez-Casteleiro—Jeffrey G. Parsons, AIA, principal-in-charge; Manuel Fernandez-Casteleiro, design principal; Omar Perez, Chuck Tewfik, William Deegan, project team*
Engineers: *A. G. Lichtenstein and Associates, Inc. (canal and lock restoration); Paulus, Sokolowski & Sartor (civil, structural, mechanical, electrical)*
Consultants: *Arnold Associates (landscaping); H. M. Brandston and Partners, Inc. (lighting); Travers Associates (traffic); Rutgers Department of Anthropology (historical)*
General Contractors: *Epic, Inc. (park structures); Robert Charles Enterprises, Inc. (canal and lock restoration)*

Cost: *$10 million (includes canal and lock restoration)*

Boyd Park, built on a narrow parcel of land along the Raritan River in New Brunswick, New Jersey, has been a strategic site since 1676. That year William Penn authorized surveyors to study the feasibility of digging a canal that would extend the Raritan to form a link between the Delaware River and New York Bay. Ultimately, the slip of land where the park sits became the terminus of the Delaware & Raritan Canal, a water route that thrived from 1838 until 1933. Today the waterfront site is still strategically significant: it's the lynchpin in New Brunswick's plans to revitalize its waterfront.

When Boyd Park was originally built in the late 1950s, it included a ball field, a few tennis courts, and swing sets. No one saw much more potential for the site until the D&R Canal and its outer towpath were put on the National Register of Historic Places in 1973. The city recognized then that restoring the old canal locks on the park site and beefing up the size and offerings of the park itself might lure more residents as well as tourists.

That same year, the New Jersey Department of Transportation (DOT) asked the city for permission to extend Route 18, a busy thoroughfare, through New Brunswick—a request that came directly from Johnson & Johnson, the city's largest employer. Though it would guarantee the corporation's continued presence in New Brunswick, the extension would effectively cut off the waterfront from the downtown, marooning Boyd Park and the locks. City officials agreed that the DOT could extend the highway, but only if the agency paid to rehabilitate the historic locks.

The DOT capitulated, but the agreement between the agency and the city was loose, and the amount and type of funding were never spelled out. As a result, the locks were left to decay while the park, rendered largely inaccessible by Route 18, declined into a scrubby, rubble-strewn wasteland.

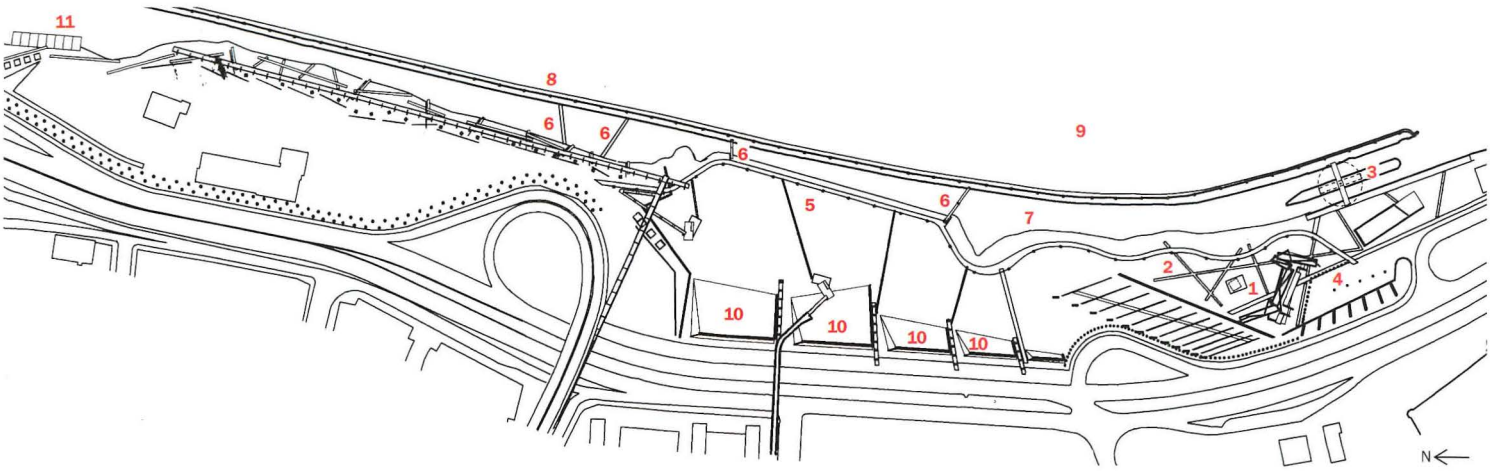
Reinvigorating the park

In 1989 former mayor and state senator John A. Lynch decided to take action—not only to restore the locks and the park, but to encourage private housing development on the waterfront's blighted and vacant lots. He renegotiated with the DOT and secured funding from them and from other sources. The

A path of grass pavers intersects the limestone "shadows" of light posts near "The Bosque" (above). Perforated concrete platforms at each bridge celebrate park entry points (opposite).

PHOTOGRAPHY: © EDUARD HUEBER

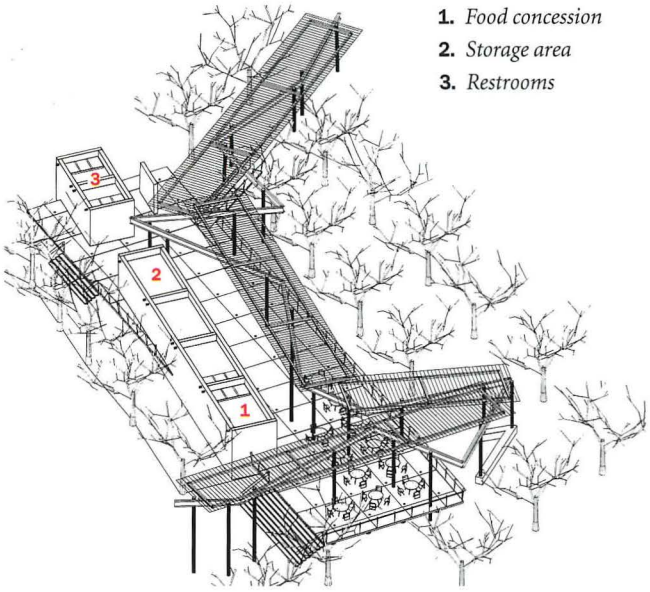
Michael Chotiner is a freelance writer in Brooklyn, New York.



SITE PLAN

1. *Café/exhibit structure*
2. *Forest, "The Bosque"*
3. *Historic locks*
4. *Parking*
5. *Multiuse field*
6. *Pedestrian bridge*
7. *Canal*
8. *Outer towpath*
9. *River*
10. *Earth berms*
11. *Boat dock*

The New Street Pedestrian Bridge has a steel-grid deck with steel railings painted yellow (left). The jaunty buildings at the end of the Albany Street Bridge house restrooms and storage facilities (below).



1. *Food concession*
2. *Storage area*
3. *Restrooms*

city then hired Parsons + Fernandez-Casteleiro to "supply a vision" for the park, says principal Jeffrey Parsons. That included finding a way to bring people safely and easily into the park, creating performance and exhibition facilities, installing pathways, and activating the entire length of the park.

To gain approvals and permits and to secure additional funding, Parsons, with city officials and the New Brunswick Development Corporation (a nonprofit corporation that served as master planner and coordinated the project), clarified that vision of the park to the more than 15 government agencies and preservation groups involved in the site. These ranged from the Environmental Protection Agency to the New Jersey Canal Society.

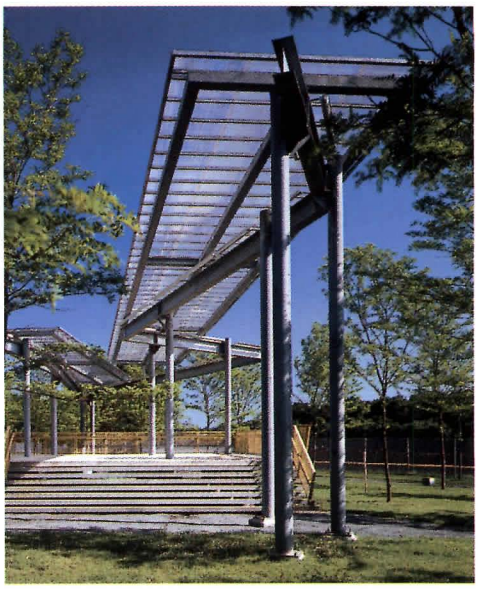
The three-phase construction began in 1994. The first two phases, including the park infrastructure and the locks restoration, were completed this summer at a cost of about $10 million. The final phase, which includes a fourth access bridge and additional restrooms and parking, awaits funding.

The park is divided into three areas: a five-acre field, a flexible venue for activities ranging from outdoor performances to ethnic festivals; the historic locks area, which includes a forested area that Parsons calls "The Bosque"; and the canal-edge walkways and gardens. The park has facilities for boating, jogging, roller-skating, and, in the winter, ice skating.

Establishing access

Visitors enter via one of three bridges. The New Street Pedestrian Bridge, designed by the architects, leads over Route 18 from downtown to the edge of the canal. On the park side, the steel bridge ends at a landing platform that's intended to give visitors a sense of arrival. The perforated concrete is lit from beneath so that the deck glows in the evening. Similar landing platforms were added at the terminuses of the existing Oliver Street and Albany Street bridges.

A ramp leading pedestrians into the park was also added to the Albany Street Bridge, primarily a vehicular bridge that carries traffic over the river to the next town. Near the foot of this bridge is the boat dock, where people can rent a canoe or paddleboat. A nearby complex of smallish concrete buildings houses restrooms and park storage facilities. "We wanted to animate all of the buildings in the park," Parsons says, explaining the jaunty, off-kilter angles of their walls.



The café/exhibit structure is roofed with polycarbonate sheets that provide "just a degree of a sense of enclosure," Parsons says. The strips of roofing also offer shelter to visitors in case of rain. The 40-by-160-foot platform provides a space for outdoor concerts and plays.

Three low steel bridges lead over the canal and to the outer towpath, which was restored. A fourth canal bridge is a replica of the original wood swing bridge formerly on the site. Used to move donkeys from the inner path to the outer, the bridge would swing out of the way when a boat approached.

The inner towpath was replaced with a curving esplanade made of crushed stone and glass block pavers. In places the path comes close enough to the canal's edge that people can reach out and touch the water.

Near the locks are the concrete walls of the café/exhibit structure, a complex of stalls that includes a food concession, space for small exhibitions, restrooms, and storage facilities. Hoisted by pilotis to one foot above the river's 100-year flood level, the 40-by-160-foot concrete slab offers tremendous views of the river and the canal.

Arriving buses and cars park near the café/exhibit area. The parking area also serves as a place to set up flea markets. Adjacent playground equipment engages children before and after they tour the locks.

Correct lighting of the structures and the park was a high priority during the planning process. "It's important for an urban park to be active after dusk, and we wanted to dramatize the activities taking place," Parsons explains. At the café/exhibit structure, fluorescent lighting reflects off the surface of the steel columns and shines through the translucent roof panels. A series of graduated-height torch lights flank one walkway as it passes through an open field. Fashioned of perforated stainless steel, the lights are spaced at regularly decreasing intervals. Strips of rough-hewn limestone, which look like shadows cast by the light poles, emanate from the base of the lamps and intersect the concrete-grid path at an oblique angle.

"Here we were playing some games with perspective," Parsons says. "The limestone strips evoke the old foundations of historic buildings formerly on the site and the variations of the canal's width during different phases of its development and decline." Concrete bollards throughout the park suggest hitching posts for mules.

Low berms along the highway and in the field area shield the park from traffic noise, although occasional breaks allow passersby to get a glimpse of the riverbank. The berms also provide seating during outdoor performances.

As for the city's hopes of encouraging housing development, new mid-rise rental apartments have already been built nearby on formerly abandoned downtown blocks. Additional projects are being discussed. "The park has given the community almost a mile of riverbank and access to a vital historic site," says city director of parks Jim Campbell. That's something people want to be near. "Someday soon we'll have a real neighborhood." ■

Sources
Skylights: *GE Lexan*
Plastic glazing: *Polygal USA*
Metal doors: *Atlas Door*
Sliding doors: *American Metal Door*
Locksets: *Yale*
Pulls: *Rockwood Manufacturing*
Paint: *Con-Lux Coatings*
Paneling: *Comtec Industries*
Furniture: *Knoll*
Pavers: *Samson Stone*
Fencing: *Anchor*

3 P.S.1 Contemporary Art Center Long Island City, New York

A TURN-OF-THE-CENTURY SCHOOL YIELDS A VIBRANT, ENERGETIC EXHIBITION SPACE THAT BLURS THE LINE BETWEEN BUILDING AND ART.

by Andrea Truppin

Project: *P.S.1 Contemporary Art Center, Long Island City, New York*
Owner: *City of New York; New York City Department of Cultural Affairs, sponsoring agency; New York City Department of Design and Construction, contracting agency*
Architect: *Frederick Fisher+Partners—Frederick Fisher, principal-in-charge, Joseph Coriaty, partner-in-charge*
Architect of Record: *David Prendergast, principal; Deborah Laurel, project architect; Jeffrey Magella, Dan Hill, Scott Weinkle, project team*
Engineers: *Mariano Molina (mechanical and electrical); Robert Silman Associates (structural)*
Consultants: *Signe Nielsen, P.C. Landscape Architecture (landscaping); Randy Sabedra (lighting); Reginald Hough (concrete)*
General Contractor: *Foundation Construction Consultants*

Size: *125,000 square feet, including exterior sculpture rooms*
Cost: *$8.5 million*

As the elevated subway screeches around the last curve into the Court House Square station in Long Island City, Queens, the P.S.1 Contemporary Art Center announces itself in the distance in bold, three-story-high letters painted on one of its faded brick walls. The sign is emblematic of P.S.1's new commitment to welcoming the general public.

When P.S.1 opened in 1976 in an abandoned turn-of-the-century elementary school, it provided a permanent home for a peripatetic museum, the Institute for Art and Urban Resources, founded in 1971. The organization was a product of the late Brendan Gill, the former architecture critic at the *New Yorker,* and Alanna Heiss, a leader in the alternative space movement, whose aim was to eliminate the elitism of the art establishment by deinstitutionalizing art.

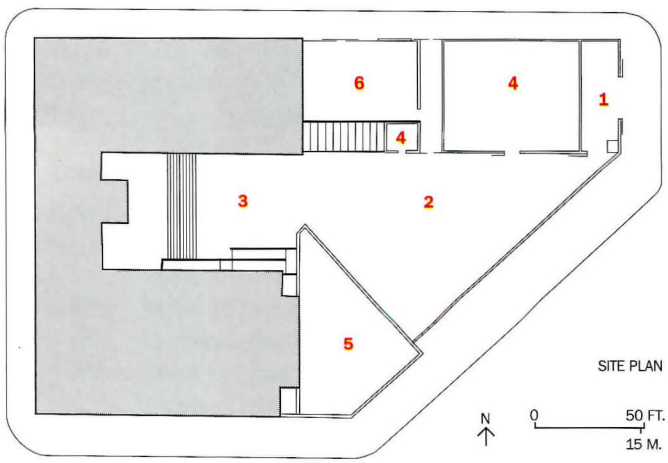
In P.S.1's inaugural exhibition, "Rooms," for example, dozens of artists filled the dilapidated building with art. They painted on blackboards and brick, tore into walls and floors, and showed that an exhibition environment need not be precious and can itself lend meaning to art.

In the years following, P.S.1 mounted more traditional exhibitions in its formal galleries, a series of classrooms renovated by artist Robert Ryman and connected by simple doorways. Visiting artists worked in on-site studios, keeping the process of making art close by. But while P.S.1 succeeded in showing a broad range of controversial work that might have been ignored by other galleries, it did not attract a broad audience. This might have been due, in part, to its location in a faded industrial area of Queens, across the East River from midtown Manhattan. In addition, the artists and critics who frequented P.S.1 enjoyed the clubby mystique involved in finding the building's obscure entrance and negotiating the crumbling, complex interior. A larger problem was that, despite the building's huge footprint, many of the building's spaces were unusable because of their poor condition, inaccessibility, or small size.

The $8.5 million renovation of P.S.1 sought to solve these problems. The delicate task of the designers was to turn P.S.1 into a "legitimate museum, not just an ad hoc space," but without losing the building's poetic qualities or P.S.1's edgy, vibrant character, says design architect Frederick Fisher.

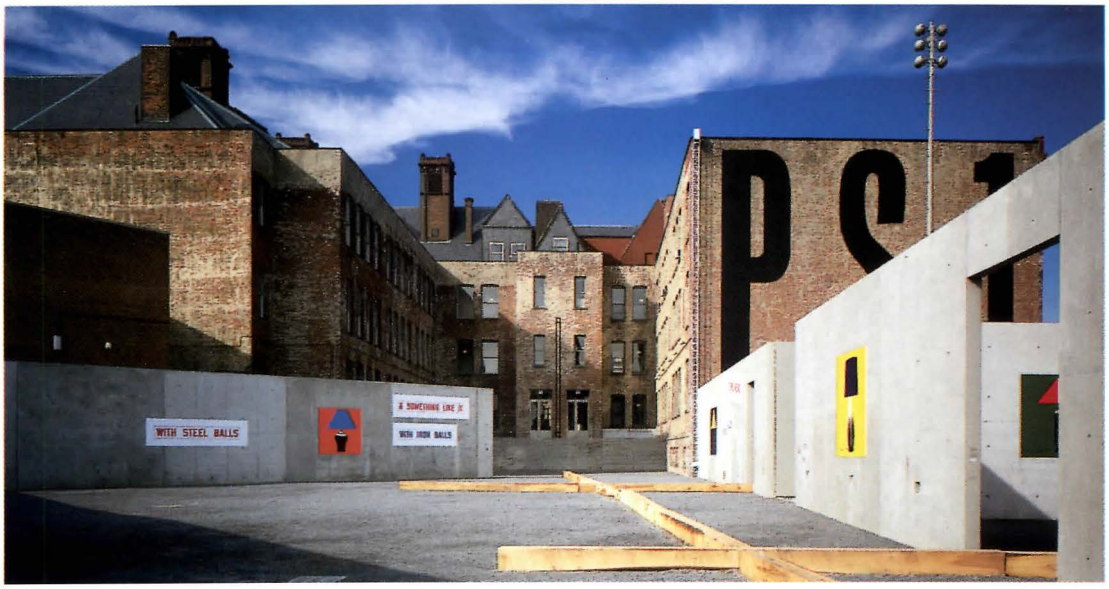
Occupied throughout the three-year renovation and expansion, the new P.S.1 was inaugurated last fall. With 125,000 square feet of indoor and outdoor exhibition space, it is one of the largest contemporary art centers in the world.

1. *Exterior entry*
2. *Sculpture courtyard*
3. *Inner courtyard*
4. *Sculpture room*
5. *Adjacent lot*
6. *Loading area*



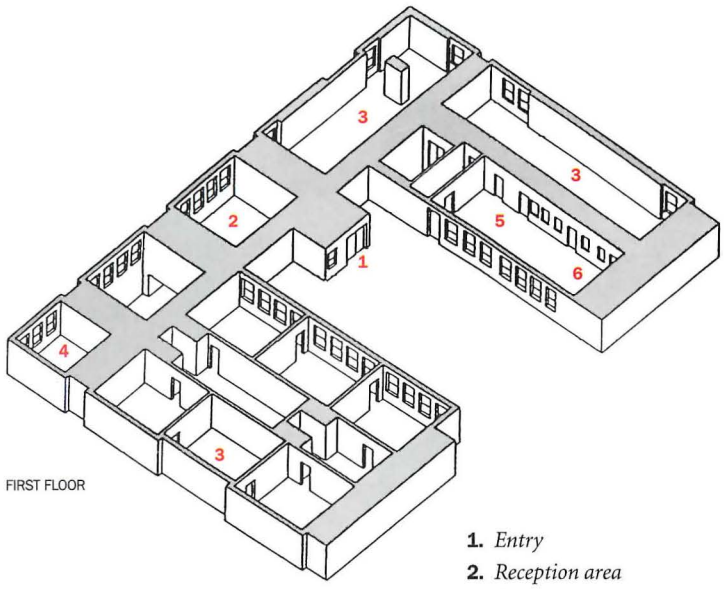
Andrea Truppin is a writer and documentary filmmaker in New York City.

PHOTOGRAPHY: © MICHAEL MORAN

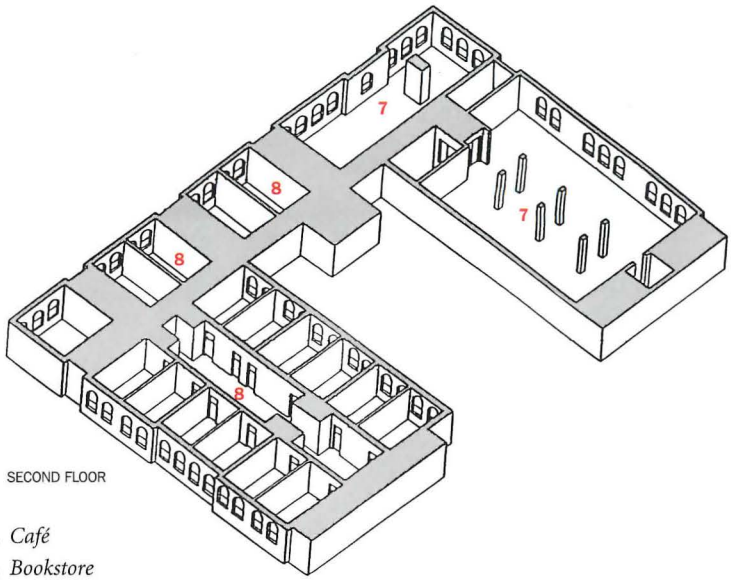


The former schoolyard was converted to an outdoor gallery, with floors of crushed gravel and concrete walls. Visitors wend their way to the entrance by passing through these outdoor rooms.

The school's two wings, built 13 years apart, are joined at a central entry area (right). The entrance, formerly on the other side of the building, was flipped to make P.S.1 more accessible to the nearby subway station.

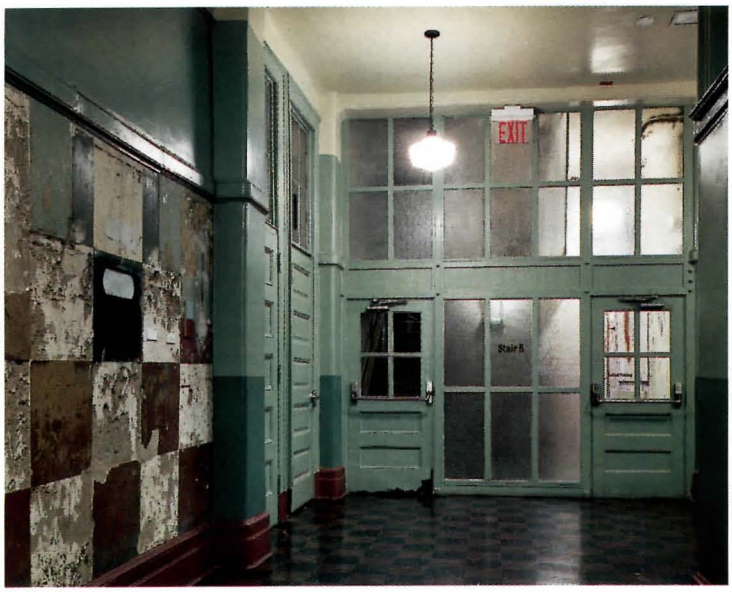


FIRST FLOOR



SECOND FLOOR

1. *Entry*
2. *Reception area*
3. *Gallery*
4. *Video gallery*
5. *Café*
6. *Bookstore*
7. *Sculpture gallery*
8. *Studios*



Some existing spaces and finishes were preserved (far left), some were re-created from fragments (plans, opposite), and others were destroyed to create entirely new spaces (left). Virtually all of the windows were left uncovered so visitors may pause in their perusals to look outside (below).

In the past 15 years, P.S.1 has been joined in Long Island City by other arts-related organizations, many housed in renovated factories and warehouses. Together these are drawing traffic from across the river.

The new design benefited from the input of an architects' committee, which included the late Max Gordon and Richard Gluckman in addition to Fisher, and an artists' committee, made up of James Turrell, Richard Nonas, Richard Deacon, and Ryman. Sculptors, in particular, were involved, "because they are so often caught by the problems of space," says Heiss. Involving artists in the planning process let P.S.1 avoid expensive mistakes, such as building outdoor spaces for large sculptures with no room for a cherry picker to move them.

P.S.1 was built in two phases, the south wing in 1892 and the north wing in 1905. The brick and terra cotta Romanesque Revival building, with massive stone foundations and delicately ornamented arches, embodies a historic change in construction technique from load-bearing brick walls in the south wing to steel-frame construction in the north wing. Part of the goal in the renovation was to use this construction intelligently.

The redesign's most fundamental alteration was to invert the building, turning the unadorned back into the front. The school was built before New York's subway system, so none of its original entrances faced the stations behind the building. The new entrance, at what was the back, is signaled by an existing tower.

New concrete stairs, broad enough to serve as seating, sweep grandly up to the entrance, filling the courtyard and culminating in a terrace that doubles as a stage. The steps lend grandeur where none was originally intended, ironically associating the utilitarian rear of the building with grander art institutions such as the Metropolitan Museum, with its iconic steps. The formal approach to the building also edges P.S.1 away from its gritty youth toward a respectable maturity.

The largest addition of exhibition space is the outdoor courtyard, which was once the schoolyard. Before the renovation, the yard, paved and surrounded by a chain link fence, served as a sculpture garden. But the art competed for attention with a busy thoroughfare and the surrounding buildings. "Much art needs to have hermetic isolation to establish its own turf. When you contain it, the artist makes the environment and creates the world," Fisher says. "If spaces are 'leaky,' if they have holes and interference from the outside, they deflate." The solution was to enclose the entire 23,000-square-foot courtyard with a concrete wall. The pavement was replaced with crushed gravel. To one side of the courtyard are two roofless rooms, one large and one small, in which outdoor sculptures can benefit from the same type of contained neutral environment used in many indoor galleries.

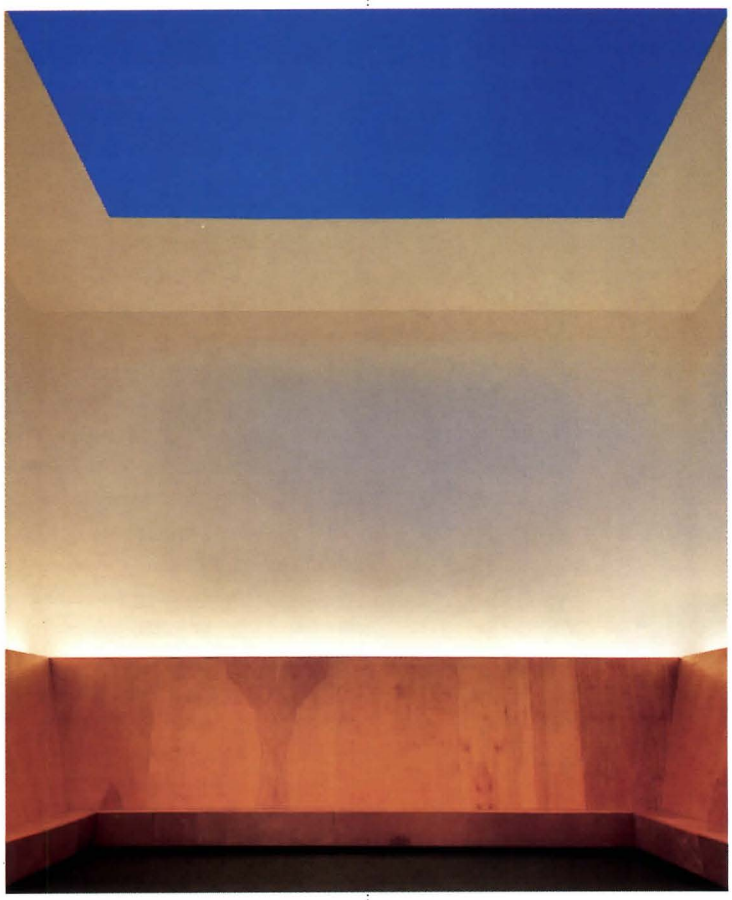
Interior changes

If the courtyard was a tabula rasa, creating new exhibition space inside called for a radically different approach. While it might have been simpler to rip out the old rooms and install a series of white boxes, Heiss (now P.S.1's executive director) and Fisher were committed to preserving the heterogeneity of the "found" space and celebrating its past life as a school. Its oddly shaped and partitioned rooms, its surfeit of staircases designed to handle the rush of pupils between classes, its blackboards and water fountains, its long hallways and multiple doors, windows, and closets—all these held traces of the school's history. The architects likened the design experience to "editing," rather than imposing an architectural vision.

Approximately 25 percent of the new exhibition space was attained by opening up warrens of classrooms, locker rooms, and bathrooms. The new café/bookstore, which also contains video installations, was originally eight rooms. As elsewhere in the building, ghosts of the original rooms remain, here in the form of redundant doors between the new space and the hallway.

At P.S.1, artwork turns up in the most unexpected places. Here a skylit brick tower is home to *Tunnel of Tears*, a neon sculpture created by Keith Sonnier in 1997.

Galleries (left and right) are located in the old classrooms. Several of the original pieces from the 1976 "Rooms" exhibition became integral parts of the building, including the Richard Serra room in the attic and James Turrell's *Sky Room* (below).



The architects felt that the "humanness" of the building resided in the visitor's freedom to wander at will, constructing a partially mediated personal experience. Accordingly, they retained all six staircases to allow visitors "to bail out or shift strategy and not always go back to the same place," Fisher says. Two staircases became sites for "Vertical Paintings," a group effort by 14 artists that can be viewed only by walking up or down the stairs. The contiguity of these paintings to the original peeling paint of the staircase walls shows resourcefulness in finding surfaces for art. Similarly, a utility closet might contain art, or it might contain cleaning equipment. The museum succeeds in priming the visitor's perception to find expression in every corner of the environment, not only in the "real" artworks.

An enormous sculpture gallery now spans the width of the north wing. The artists' studios that were formerly in this space were moved to the south wing. A vaulted terra cotta support system, discovered under the plaster ceiling in the sculpture gallery, was restored. The wood floor was ripped out and replaced with a new concrete surface, steel-troweled to a glossy patina, that can support heavier loads. A powerful colonnade marches between the gallery's front and back entrances. Its white surface stands out against the brick red vaults to reinforce the axis and huge scale of the space.

A third-floor gallery that was once the school's auditorium had been P.S.1's largest column-free exhibition space—the pitched roof above is supported by wood trusses. The light-flooded room, which boasts 25-foot ceilings, was beloved by artists, but its two window walls left few surfaces on which to hang art. In a bold move, the architects inserted a 60-foot-square box into the space, creating a slightly smaller but more usable gallery that can hold large paintings, while the remaining space on the window walls became narrow, daylit galleries suitable for smaller works.

Community outreach

P.S.1 had long been involved in art education. The renovation allowed them to increase workshops for neighborhood children, running after-school and weekend programs. The architects placed the art education studios in the basement, which has windows, so that kids could make noise and "throw paint around" without disturbing visitors to the museum, Heiss says.

Budget restrictions precluded bringing the impressive attic space, with its elegant roof trusses, up to code or installing air conditioning, although heat is provided by radiators. This limits the kinds of art that can be housed at P.S.1 in the hot and humid New York summer.

Most of the windows in the building remain uncovered. This approach works against what Fisher calls "museum fatigue," a sense of being in a hushed, rarefied environment, out of touch with the world. Many windows frame spectacular views of Manhattan, which, after seeing everything as art inside P.S.1, begins to resemble a giant outdoor sculpture. ■

Sources

Steel entrance doors: *Torrance Steel Window Co., Inc.*
Locksets: *Schlage*
Floor tile: *Kentile*
Downlights: *Edison Price*
Plumbing fixtures: *American Standard*

4 Elmhurst Art Museum Elmhurst, Illinois

A SUBURBAN CHICAGO COMMUNITY ARTS FOUNDATION INCORPORATES A PROTOTYPE SUBURBAN HOUSE DESIGNED BY MIES VAN DER ROHE.

by Craig Kellogg

Project: *Elmhurst Art Museum, Elmhurst, Illinois*
Owner: *Elmhurst Fine Arts and Civic Center Foundation*
Architect: *De Stefano + Partners—James R. De Stefano, FAIA, managing partner; Avram Lothan, AIA, design partner and project architect; Ferdinand Scheeler, AIA, technical partner; John Winner, AIA, Laurence Saint Germain, design team*
Engineers: *Tylk Gustafson and Associates (structural); Environmental Systems Design (mechanical, electrical, plumbing)*
Consultants: *Peter L. Schaudt (landscape); Susan Johnson Design (graphics); Bob Lane (signage)*
General Contractor: *Beacon Construction*

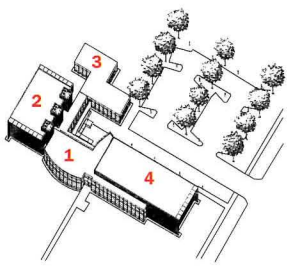
Size: *15,200 square feet*
Cost: *$2.2 million*

One wonders how Mies van der Rohe might have felt watching the steel structure of his McCormick House being chopped in half and then rolled three blocks on axles welded to the frame. The spectacle, though traumatic, was lifesaving, since today the 2,200-square-foot house is settled and once again occupied, now as part of a 15,200-square-foot museum in Elmhurst, Illinois. The staff uses the house's former bedrooms as offices, and lecture audiences assemble in what were once the living and dining rooms.

As the Elmhurst Art Museum's "primary artifact" in a broad collection consisting mostly of paintings and prints, the house has proven to be an attraction in its own right. Busloads of visitors now stop in Elmhurst en route to Mies's Farnsworth House, some 50 miles away in Plano, Illinois.

Built in 1950–51, the McCormick House was one of only three Mies-designed single-family residences in the United States. Real estate investors with plans to demolish the house and build something grander became interested in the property when it appeared on the market in the early 1990s. Although neighbors had mixed feelings about the building's severe Modernism, they knew the house brought distinction to their community and should be saved.

Meanwhile, the Elmhurst Art Museum, a community-based organization founded in 1946, was looking for new quarters. After 10 years in a local community center, the museum's organizers secured a site in Elmhurst's Wilder Park and began plans for a building. Around the same time the McCormick property became available. With the fundraising efforts of museum patrons and the neighbors of the house, the property was quickly purchased by the museum, for about $500,000. The McCormick House was subsequently moved to Wilder Park and its land was sold to developers, recouping much of the money put up by the museum.



1. *Sculpture gallery*
2. *Gallery*
3. *Mies house*
4. *Educational area*

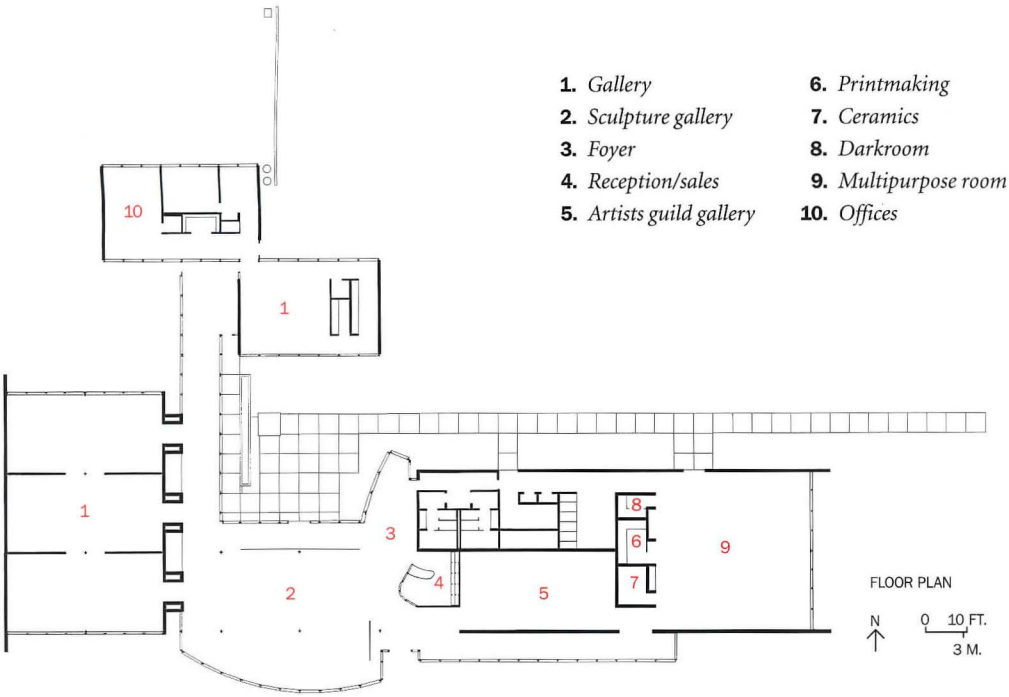
Old meets new

Today the house constitutes one of three major components of the Elmhurst Art Museum, completed last fall by De Stefano + Partners. Serving as the anchor for the complex and, to a degree, as inspiration for the remainder of the structure, the Mies house pushed the museum board toward an architectural solution that is more modern than they might have requested. "The board would have been happy with a red-brick building with white columns," says project architect Avram Lothan. While the museum "puts the house on the architectural map," the old building returns the favor, he says, by giving the new construction a physical history. In contrast to Mies's Modernism, Lothan says, the new work aspires to a "nervous energy" not found in serene, classic mid-century compositions.

PHOTOGRAPHY: © BARBARA KARANT, KARANT & ASSOCIATES

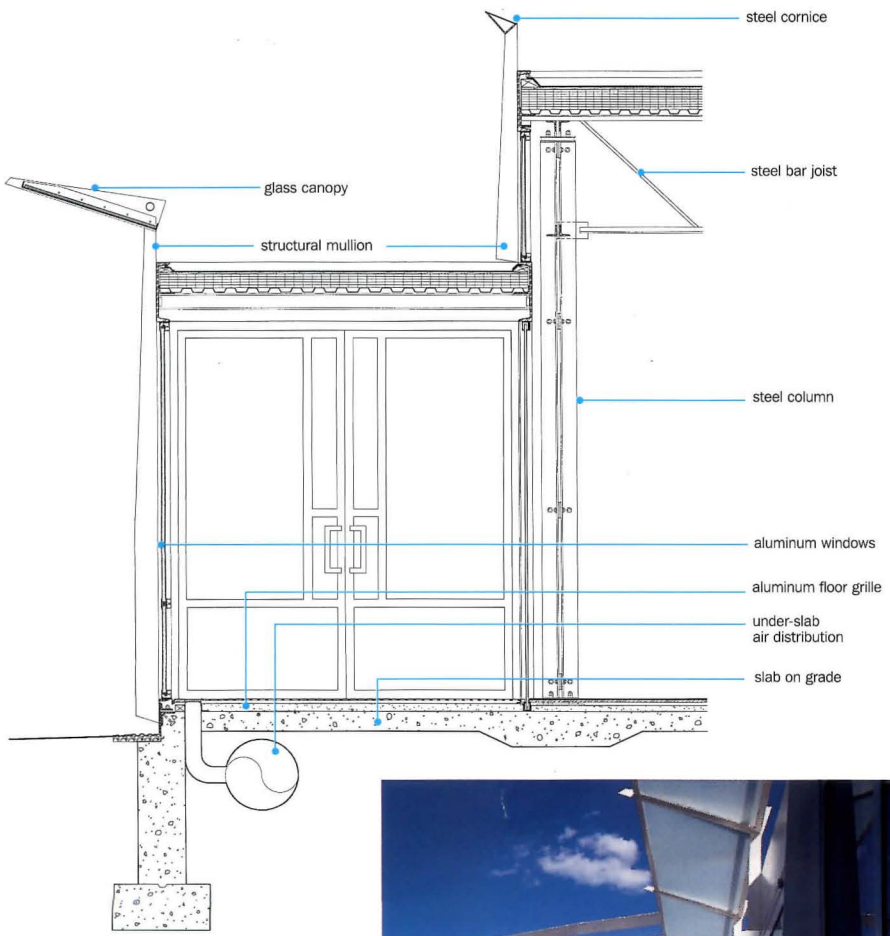
Craig Kellogg is a freelance writer based in New York City.

Bowed glass guides visitors to the entry (above). The courtyard provides the garden-like setting Mies called for in his guide to small-city museums.



1. *Gallery*
2. *Sculpture gallery*
3. *Foyer*
4. *Reception/sales*
5. *Artists guild gallery*
6. *Printmaking*
7. *Ceramics*
8. *Darkroom*
9. *Multipurpose room*
10. *Offices*

Visitors enter the museum through the glass-walled sculpture gallery (opposite). In keeping with Mies's preference for unadorned surfaces, the ceilings reveal their structure and the floors are ebony-stained oak. Offset vertical mullions interspersed with slightly curved steel columns give the building a sense of rhythm (below).



SECTION THRU VESTIBULE

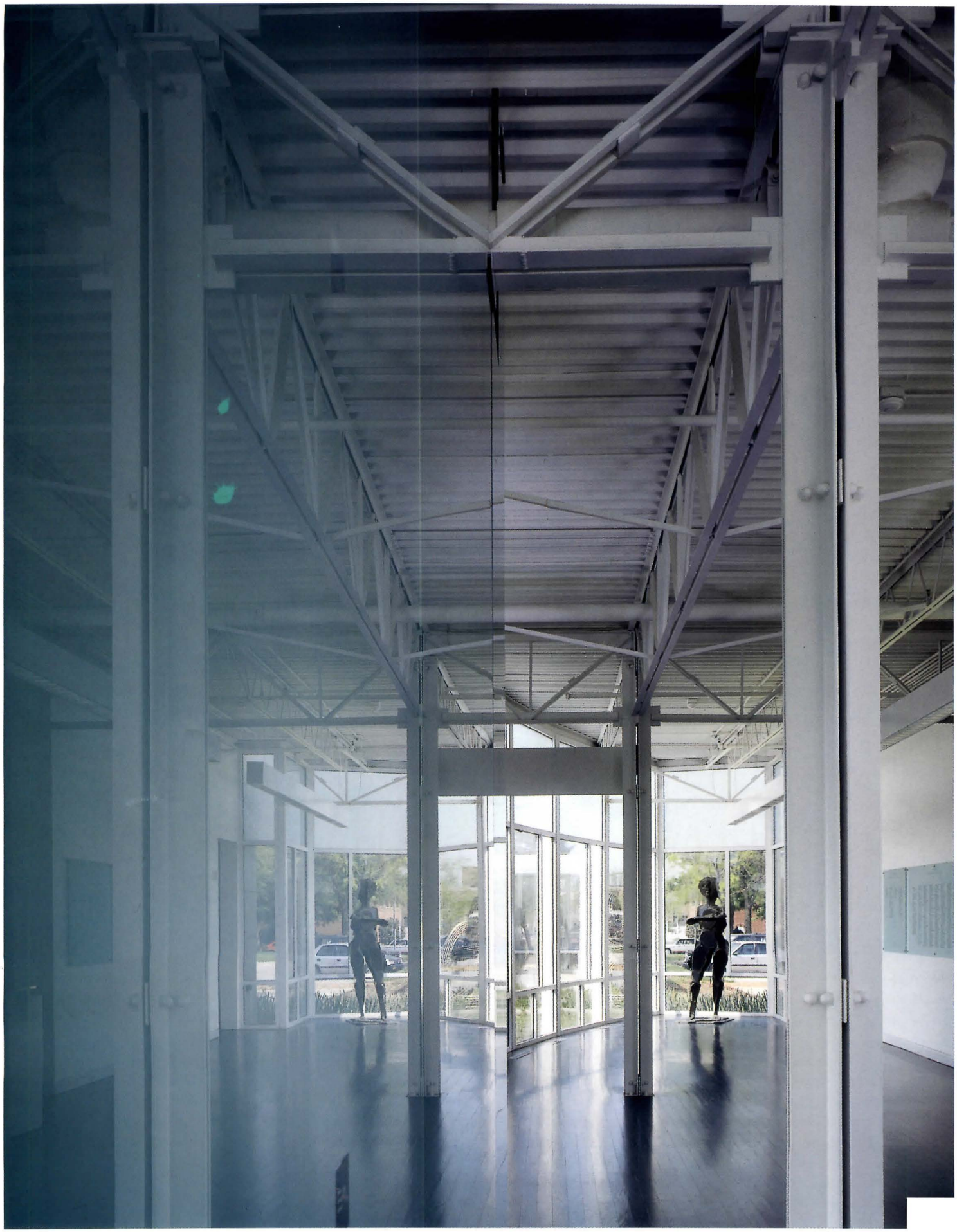
0 3 FT.
1 M.

In 1943 Mies published a hypothetical plan for a small-city museum. This plan, which advocates a structure that is welcoming and placed in a gardenlike setting, served as a guide for Lothan. However, building the museum as one universal volume—a Miesian maxim—would have overwhelmed the house and failed to provide the variety of zones the program demanded. So Lothan distributed functions into a collection of interconnected pavilions.

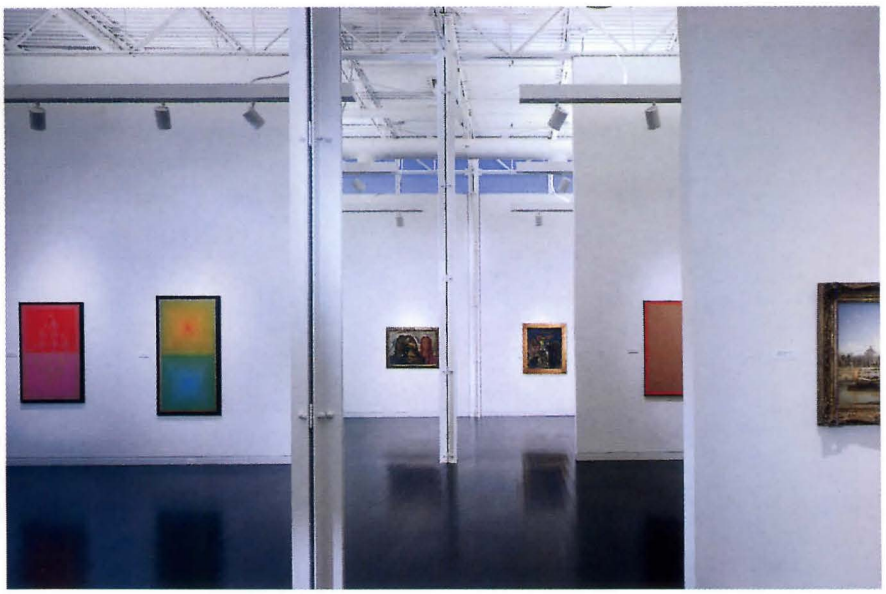
The entire project unfolds from a glass-walled corridor, referred to by Lothan as "the cloister," that rims two sides of an entry court. An entire wall of the Mies house's original aluminum windows (reglazed with insulated glass), once part of the living room, forms the third side of the court. In deference to the house, ceiling heights in the corridor are low, adding to the cloistered feel.

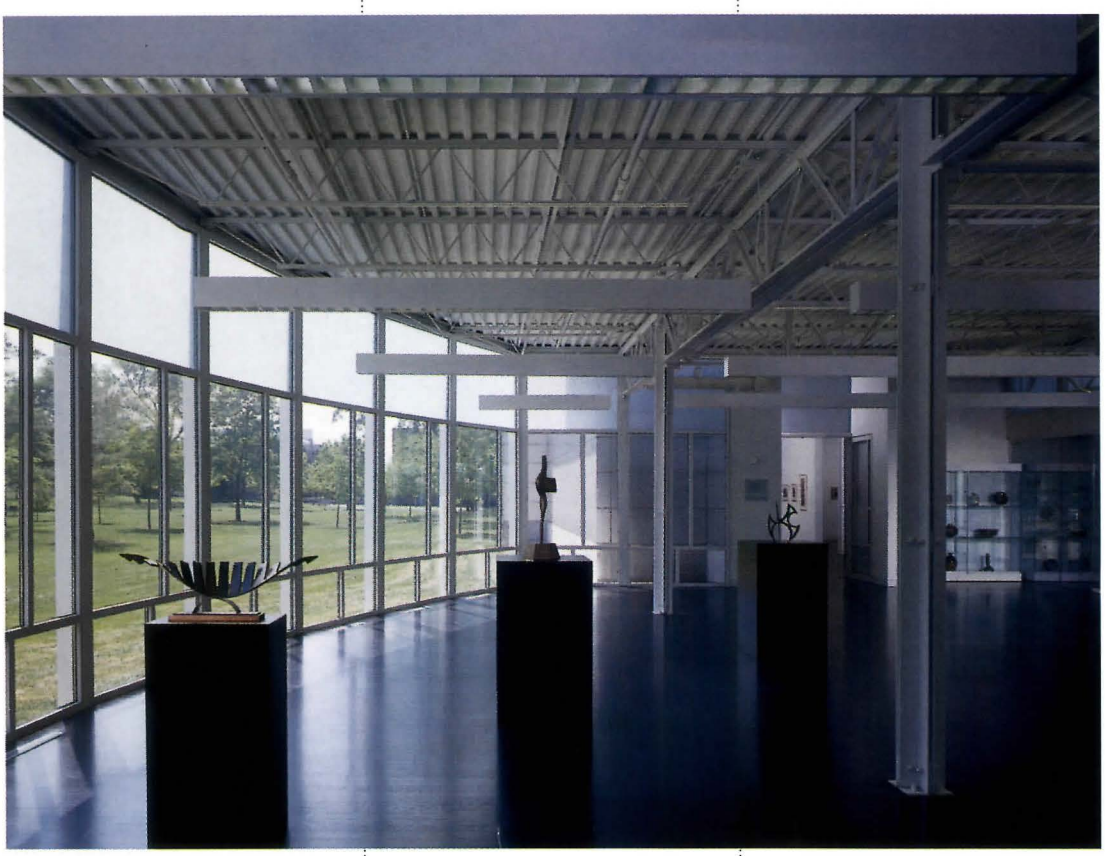
The house, with its expansive windows and masonry end walls, was commissioned by real estate developer Robert McCormick, who met Mies during the planning of 860/880 Lake Shore Drive. McCormick had Mies design the house for use as a subdivision prototype. When construction costs became prohibitive, McCormick scrapped the idea and decided to live there himself.

Although the house was costly



The I-beam structure of the house is visible in the multipurpose room (below). Galleries (right and bottom) exhibit the permanent collection as well as works of a local artists guild.





to build, several design flaws were uncovered in the process of moving it. For example, the narrow modular interior partitions, modeled after veneered doors, are an awkward, unmatched hodgepodge of oak, maple, and birch veneer panels installed side-by-side. But besides straightening out the house's steel structure and bringing it up to code, the design flaws were not corrected. Doing so would be, in a sense, tampering with a piece of architectural history. The house was reconfigured only in minor ways in order to suit the needs of the museum.

In addition to office space, the renovated house contains a small kitchen, moved from its original site among the bedrooms to the rectangle of public rooms at the front, and a multipurpose space that can on occasion serve as an art gallery.

The origins of Modernism

The remaining portions of the museum include the main gallery block, which holds the permanent collection, and the educational block, a space where works by a guild of community artists are displayed. Also in this area are rooms for art classes held by the city parks department, as well as workspaces for artists, including a darkroom and printmaking facilities.

The gallery block, sheathed in silvery aluminum panels, dominates the building. In contrast to the crouching corridors, the gallery space is wide open, with 20-foot ceilings and clerestory windows at the north and south ends sandblasted to diffuse light. Elsewhere, sandblasted glass canopies shade the windows. Daylight is augmented by lighting from color-corrected fluorescent pendants throughout the museum. Tungsten halogen track spotlights, mounted beneath the fluorescents, are also used.

Three towers, located along the side of the gallery space and visible from the courtyard, accommodate the mechanical systems. Further along, the cloister widens into the sculpture gallery, with its curved, floor-to-ceiling glazing.

Updating a work by Mies gave Lothan a clearer understanding of the very origins of Modernism. In Chicago and in that era, he says, "Mies found the technical resources to build the things he had speculated about for so many years." ■

Sources

Curtain wall: *Lintel Wall Panels*
Masonry: *Belden Brick*
Windows: *Milco*
Glass: *Arcadia*
Entry doors: *Kawneer*
Furniture: *Knoll*
Locksets: *Best*
Hinges: *Stanley*

Improving Glass Performance

NEW FILMS, COATINGS, AND LAMINATES MAKE GLAZING SAFER, STRONGER, AND MORE ENERGY-EFFICIENT WITHOUT SACRIFICING TRANSPARENCY.

by Stephen H. Daniels

Glass, so delicate, so ethereal, has become a rigorous building material, something that can be buffeted by windblown debris, engulfed by flames, stomped on, even pounded by heavy objects—all without cracking, chipping, or losing its transparency. Glass can be relied upon to reduce security risks, curb energy consumption, and lower building operating costs, all while looking sublime. Glass can be brilliant, colorful, richly textured, even sculptural. And it can be as easy to maintain and as cost-effective as concrete or metal.

"With glass you can create illusions that cannot be accomplished with any other material," says materials and design consultant Michelle Andrews. "We've used more glass in the past two or three years than at any other time, thanks to its insulative value, variations in design, a newfound clarity, and finishes that make it easier to maintain."

There's no doubt that glass, used in roofs, canopies, custom skylights, curtain walls, and atriums, is more desirable than ever. The demand for architectural glass has risen steadily over the past five years and, almost without exception, the major manufacturers are expanding their facilities to meet that demand and to gear up for new technology. Europeans still use five times the amount of architectural glass that Americans do. That's thanks to the promotional efforts of the major overseas glass companies, as well as a stronger tradition of using structural glass and more lenient code requirements. "But Europe and Asia lag in the development of coatings," says Robert Heintges of R. A. Heintges Architects Consultants. "As a result, we're catching up."

Glass is made in much the same way today as it was 40 years ago when the float glass process was invented. Molten silica is poured onto a bed of molten tin, where it remains until it hardens. The result is glass that is perfectly flat and clear. Refinements in technology have made the glass available in thicknesses ranging from 1/16 inch to one inch. Rolling the glass in a semimolten state creates patterns. Introducing various additives to the silica produces colors, tints, and other effects. Cobalt oxide turns glass blue. Cobalt and nickel neutralize other metals and make glass colorless. Iron produces an aquamarine cast but adds strength. Reducing the amount of iron creates glass that is less reflective and therefore appropriate for retail applications. Phosphorus makes glass opalescent. Many companies have their own formulas for achieving different effects.

The mechanical properties of glass can be altered by heat strengthening or tempering. By reheating and then quickly chilling the glass, it is made anywhere from two to six times stronger than untreated glass and able to stand up to greater temperature extremes. The drawback to tempered glass is that when it does break, the fragments are small and, consequently, dangerous. Glass can also be chemically treated for strength, which makes it suitable for paving or flooring. Safety glass is made by sandwiching glass between layers of plastic. Security glass consists of glass layered with sheets of various plastics, usually polyvinyl butyral (PVB), though newer, tougher plastics are on the horizon. The addition of these layers reduces sound transmission as well.

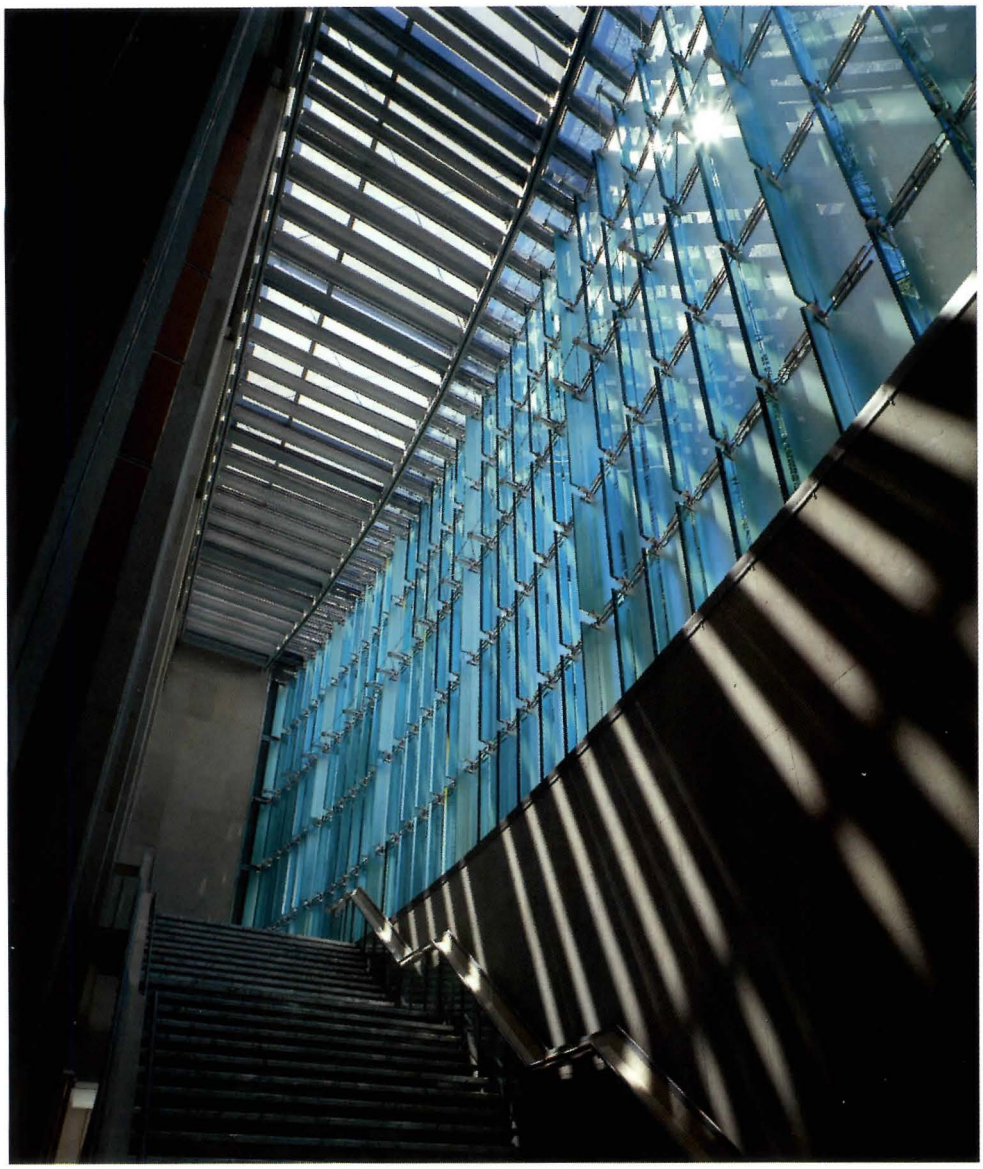
The Design Center in Linz, Austria, has a laminated glass roof that evokes crystal palaces (above). The expansion of McCormick Place in Chicago (left) is clad with low-e glass.

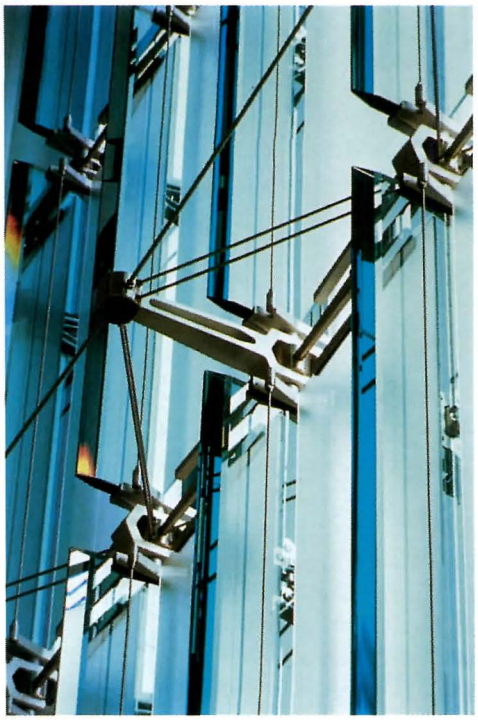
Stephen H. Daniels is a freelance writer specializing in building technology and construction. He lives in the Seattle area.

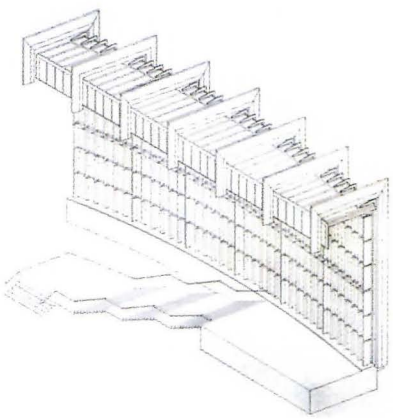
Continuing Education *Use the following learning objectives to focus your study while reading this month's ARCHITECTURAL RECORD/AIA Continuing Education article. To receive credit, turn to page 196 and follow the instructions.*

Learning Objectives *After reading this article, you should be able to:*

1. *Describe how films, tints, and textures extend the range of applications for glass.*
2. *List the additives that change the color of glass.*
3. *Describe what low-emissivity coatings do for glass and how they are applied.*
4. *Explain how the properties of glass can be altered, and how these alterations affect how glass absorbs or reflects heat.*







The First Hawaiian Bank has two parallel glass exterior walls: the outside skin is the weather wall, while the translucent interior wall (above left) acts as a "projection screen showing the changing qualities of light," says James Carpenter. Glass prisms (above right) contribute to the vertical support system.

But the biggest advances in glazing are the films, now virtually transparent, that are layered on the surface of the glass or integrated during manufacture. They have the ability to selectively reflect or absorb different types of solar energy. Used together with tints and laminates, these films significantly extend the range of applications for glass. As a result, the architect's quest for glass that is truly clear, nonreflective, minimizes heat transfer, and resists impact may not be so elusive, says Michael Flynn of Pei Cobb Freed & Partners. "The industry is not far from achieving this seemingly contradictory set of of criteria."

Boosting energy efficiency

Low-emissivity, or low-e, glass has almost single-handedly spurred innovation in the industry. Introduced in 1989, low-e was intended for cold climates, where it reduces energy loss by reflecting heat back into a living space. It is equally effective in Sunbelt applications, where it limits heat gain by reflecting radiant waves. Though until recently low-e cost four to five times more than untreated glass, the price has dropped as the manufacturing process has been streamlined; it now costs about $1 more per square foot than normal glass. Representatives for the glass industry say low-e will be the norm on every building within the next five years.

More recently, manufacturers have introduced spectrally selective coatings, applied as part of the low-e coating. These permit some portions of the solar spectrum to enter a building while blocking out others, including infrared and ultraviolet radiation. By limiting solar heat gain in the summer, preventing loss of interior heat in the winter, and allowing occupants to reduce electric lighting by maximizing daylight, the coatings reduce energy consumption—all without tinting the glass, making it reflective, or significantly compromising transparency.

"If it weren't for these advanced coatings, the percentage of glass we can use on a building by code would be significantly less," says David Van Galen, AIA, of LMN Architects. At the new Boeing Commercial Airplane Group Headquarters outside Seattle, energy codes would have allowed only six feet of glass per floor. "With the newest low-e glasses, we were able to include more glass, collecting light and views of the surrounding park."

Architects are overcoming their reliance on reflectivity and tints as the first line of defense against solar gain, Flynn says. Reflective glass

"sacrifices visual warmth for energy gain," he says. It also reduces the amount of daylight that can enter. New low-e films make reflective glass less critical, though it is still favored by some clients for its privacy and flashiness. To Flynn, though, "Absolute transparency, or as close to it as you can get, is more desirable."

Tints and coatings can be added to make the glass absorptive, again limiting the amount of infrared waves entering a space—this time by absorbing the waves instead of reflecting them, as spectrally selective coatings do. Mixing some additives into the glass, often cerium oxide, which gives the glass a light tint, increases absorption. Colored glass absorbs solar waves from across the spectrum, lessening the amount of light and heat entering the space.

The microscopic layers of metal oxides that compose low-e and spectrally selective films are generally applied to the glass in two ways. Sputtering, or vacuum deposition, ionizes the metal, depositing it on the glass in a thin film. Because this is a low-temperature process, low-e can be sputtered onto plastic, making it suitable for laminated glass or for use in the new retrofit films, applied over existing glazing. But sputtered coatings, because the metals are exposed on the surface of the glass, can be damaged. A second method is the pyrolytic process, in which oxides are applied to glass while it is still molten, making the coating integral to the glass.

The result of these innovations—and what many architects don't realize—is that a building with a properly glazed facade that includes these new coatings can have a lower annual heating and cooling load than one with an R-19 insulated opaque wall, says Steve Selkowitz, head of the building technologies department at Lawrence Berkeley National Laboratory. In cold climates, that's true even when glass is placed on the north side. During the winter coated glass can gather more thermal energy than it loses over a 24-hour period.

Security and safety

Recent code restrictions have changed the way glass can be used in a building. Laminated glass, always necessary for overhead glazing, is now increasingly used in vertical glazing. And blast-resistant glass is often required in federal buildings and courthouses, and occasionally in buildings overseas. Making glazing resistant to storm damage, break-ins, bombings, and fire involves multiple layers of glass and plastic. PVB is the most commonly used interlayer because of its affordability and transparency. It's also compatible with low-e and spectrally selective coatings.

When it comes to security, there's little substitute for glass thickness. Still, manufacturers are striving to make glass lighter, more transparent, and at the same time stronger. DuPont, for example, recently

GLASS PRODUCTS

Architectural Glass Design Inner-Lite multilayered panels combine tempered, laminated, and blown glass in one unit. 707/255-5954.

Bendheim More than 2,000 specialty glasses are available from this distributor. 800/835-5304.

Courtaulds Vista SpectraSelect is a solar control film. Llumar Magnum is a scratch-resistant film laminate that deters graffiti. 540/627-3000.

DuPont SentryGlas, made of Butacite and an abrasion-resistant polyester film, prevents shattering and offers all the properties of laminated glass. 800/533-1313.

Glasstech Offers decorative glass that is textured, tempered, slumped, or sandblasted. 310/202-6001.

Interpane Securepane safety laminated glass protects against hurricane-force winds and smash-and-grab burglaries. 800/334-1797.

Joel Berman Glass Studios Tactiles (right) are cast-glass decorative wall tiles. 888/505-4527.

Libbey Owens Ford Gold Eclipse reflective glass is a pyrolytically coated glass with a gold tint. 419/247-4721.

O'Keefe's SuperLite I is fire-rated glazing independently certified by the Safety Glazing Certification Council to meet U.S. Consumer Product Safety Category II standards. 800/227-3305.

Owens Corning Dotted window panels on the overall curtain-wall system of the company's headquarters are a double glass pane with a frit applied to the interior surface for a shading coefficient of .28 and a U value of .31. 419/248-8000.

PPG Starphire allows light transmittal without the distortion caused by the green color in ordinary glass. Starphire has an iron content that is one-tenth that of ordinary clear float glass. 412/434-2858.

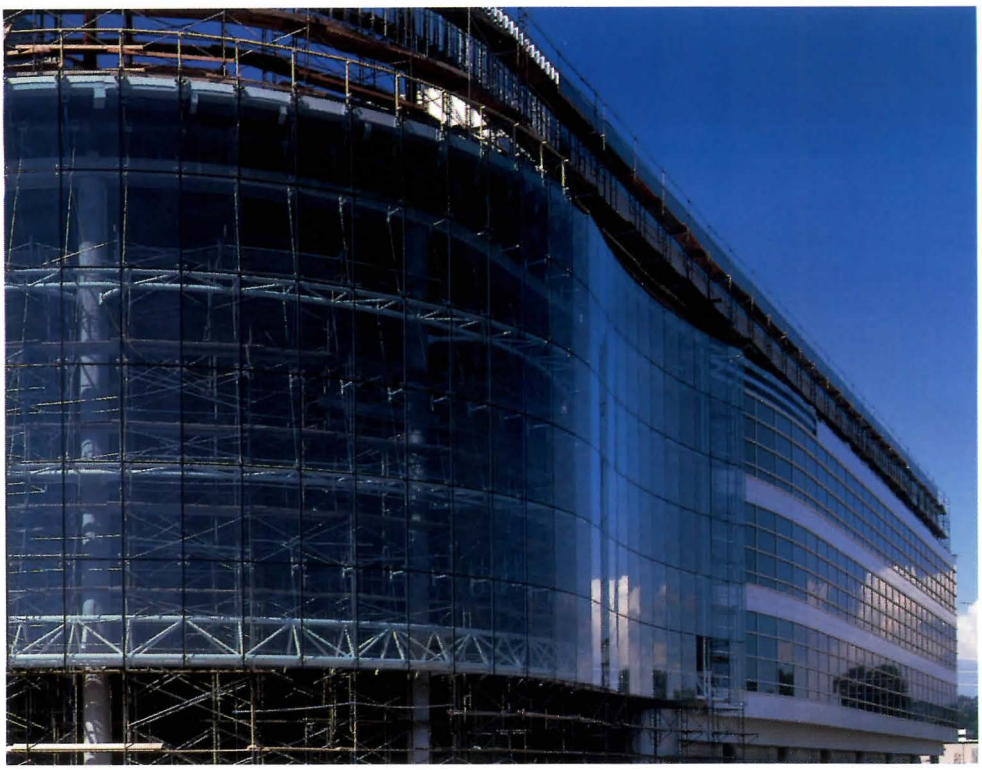
Pilkington Planar Systems W&W Glass Systems (left), Pilkington's U.S. representative, completed 11 canopies, covered in clear and fritted laminated glass, for the San Francisco Municipal Railway. 800/452-7925.

Schott Amiran is an antiglare glazing that reduces reflected light from 8 percent reflection to 1 percent. 914/968-1400.

Solutia KeepSafe Maximum is a shatter-resistant safety glass that also screens out 99 percent of UV radiation. 314/436-6565.

Viracon SentryGlas Plus hurricane-resistant glass features DuPont's SGP and standard annealed, heat-strengthened, or tempered glass. 800/533-2080.

Visteon Two new blue float glasses, Versalux Blue 2000 and Blue 2000 reflective glass, are available coated or uncoated. 313/390-9344.



Using new low-e coatings and fritted glass significantly reduced solar heat gain, allowing LMN Architects to use a much greater expanse of glass than what codes would have allowed otherwise (left). "Super transparency was very important to us here," David Van Galen says. Low-e glass, tinted green for aesthetic reasons, was used on New Jersey's Parsippany Commons (above). Fritting reduces glare and limits solar gain.

introduced a Surlin-based plastic interlayer for hurricane glass. The material is tougher and more effective at stopping projectiles than PVB, though it is also more expensive. Companies are also working to make security glass architecturally acceptable, says Steven Wetzel, director of marketing for Viracon. A new generation of bullet-resistant glass, made with interlayers of polycarbonate, now looks the same as standard glass. That's important when designing a courthouse, for instance, where the judges' chambers must be glazed with bullet-resistant glass but the rest of the structure uses standard architectural glass.

Decorative and practical

At the Boeing headquarters building, LMN Architects used fritted glass—in which crushed glass is melted onto the surface of the float glass, providing various levels of opacity or color—to screen out glare and limit solar gain. As the serpentine wall sweeps to the west, the glazing becomes increasingly opaque, while to the north, the glass is transparent in order to gather light.

"Even with the advanced coatings, all the glass we used would not have been possible energy-wise without the fritting," Van Galen says. The slick, durable surface of fritted glass makes it easy to clean and resistant to oil and water stains. Fritted glass is also more reasonable in cost and more widely available than sandblasted or acid-etched glass.

Sandblasting does allow detailed custom designs, but dirt can lodge in the pockets that the pummeling sand produces. A better choice is often acid-etched glass, which diffuses light and has a silky appearance. Slumped or cast glass, made by heating glass almost to its melting point and laying it into a carved mold, gives interesting custom patterns; rolled glass provides a more consistent texture. The former is, however, unpredictable in its load-carrying abilities. Both are used to provide privacy, reduce glare, and create unusual optical effects. Working with various adhesives, companies like Architectural Glass Design in Napa, California, sandwich metal, paper, painted elements, or even fused or blown glass between layers of tempered or laminated glass.

The future of glass

James Carpenter, AIA, uses glass as a structural material in much the same way other architects select concrete and brick. He's learned that glass is strong in compression, but not as effective in tension; his structures separate these two forces and capitalize on compressive strength. Structural components are made of laminated glass—if a piece fractures, the glass will hold together sufficiently to retain its structural qualities until it can be replaced. Using laminated glass also means that shards won't fall out and injure someone.

At the First Hawaiian Bank Building in Honolulu, Carpenter paired two glass skins to create a 100-foot-long, 48-foot-high glass wall. This is supported with glass columns that are post-tensioned against one another and braced horizontally. "The goal was to build a totally transparent clear glass wall in an extreme, sunlit environment," he says. Doing so would have been impossible a few years ago; occupants would have "fried" and security would have been an issue. "Glass companies want architects to push them to the limit to see what they can do," he says.

There's even more significant progress to come. "Glazing will become intelligent, able to react to the environments within and without," Selkowitz reports. Scientists are experimenting with photochromic glass, which darkens when certain levels of light are reached. They are also looking at ways to put photovoltaics within glass to harvest solar energy.

But the technology that holds the most promise and is the most imminent is electrochromic glazing. This automatically adjusts its translucency in response to changes in heat and light. Consisting of a multilayered, thin film applied to glass or plastic, electrochromic glazing is controlled by low-voltage current. Linked to the building's HVAC system and lighting controls, the film changes from clear to increasingly dark. Reversing the current returns the film to clear. The ability to transform the window into a semitransparent or opaque wall gives architects a whole new design avenue while controlling energy flow in the entire building envelope. Electrochromic technology, now under development, will be available within the next three to five years. ■

LIGHTING...

Those of us who produce architecture magazines never forget that what we put on paper is only as good as the work designers submit to us. On the other hand, no designer who submits material does so without risks: the project may be rejected, the facts may be misinterpreted, the work may be misunderstood.

When I edited my first lighting magazine in 1986, a number of lighting designers told me that they wanted to see how the magazine was going to turn out before they submitted their work. This was discouraging, but eventually my lucky break came when a lighting designer named Craig Roeder called me out of the blue and asked if I would like to publish a project he had just finished. In his extremely enthusiastic way, Craig promised me that the Lloyd Paxton Gallery in Dallas would be the blockbuster project I needed to get my magazine off the ground, that it would garner the envy of designers and the financial support of advertisers everywhere.

He sent the transparencies to me overnight, and the project did not disappoint. The gallery was loaded with the kinds of features that make architectural lighting interesting to look at and read about. The project leapt off the pages, helping to prove to everyone that lighting could be presented in a way that would be meaningful to architects.

This was the beginning of a long association between Craig and myself. During my years with that magazine and for the eight and a half years I've edited the lighting section of RECORD, *it seemed that he did a really interesting project—a "must publish" work—at least once a year. He would never tell me about these projects beforehand. Instead, he would call to announce, in a giddy voice, that photographs of a new project would arrive the next day. Then he would try to convince me to put his project, sight unseen, on the cover. I never promise a cover, but in the end he did get a few of them.*

Craig passed away on June 16 at the age of 48. There are two things about him I will miss the most: his passion for lighting and his great creativity. I didn't speak to Craig that often; he traveled a great deal and it was hard to catch him in his office. But every once in a while, I would get a postcard from him. Although he never wrote much, the cards were always signed "LOVE AND LIGHT, Craig."—Charles Linn, AIA

Lighting design projects by Craig Roeder: Interstate Tower, Charlotte, North Carolina (1); Health Central, Orlando, Florida (2, 5); Le Bonheur Children's Medical Center, Memphis, Tennessee (3); Lloyd Paxton Gallery, Dallas, Texas (4).

CREATIVE USES

LIGHTING ENHANCES BYZANTINE FRESCOES IN 20TH-CENTURY CHAPEL

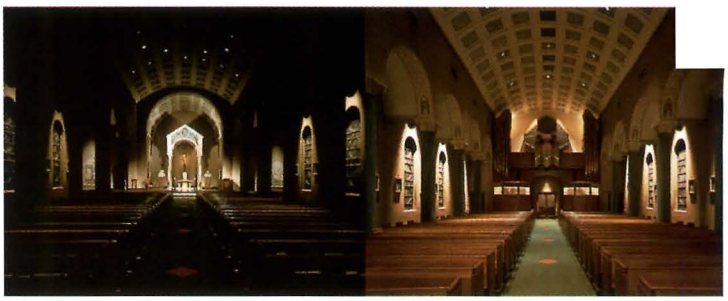
The Byzantine Fresco Chapel in Houston has received widespread attention for its architecture, but lighting also plays a crucial part in its success. Located at the de Menil Foundation, the structure was designed by architect François de Menil, and its lighting was designed by Paul Marantz and Barry Citron of Fisher Marantz Renfro Stone.

The proportions and form of the building's translucent glass walls were inspired by the two frescoes to be housed there, which were originally part of a small chapel on the island of Crete. The engineering firm Ove Arup and Partners designed the metal-tube structure that supports the glass and also conceals wiring for the fresco lighting.

Because the space is used as both a museum and a chapel, the lighting designers faced several challenges: to create a space with a luminous, spiritual quality; to provide proper illumination for viewing the frescoes; and to conceal the lighting equipment from view.

The chapel was constructed within a concrete room. Inside, the floor, upper walls, and ceiling are made of steel and finished in black. Adjustable fixtures fitted with spread lenses were concealed in the black portion of the walls and suspended from the ceiling. These backlight the glass arches and the upper part of the glass walls. Fluorescent strips were recessed into the concrete floor to edge-light the lower portion of the glass walls and shielded to prevent glare. The unfinished concrete perimeter walls are also uplit from the floor by fluorescent lamps.

Custom-made miniature MR16 fixtures anchored to the metal structure uplight the frescoes. The lighting levels can be adjusted using a preset dimming system.



NEW LIGHTING SYSTEM SHINES INSIDE REMODELED HOUSTON CATHEDRAL

After almost 60 years of service, St. Anne's Catholic Church in Houston has received an inspired restoration and remodeling by Ray Bailey Architects and a new lighting system designed by Michael John Smith.

Before the church—designed by Maurice Sullivan in 1939—was remodeled, it was illuminated by pendants suspended from the nave and a pair of sconces high up on the transept walls flanking the sanctuary. "The pendants were the brightest objects in the space," says Smith, "so the glare made it difficult to see."

Recessed adjustable accent lights were installed in the nave's barrel-vaulted ceiling and aimed downward to light the pews and the center aisle. "The stained-glass windows in the side aisles were so bright that the walls around them went black," says Smith. To compensate, adjustable recessed PAR56 medium floods were put over each window to balance out the daylight streaming in. The vault over the sanctuary is lit by uplights recessed into the floor, and the baldachino is crosslit by track lighting concealed behind the narrow walls that support the arch separating the sanctuary from the nave.

Smith specified a 16-scene preset dimming system for the church, with each scene programmed for a different type of service: for example, there is a scene for weddings (above left) and one for masses (above right). According to Smith, the most exciting moment of the project came immediately after it was completed, during an Easter Gloria service. When the lights came up from complete darkness to full intensity, they revealed the newly cleaned mosaic walls and the renovated church to the congregation for the first time. "It was so beautiful you could hear the people gasp," says Smith.

TRADE SHOW EXHIBIT LIGHTING PUTS COLLABORATION IN SPOTLIGHT

Lighting designer Steven Rosen, of Available Light, explains that the trade show exhibit for Bay Networks needed to be "very warm, welcoming, and classy." He says that his goal was to make the lighting an organic part of the booth design, noting that exhibit designers, lighting designers, and multimedia producers often work too independently on exhibit designs, resulting in lighting that has a pasted-on look.

To create several spaces within the booth, exhibit designers Folio Exhibits used dividers and a large triangular canopy made of translucent materials. The dividers are painted with ever-changing color-saturated light from Fresnels and ellipsoidals hung from overhead trusses. Symbols and logos that are part of Bay Network's marketing message are also projected onto these surfaces. Videotapes shown in a small theater have a special track that cues a computer to create lighting effects that correspond to what visitors are seeing and hearing.

PHOTOGRAPHY: © PAUL WORCHOL (LEFT); FRANK MARTIN (TOP RIGHT); STEVEN SLATKIN (BOTTOM RIGHT)

Fire & Ice Restaurant Sizzles with Hot and Cool Color and Light

by Russell Fortmeyer

Although themed restaurants—where entertainment is as significant an attraction as the cooking—are all the rage now, the owners of the new Fire & Ice restaurant in Cambridge, Massachusetts, decided to keep their focus on food. Instead of loading a space up with sports memorabilia or movie props, they wanted the design of their flagship restaurant to showcase an innovative concept for the kitchen: the "improvisational grill." At Fire & Ice, patrons use their plates like painters' palettes, assembling their own meals from ingredients available at various food stations, then handing them over to chefs who cook them at a central grill.

Taking cues from the impromptu nature of this dining experience, architects Prellwitz/Chilinski Associates created an 8,000-square-foot restaurant that could easily be mistaken for a nightclub. From the cool atmosphere of the bar near the entrance to the warmer, animated rear dining area and courtyard, the design is a collage of moods and colors. Paths of light lead diners through the space, while color is used to create the sensation that some areas of the restaurant are warm and others cold. The contrasts energize the dining room, creating a festive atmosphere. Suspended, corrugated metal cut in angular shapes, and metal panels punched with geometric shapes have been painted in bright, high-energy colors. These elements are reinforced by an unconventional lighting system partly fashioned out of generic and found lighting components.

Partner-in-charge David Chilinski says his primary goal was to "craft an environment that would get people involved." A cascade of colorful wall panels leads patrons down from street level to the 235-seat restaurant. The entire space is an integration of its parts; the colors of the food are picked up in wall panels and furniture, and again in the lighting. Reflective textures, spirally sanded metal laminate, a radiating floor pattern, and a kinetic, industrial chic is intended to encourage patrons to busy themselves concocting their food. An open-ended circulation arrangement invites them to meander through the food stations in no particular order.

"Because Fire & Ice is a restaurant based on participation, the owners wanted a sense of excitement, liveliness, and dynamism in the space," says Mark Connor, project architect. "We wanted to come up with an image that wasn't theme-based but was still very lively."

While the architects worked in this vein, the lighting design was kept relatively simple and economical but with a few

Russell Fortmeyer studies architectural engineering with an emphasis on lighting design, and frequently writes about architecture and urban planning.

Dots of light from generic lamp holders dance among bright geometric cutouts and shapes in Fire & Ice's kinetic space.

PHOTOGRAPHY: © STEVE ROSENTHAL

Project: *Fire & Ice, Cambridge, Massachusetts*
Owners: *John Schall and Jim Miller*
Architect and lighting designer: *Prellwitz/Chilinski Associates—David Chilinski, partner-in-charge; Mark Connor, project architect; Susan Greco, interior design; Chris Brown, designer*
General Contractor: *Shawmut Design & Construction*
Electrician: *TriState Electric*

Recessed downlights with halogen sources light paths and vitrines containing vases and cut flowers. The architects' intent was to light selectively, rather than washing all of the surfaces in the space with light.

surprising twists. Incandescent pendant lighting in the entry and bar area is provided by conventional desk lamps Connor bought in a local store and simply turned upside-down and hung at various heights from tracks. The shades are clear acrylic and translucent vinyl punched with geometric patterns.

"It's a lot of fun to take these objects that people have in their houses and transform them into something that is uncommon," says Connor. Along the high walls of the bar and on architectural fragments in the dining room, a series of red, blue, green, and yellow A-lamps in porcelain sockets "dance," as Connor puts it, across the surfaces. The food stations and grill area are lit with halogen lamps on tracks, which echo the "fire" of the eight-foot-diameter central grill. An outdoor courtyard that seats 45 is lit with caged, bare-bulb construction lights fixed to cables; the layout of bricks in the courtyard's terrace mimics the radiating pattern of the interior dining room ceiling, which is accented with strands of linear fiber-optic lights. Both inside and out, though, lighting is used selectively, bounced on and off different areas, as opposed to illuminating every surface evenly.

Connor says much of the lighting design occurred during the construction process, which suited the architects' desire for the restaurant to have a spontaneous, almost happenstance appearance. In particular, the pendants and the spotlights in the dining area were installed in tracks wherever possible for maximum flexibility. Some of the tracks are on simple dimming systems, but there's no sophisticated control system for employees to manage. Connor says he approaches restaurants very much like theatrical set design: because trends and ideas in restaurant design evolve quickly, it's important to create an impact without spending a lot of money on materials that aren't going to be around forever.

Since its opening almost a year ago, the restaurant has been a hit—both gastronomically and socially. "The energy of the concept combined with the lighting and the colors puts people in the mood to do something experimental," explains Chilinski. Jim Miller, who co-owns the restaurant with John Schall, believes that good design and good food must be combined in equal parts to assure a restaurant's success. "Fire & Ice's design genuinely reflects the restaurant's unique approach to food service," he says, "rather than being a place that serves so-so food but tries to get by on a themed design." ■

Sources

Desk lamps: *Crate & Barrel*
Track lighting and mono-points: *Juno*
Keyless porcelain sockets, galvanized floodlight bases, and metal construction guards: *Leviton*
Lamps: *General Electric*
Custom pendant bases: *Prellwitz/Chilinski Associates*
Custom pendant shades: *Addsource*
Fiber optics: *Lumenyte*

Custom-made pendants hang in the entry and bar. Keyless porcelain sockets with colored lamps accent geometric shapes on the walls.

A New Light Brightens a High School for Creative and Performing Arts

Outside, CAPA is lit by pole-mounted metal-halide fixtures. Extra light is focused on the pediments. Columns are backlit by surface-mounted metal-halide wallwashers. Reproductions of the original lanterns hang over the entry of the building.

by K. Schiffman

Philadelphia's Ridgway Library has been touted as one of the most significant pieces of Greek Revival architecture in the United States. Designed by Addison Hutton and built in the countryside south of the city in 1878 by Dr. James Rush and his wife, Phoebe Ridgway Rush, it was to be a private subscription library located in what they believed would be the next area of town to flourish. Unfortunately, the north end of the city became fashionable instead, and the library experienced limited success. In 1966, when the Library Company moved out, the building was sold to the City of Philadelphia, and when no suitable use for the massive main hall and reading rooms could be found, its windows were bricked up and the lower level was converted into a recreation center for residents of the somewhat depressed South Philadelphia neighborhood.

One hundred twenty years after its birth, the imposing structure at Broad and Carpenter Streets has finally come into its own. Last year, the Ridgway Library was transformed into the Philadelphia High School for the Creative and Performing Arts (CAPA), anchoring the portion of Broad Street that is now being called the Avenue of the Arts. CAPA's 600-odd students had originally been crammed into an old junior high school built to accommodate three-quarters of that number. A few years ago, the story goes, the heads of several organizations—Connie Clayton, former superintendent of schools; Wilson Goode, former mayor of Philadelphia; and Bernard Watson, president of the William Penn Foundation—ran into each other at a cocktail party and hatched a plan to resurrect the underutilized library building by turning it into a new CAPA.

As a restoration project, CAPA was an architect's dream—and that of a lighting designer as well. Alfred R. Borden IV, of the Lighting Practice, Inc., in Philadelphia was the lighting designer for the project. For years, he says, whenever he drove past the grand, imposing library he imagined how the exterior of the building might one day be lit.

Borden believed that a building of such mass and drama represented high ideals—perfect for a school. From the start, his idea was to make the structure glow with the ethereal light it deserved. "It called for a dreamlike quality, like it was floating," says Borden. Even though contemporary lighting equipment would have to be added, Borden's goal "was really to illuminate the space as it once was, not to add something that was not previously there. Inside the building, the goal was to keep the lighting warm and soft-edged, and to feature all of the decorative elements."

The principal architect, James Bennett Straw, AIA, of Kise Straw & Kolodner, was intent on restoring as much of the building as possible to its original splendor. "When we took over the building, the upstairs had been vacant since it was closed," says Straw. "Pure restoration is done primarily for interpretive purposes, to bring a space back to its original appearance. In most parts of the building, that was not possible because the uses of the rooms were going to change. Where this occurred, we did derive the new appearance of the rooms from the original."

One stroke of luck was that the library had never had a lot of money to make improvements, so parts of the building, though worn, had not been completely destroyed or removed. The color, for instance, was relatively easy to restore. Straw had a paint analysis conducted so the original Greek Revival color palette of Etruscan red, orange, cream, and black could be exactly matched. Architecturally, the main hall had retained its original structure of dropped metal ceilings suspended by rods from steel trusses. But below the ceiling there was much deterioration. "In some areas only pieces of the original oak wainscoting remained," recalls Straw. "We had to move some of the pieces and reconstruct others." Plaster decorations and moldings were duplicated in a workshop set up in one of the building's rooms.

The School District of Philadelphia had a few rules for the

K. Schiffman is a freelance writer located in Philadelphia. A graduate of Temple University's School of Communications, she writes on many subjects, including architecture and lighting technology.

Project: *Philadelphia High School for the Creative and Performing Arts, Philadelphia, Pennsylvania*
Owner: *The School District of Philadephia*
Architect: *Kise Straw & Kolodner—James Bennett Straw, AIA, principal-in-charge; Nilo C. Regojo, project manager*
Lighting designer: *The Lighting Practice—Alfred R. Borden IV, principal; Julie Panassow, associate*
Theater design and lighting consultant: *Roger Morgan Studio—Roger Morgan, principal; Martin Vinik, associate*
Mechanical/electrical engineers: *Mark Ulrick Engineers—Ulrick Joseph*

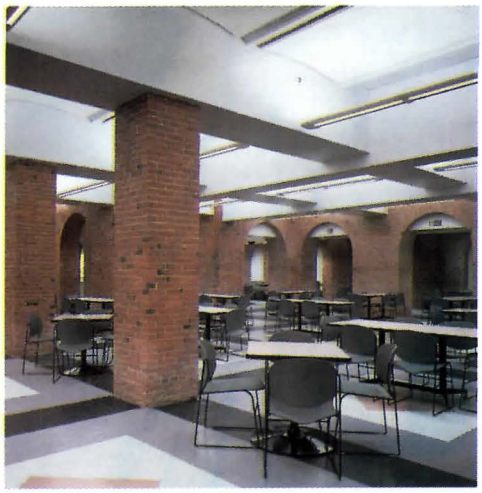
The school library, originally one of the building's reading rooms, is lit with suspended bidirectional fluorescent fixtures.

lighting of the school. High on the list was that it be energy-efficient, easy to maintain, and accomplished with a minimum of lamp types. But these constraints did not keep Borden's design from enhancing the architecture of the building. "The whole project is lit in a deceptively simple way," he says. "We tried to keep fixtures as unintrusive as possible yet still give the building the grandeur it deserves." The objective was to show off all the reconstructive work in a way that seemed natural.

The school's facade was lit by metal-halide fixtures on poles installed near Broad Street. In order to keep light from spilling onto nearby homes, the luminaires have tight beams, which were carefully aimed. Wider beams were focused on the pediments of the front elevation. Surface-mounted metal-halide fixtures with asymmetric reflectors backlight the colonnade.

In the main hall, the ceiling was uplit with metal halide to "mimic the way the space would originally have been filled with daylight from clerestories and several skylights," says Borden. "We have simulated that feeling using electric light. In order to keep the indirect lighting from making the space look flat, we put halogen accent lighting in downlights along the perimeter walls. The halogen light, which is significantly warmer than the metal halide, helps draw one's eye up to the gallery level. Where the skylights and clerestories remain, we used additional fluorescent lighting." Halogen downlights drop warm pools of light on the main hall's grand staircase. In the school's library, which was a reading room in the original Ridgway Library, cable-suspended direct/indirect fluorescent fixtures hang centered below each ceiling coffer.

There are two music rooms accessible from the main hall stairs; one is at the top of the stair, and the other directly across the gallery. High-color rendering metal halide was used to give the music rooms a luminous feeling. "We wanted to create the light level that the students would need to read music and avoid shadows," Borden explains, "and at the same time not disturb all the acoustic treatments on the walls and in the coffered ceilings. We used warm, phosphor-coated metal-halide lamps in downlights with gold reflectors. It gave the rooms the incandescent feel we were looking for." Because metal halide must warm up before restriking, these lights are on timers to keep them from being accidentally turned off during the day.



Ceiling vaults in the rathskellar (top left) are illuminated by bi-directional fluorescent pendants. The new art studios (left) have skylights supplemented by fluorescent and halogen track. The size of the theater (above) and its lighting system can be changed as needed to accommodate performance requirements and audience size.

The space in the basement of the building that was occupied by the city recreation center is now the school cafeteria, or rathskellar. It too has its own reconstruction story. Originally, the brick archways supporting the ceiling were plastered. Once the contractors began to scrape and refinish them, the old plaster started to fail. The painting contractor refused to guarantee the work, because in that condition it would continue to fall off. "The brickwork we discovered when the plaster was being removed for these repairs was so lovely," says Straw, "that we decided to leave it uncovered. Al [Borden] had to go back in and redesign the lighting for the newly exposed dark brickwork. The result is a surprisingly nice set of archways and a beautifully lit room."

"The rathskellar could have been dingy," continues Borden, "so we did a more luminous treatment. Originally the school district wanted wall-mounted lighting fixtures—they wanted them to be just about bulletproof—but they settled for a few wall sconces to add interest to the indirect, out-of-the-way fluorescent uplights we chose to light the vaults. The space is arranged so the columns are darker and the ceiling is brighter—almost a daylight effect, where the ceiling is radiating the light down."

Another addition to the high school is a very user-friendly 350-seat theater. It was built as an extension to the rear of the original building, and its back wall, which had been an exterior stone wall of the building, was left exposed. Roger Morgan, of Roger Morgan Studio, designed the stage, the seating, and the lighting. Morgan was fascinated by the opportunity to work on a theater for young people. "It's a big challenge to design a space that is also a teaching tool," says Morgan. "It's important to give the students a space they can manage. The space needs to be both easy to use as far as lights and sets go and yet adaptable to different types of activity." Morgan built catwalks that span the entire theater—above the seating and the stage—to give students the flexibility to change the lights for both production and audience size. In addition, there are tracks hanging from the catwalks, giving students the ability to physically draw curtains and change the seating capacity. "It's important to make things intimate," adds Morgan.

With all of the utilitarian features needed in an arts school added to the costs of restoring the building, the budget was not that of an ordinary school project. "The school district kept asking how we could be spending more than three times what their rules of thumb suggested," remembers Morgan. "I would troop myself in front of them and remind them that this was not a typical high school."

The restored CAPA aspires to capture the spirit of architecture during the Greek Revival period. As an adaptive reuse project, it has regained its original opulence. And though it has an imposing visage, CAPA still manages to be user-friendly—important for an educational institution.

Borden, trained as a theatrical lighting designer by education, was endeavoring to paint the building with light, to give it a distinct feeling. "Onlookers should sense that the building is attempting to reach for a grander, more celestial state of achievement," says Borden. It is exactly what a high school for the creative and performing arts, filled with young minds and raw talent, should be. ■

Sources

Downlights: *Kurt Versen*
Atrium lobby lights: *Sterner*
Accent lights: *Lightolier*
Exterior facade lighting: *Arc Sales*
Fluorescent pendants: *Peerless Lighting, Litecontrol*
Historic lantern reproductions: *Spring City*

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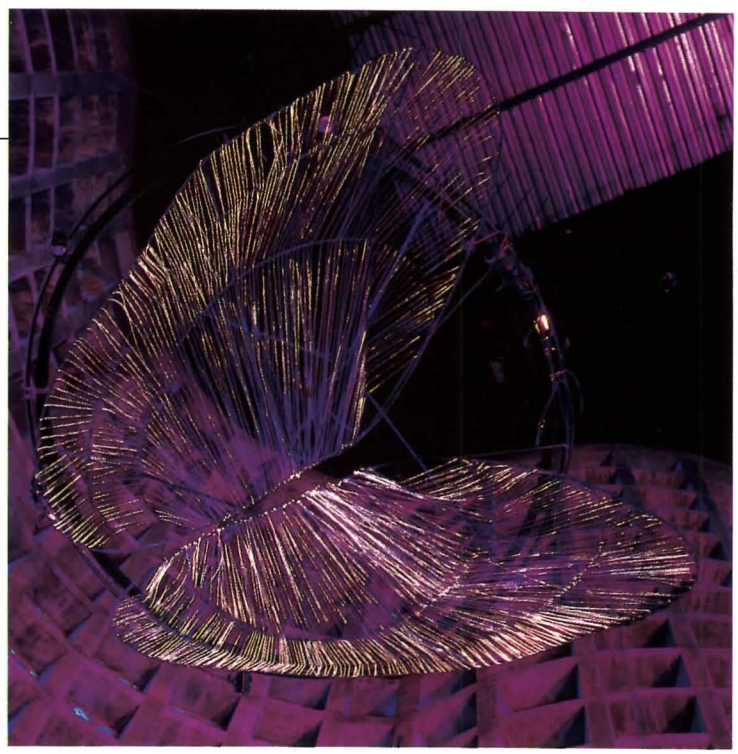
CIRCLE 76 ON INQUIRY CARD

Three Interactive Lighting Installations Fill a Blue-edged Darkness

By David Simon Morton



A butterfly and cocoon from *Satori* (above and right). A sensor in each cocoon detected a visitor's presence, illuminating the fiber optics of a butterfly above. Each wing contained 420 fibers.

The Great Hall of the New York Hall of Science, designed by architect Wallace K. Harrison for the 1964–65 World's Fair, is supposed to feel like outer space. The 80-foot-high undulating wall that surrounds the hall is a grid of frosted cobalt-blue panes that, when backlit by the hardest daylight, glow with the soft strength of starlight. It is essentially a well-crafted void, a perfect space, perhaps, for meditation. But it needed "Lightforms '98," a spring exhibition of three kinetic lighting installations sponsored by Art and Science Collaborations, Inc., to make it as exciting for kids as, say, the popular Science Playground just outside.

Of the three installations, *Lost Referential,* by Montreal artists Louis-Philippe Demers and Bill Vorn, was the most fully integrated into the hall's architecture, giving the space a brain through artificial intelligence (AI). Thirty-two pyroelectric sensors spaced along the walls detected visitors' movements, forwarding the information to a computer hidden in a storeroom. As a first response, one of eight cyberlights spun around and spotlighted whoever tripped the sensor.

An AI program that the artists developed processed the data collected from the sensors, conceiving responsive patterns of light. Sometimes the lights swarmed around an area where people were concentrated. As if the program had changed its mind, the cyberlights then scattered and collected in empty areas of the hall. Sometimes the lights just moved at random.

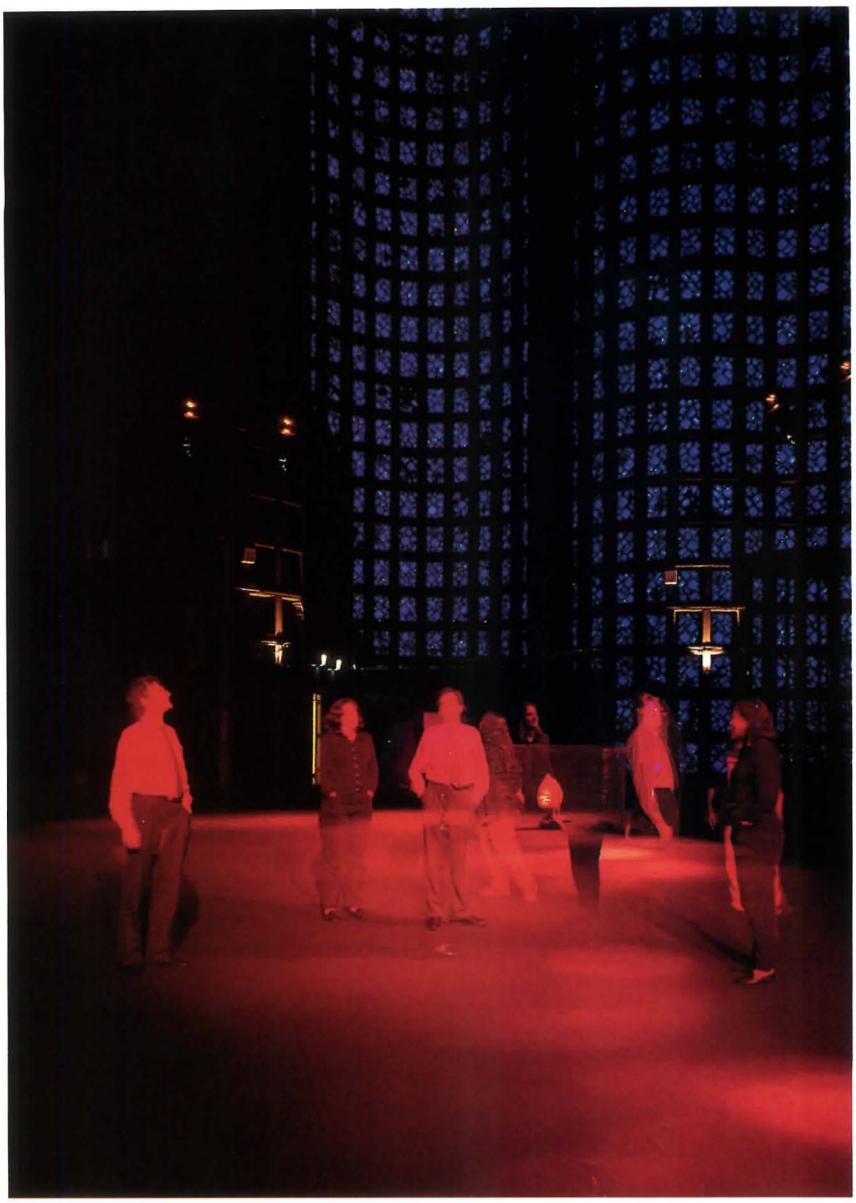
Demers and Vorn also gave the hall a heart, an amplified beat corresponding to the human pulse triggered when someone put their finger in an EKG monitor (subject and monitor were lit by a Source 4 lamp). Sixteen Fresnel lights, their amber glow contrasting with the cobalt blue walls, pulsed to the same beat. With eight different sound samples programmed by the artists playing in eight different speakers placed around the room, the installation was quite loud.

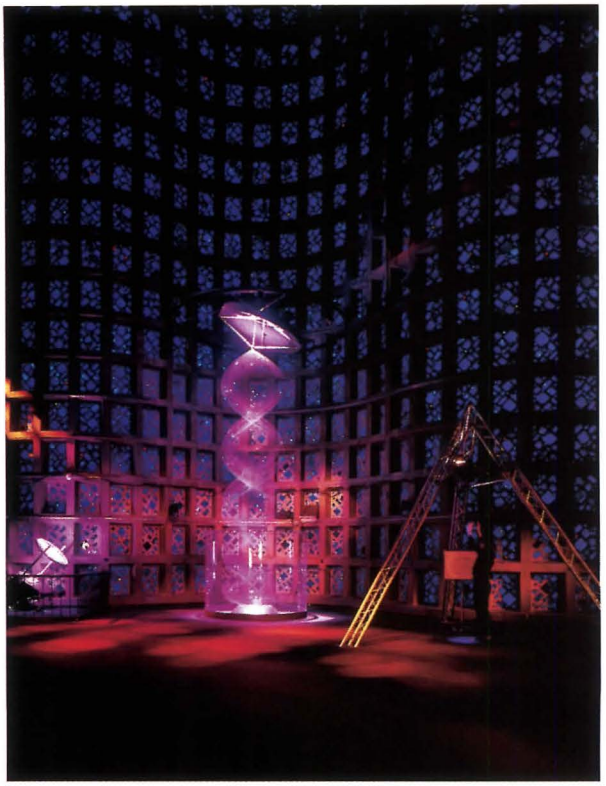
Equally dynamic, if less sprawling, was English artist Paul Friedlander's *Dark Matter,* a vertically suspended, whirling nylon rope of changing colors and speed that filled one of the Great Hall's ten curved bays to a height of 25 feet. Friedlander, who has a degree in physics, spent much of his career designing stage lighting for such rock acts as Pink Floyd before he marshalled his interests for his current profession: building light sculptures that represent theoretical physical phenomena. *Dark Matter* is not dark. The sculpture is a visualization in light of what some scientists have theorized are cosmic strands that, in invisible concentrations, make up 90 percent of the universe's mass. Friedlander was also inspired by the spinning motion of a jump rope.

Below, a turntable housed in a plywood casing powered the rope's movement. Above, a flat Mylar "space mirror," secured by steel wire cables, was tilted at an angle of 15 degrees in relation to the rope. On the floor to one side was a 4000W HMI arc lamp fitted with a wheel of several different color filters that rotated at high speeds. To the other side stood a pyramidal control station, constructed of thin-walled aluminum tubing, where two downward-pointed sound beams (paired with PAR lamps) awaited visitor interaction.

Moving one's hand in the path of one sound beam altered the speed at which the rope spun. Movement below the other sound beam altered the speed at which the color wheel rotated. The faster the rope spun, the louder the whirring sound accompanying it. The faster the color wheel rotated, the more the vertical bands of color on the dynamic column of rope appeared to converge.

The effect was chromastrobic, a trembling spectrum achieved without the splitting of light. The arc lamp directed light through a 35-inch-diameter Fresnel lens to the mirror, which reflected a column of light downward onto the moving rope. Even though the color wheel in the arc lamp was rotating rapidly, different colors appeared on the rope at the same time because it, too, was in a whirl. *Dark Matter* emitted enough





Guided by artificial intelligence, the cyberlights of *Lost Referential* (left) alternately chased and fled from visitors. At times the lights of *Lost Referential* converged on the dynamic spinning rope of *Dark Matter* (above). Visitors could manipulate the speed of the rope and how colors appeared on it.

energy to activate the sensors of *Lost Referential,* causing that installation's cyberlights to occasionally converge on the moving rope.

Hanging at eye level toward the middle of the Great Hall were three glowing cocoons, designed by Dutch artists Dirk Rutten and Jeroen Kascha. At first their installation appeared simple: conventional 40W bulbs encased in translucent paper, with the sounds of crickets chirping overhead.

But there was more: unseen in the dark were heat sensors jutting out from the skin of the cocoons. When a person came within six feet of the installation and stayed for six seconds, a control box sent a signal up a 40-foot electrical wire into the darkness above. The light in the cocoon went off and, accompanied by the sound of a magic wand, a butterfly with a 15-foot wingspan appeared overhead.

THE GREAT HALL WAS A WELL-CRAFTED VOID IN NEED OF SOME EXCITEMENT.

Fiber optics were at work: a computer-controlled 150W or 200W illuminator at the center of the aluminum-frame butterflies lit up 420 fibers in each wing, the colors changing with each metamorphosis. After three seconds, the control box in the butterfly shut off the light, and the cycle was reset. Before the butterfly appeared again, the observer would have to step outside the six-foot radius.

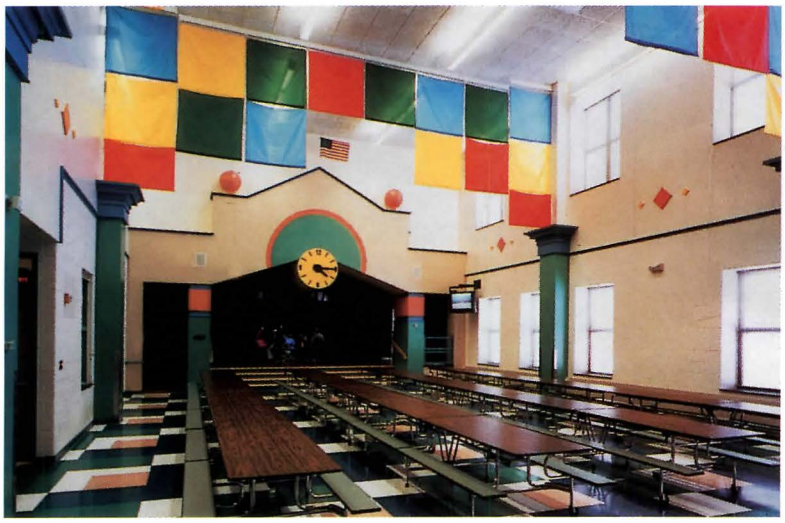
This installation was called *Satori,* the Japanese Buddhist term for sudden enlightenment, but because of the six-second delay, it took the kids roaming the hall a while to figure out why the butterflies were appearing. Throughout the hall, it was as if light wasn't moving at the speed of light, but had been slowed somehow for the sake of metaphor, and for play. ■

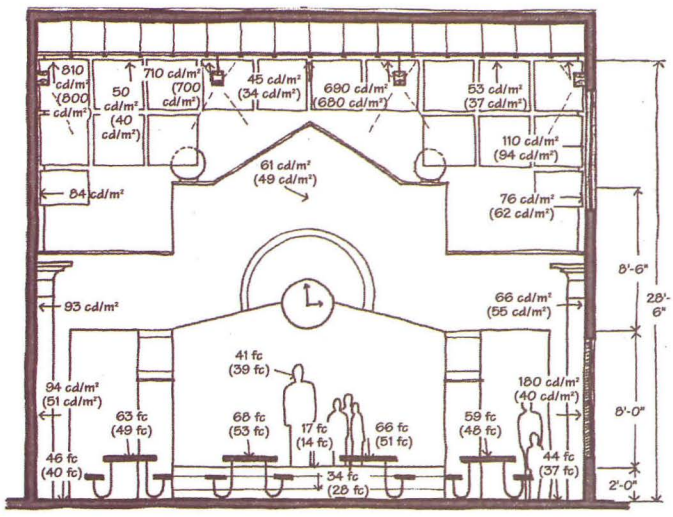
Sources

Cyberlights (*Lost Referential*): *High End Systems*
Lightboard (*Lost Referential* and *Dark Matter*): *Leprecon*
HMI 4000W arc lamp (*Dark Matter*): *KOTO*
Ultrasonic sensors (*Dark Matter*): *Soundbeam*
Side-emitting fibers (*Satori*): *TPR Enterprises and Lighting Projects of Philips*
Halogen lamps (*Satori*): *TPR Enterprises (150W) and Lighting Projects of Philips (200W)*
Fiber-optic illuminators (*Satori*): *TPR Enterprises and Lighting Projects of Philips*
Infrared sensors (*Satori*): *Macro/Leviton*

Case Study: An Elementary School that Saves Energy and Is Visually Comfortable

by Paula A. Rodgers





The cafeteria is lit with continuous rows of wall- and cable-mounted fluorescent up- and downlighting. The stage is lit with track lighting fitted with color filters and louvers.

Elementary schools offer the architect and the lighting designer a variety of lighting challenges, from classrooms and cafeterias to gymnasiums. Lighting design in schools is far different now than it was in the 1950s and 1960s, when more light was equated with better sight. Lighting design for today's schools instead emphasizes visual comfort, energy conservation, and the intelligent integration of daylight into learning spaces.

Rensselaer Polytechnic Institute's Lighting Research Center investigated the effectiveness of the lighting schemes used in the recently opened 100,000-square-foot Mary McLeod Bethune Elementary School in northeast Rochester, New York, by surveying students and teachers about their response to the lighting and by looking at the school's energy use. The findings of the center's DELTA (Demonstrations and Evaluation of Lighting Technologies and Applications) team, presented here in a case study, offer lessons for both lighting designers and architects.

The colorful two-story facility accommodates up to 800 children in preschool through fifth grade. One of the goals of the design was to give the large school a more intimate scale, so that the children could relate to each other in smaller groups. To accomplish this architecturally, SWBR Architects, who designed the school building, used offset corridors in the large L-shaped building to subdivide it into "neighborhoods." Another goal of the design was to allow for technological advances in education: currently each classroom in the school is connected to a district-wide video learning program through computers and a television system.

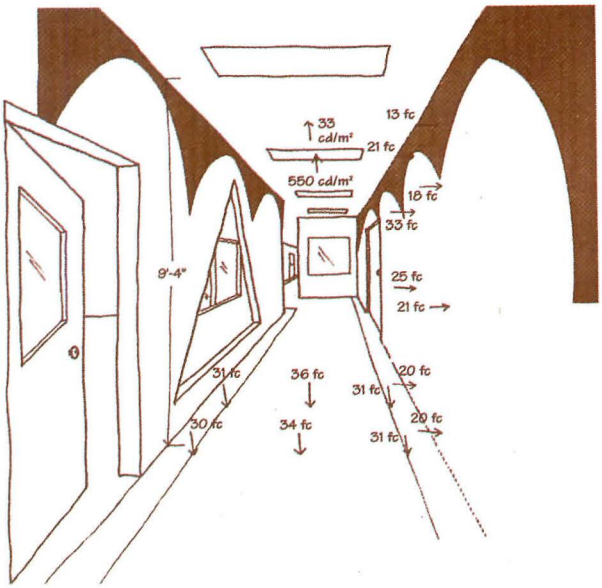
Paula A. Rodgers was the project coordinator and team leader for the Lighting Research Center's DELTA study of the Mary McLeod Bethune Elementary School.

Lighting objectives

The objectives for the school's lighting, designed by architects Tom Ritzenthaler and David M. Kaye, of the Rochester City School District, and M/E Engineering, were simple: to use energy-efficient lighting products to reduce lighting energy use; to simplify maintenance by limiting the number of lamp types and by using lamps that the district already stocks; to provide low-glare ambient lighting to produce a visually comfortable environment for students and teachers; to increase energy savings by automatically switching off lighting when classrooms are not in use; and to integrate windows and skylights throughout the building to give students and teachers a connection to the outdoors.

Project: *Mary McLeod Bethune Elementary School, Rochester, New York*
Owner: *Rochester City School District*
Architect: *SWBR Architects*
Lighting Design: *Rochester City School District—Tom Ritzenthaler, associate architect/project manager; David M. Kaye, assistant architect, facilities; M/E Engineering*
Site Sponsors: *Rochester Gas and Electric Corp.; New York State Energy Research and Development Authority*
Evaluation: *Rensselaer Polytechnic Institute Lighting Research Center DELTA team—Naomi Miller, program director; Russell Leslie, Mark S. Rea, reviewers; Paula A. Rodgers, project coordinator; Naomi Miller, evaluation team leader; Judith Block, publication manager; Claudia Hunter, editor; Naomi Miller, Conan O'Rourke, Paula A. Rodgers, evaluation team; Peter Boyce, John Bullough, Neil Eklund, Andrew Johnson, Devki RajGuru, Sandra Vasconez, technical assistance*

Corridor walls use patterns to help students identify their "neighborhoods." One-by-four-foot fluorescent troffers light the way.



Energy efficiency was achieved by using T8 fluorescent lamps powered by electronic ballasts in classrooms, corridors, the library, and the cafeteria. These have a color-rendering index of 85 and a correlated-color temperature of 3500K (neutral). The gym received a combination of energy-efficient high-pressure sodium and metal-halide lamps. Ultrasonic occupancy sensors were used in classrooms to detect movement and to switch lights off when the rooms were not in use.

Typical classrooms

The typical 1,000-square-foot classroom at Bethune Elementary School has a 12½-foot ceiling with continuous rows of pendant-mounted fluorescent uplights. Each fixture has two rows of slots on the bottom, which contain perforated white metal panels whose openings provide a small amount of surface brightness. Uplights are spaced nine feet apart and suspended with aircraft cable 18 inches from the ceiling to the top of the luminaire. To add visual interest to the classrooms, the soffits and soffit faces were painted in bright colors.

During the day, with the classrooms' horizontal blinds partially open, DELTA measured horizontal illuminances at student desks of 38–48 footcandles (fc) (410–520 lux [lx]). Nighttime desk illuminances were 30–49 fc (320–530 lx). These illuminances comply with the State Education Department of the University of the State of New York's guideline of a minimum of 30 fc maintained on classroom desks. The daytime and nighttime vertical illuminances in the center of the main chalkboard are about 27 fc (290 lx), very close to the state's guidelines of 30 fc on chalk- and display boards.

Students learn to use computers at a work area in the back of the classroom. Ceiling luminances in this part of the classroom range from 560 candelas per square meter (cd/m^2) directly above the luminaires to 110 cd/m^2 between luminaires. This 5:1 luminance ratio meets the Illuminating Engineering Society of North America's Recommended Practice for Office Lighting (ANSI/IESNA RP-1-1993) for spaces where video display terminals are used.

In each classroom a television is suspended in one corner and is operated by the teacher with a hand-held infrared remote control. The electronic ballasts in the uplights interfere with the remote control, so the teacher must turn off the lights in order to operate the television. This is a minor annoyance for the teachers, but the darkened room actually enhances the visibility of the television. All lighting is controlled by an ultrasonic occupancy sensor near the center of the main classroom area.

Vaulted-ceiling classrooms

Some of the classrooms on the second floor of the school have vaulted ceilings with a 26-foot apex. Asymmetric fluorescent uplights are mounted around the perimeter of the room 13½ feet above the finished floor, and a 12-foot-long uplight with symmetrical distribution is suspended at the same height in the center of the vault. The soffits are painted in bright colors, which continue up the vertical surface at the base of the vaulted ceiling. Above the chalkboard, a continuous linear luminaire is recessed in the soffit for supplemental lighting on the board. The computer work area is lighted by compact fluorescent downlights recessed in the soffit.

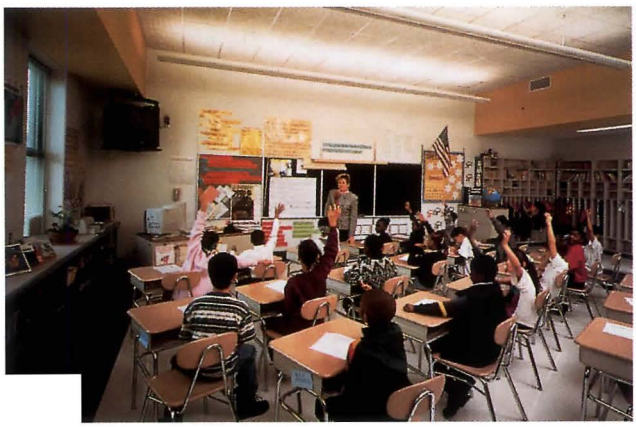
During the day, with the horizontal blinds open and all lights on including the chalkboard light, desktop illuminances range from 26 to 39 fc (280–420 lx). At night the illuminances are similar, ranging from 26 to 36 fc (280–390 lx). The vertical illuminance in the center of the chalkboard is about 20 fc (220 lx) day and night.

The illuminances that DELTA recorded in the vaulted classrooms are slightly lower than in the classrooms without vaulted ceilings. This difference is probably due to the color of the wall above the uplights, which is as low as 10 percent reflective, absorbing light that would otherwise be reflected back into the space. DELTA compared the illuminances in these rooms to those in the vaulted-ceiling art room, where all the wall and ceiling surfaces were painted white: illuminances on the desks were 20 fc (210 lx) higher in the art room.

Gymnasium, library, cafeteria, and corridor lighting

The gym can be divided into two small courts. The 31-foot-high barrel-vaulted ceiling runs lengthwise southeast to northwest. Sunlight falls on the southeast- and southwest-facing translucent fiberglass windows all

Typical classrooms (below left) use indirect fixtures that have slots on their undersides to allow a small amount of direct light into the room. Similar fixtures are used in vaulted classrooms (below right), but they are augmented by fixtures mounted on the side walls. The library (right) uses indirect fluorescent fixtures similar to those in the classrooms to produce 45 footcandles at the desktop surfaces.



day, providing diffused daylighting. In addition, HID luminaires light the ceiling, which is made of metal decking painted white. These uplights, mounted on the bottom chord of the ceiling trusses, six to nine feet from the ceiling, contain one metal-halide lamp and one high-pressure sodium lamp in the same housing. Even though the two light sources have very different color appearances, the luminaires are far enough from the ceiling that the colors combine to produce a yellow-white light on the ceiling and the floor below. Illuminances at the floor range from 35 fc (380 lx) near the wall behind the basketball hoops to 68 fc (730 lx) in the center of the gym. Vertical illuminances at five feet above the floor average 39 fc (420 lx), far above the minimum of 20 fc required by New York State for gyms.

In the library, continuous rows of uplights are mounted on an eight- to ten-foot spacing, providing an average of 45 fc on tabletops in the reading area. This exceeds New York State's minimum requirement of 30 fc at desk height in libraries. In the stack area, vertical illuminances range from 22 fc (240 lx) at the highest shelf to 14 fc (150 lx) at the lowest. Titles on book spines are easy to read on all the shelves. At the circulation desk, CFL downlights recessed in a dropped soffit boost light levels to 64 fc (690 lx).

The lunchroom is a two-story space that uses continuous rows of fluorescent up- and downlighting, pendant- and wall-mounted about one foot from the ceiling. The short suspension length prevents the uplight from spreading evenly on the ceiling, so bright stripes of light are visible above each luminaire. The two-lamp downlight section provides an average of 50 fc (540 lx). Horizontal blinds, usually closed, shade windows on the south wall. During the day, with all the lights on, illuminances at the lunch tables average 64 fc (690 lx). Brightly colored banners echoing the accent colors in the classrooms are suspended from the ceiling in a staggered pattern, catching light from the linear luminaires as well as from the high windows.

There is a large and very colorful proscenium stage at the east end of the cafeteria, where students rehearse and perform school plays and concerts. The stage is deep, with several rows of black curtains and track lighting controlled by a small theatrical dimming system. The track

ELEMENTARY SCHOOLS OFFER LIGHTING DESIGNERS A VARIETY OF CHALLENGES.

lights are fitted with louvers and colored filter accessories, which the students can use to produce a variety of stage-lighting effects. Work lighting is provided by fluorescent wraparound-lensed luminaires surface-mounted to the ceiling.

Corridors have different multicolored patterns in the walls and floor tiles to help students identify their school "neighborhoods." Recessed one-by-four-foot lensed fluorescent luminaires are spaced 10 feet apart, providing very uniform floor illuminances averaging 32 fc. They produce a slight scallop pattern on the walls, where student projects are displayed,

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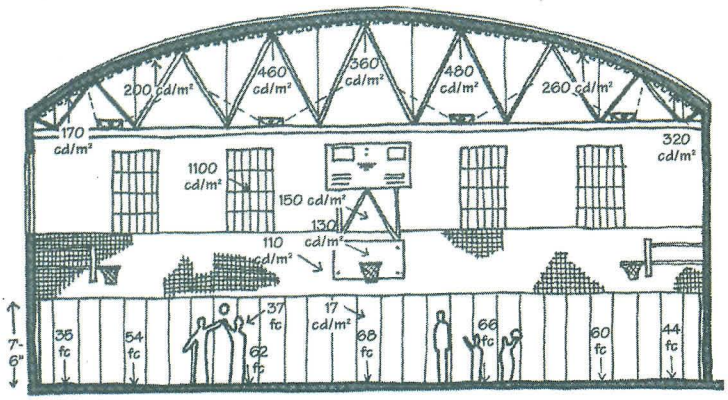

The gymnasium is lit by uplights mounted to the bottom joists of the ceiling structure. Each fixture has a metal-halide and a high-pressure sodium lamp inside that produce a yellow-white light.

but the maximum to minimum uniformity ratio is only 2.5:1. This even lighting makes the corridors seem bright and open, so students and staff can easily see where they are going.

Evaluating the lighting

The DELTA team surveyed users at the school to get their impressions of the lighting. One teacher who taught in a vaulted-ceiling classroom felt that her room was not bright enough; she said her students sometimes had to come closer to the board to see what she was writing. DELTA compared photometric measurements in this room, whose upper wall surfaces were painted green, with the same type of room where all the surfaces were painted white. DELTA discovered that the low-reflectance accent paint color lowered the illuminances at desk height by about 30 percent. DELTA recommended that the school district paint all the surfaces above the uplights white to increase the amount of reflected light in the space.

Children also provided valuable feedback about the lighting. DELTA surveyed three classes of fifth-grade students, asking them to rate the quality of lighting in each of the evaluated areas and then compare it to the lighting in similar areas of the school they had attended the year before. Most of the students thought the lighting in the gym, the classrooms, and the corridors was good and that it was better in this school than in their previous school. Almost half of the students rated the cafeteria lighting as fair, but they still found it better in this school than in their previous school. A high percentage of students did not rate the lighting in the library, and although most of those who did respond rated the library lighting as good, they said the lighting in last year's school library was better. This apparent contradiction may be due to the fact that students had spent little time in the new school's library.

Lessons learned

Indirect lighting can provide a visually comfortable classroom environment while using a modest amount of energy. In the case of Bethune Elementary School, the combination of energy-efficient lamps, ballasts, and luminaires; automatic controls; high ceilings; and adequate suspension lengths produced a classroom lighting environment that is pleasing in appearance and visually comfortable for teachers and students, at a lower lighting power density than energy codes require.

When relying on reflected light to illuminate a space like the vaulted-ceiling classrooms, the Bethune experience suggests that designers optimize surface reflectance by specifying light colors. The best solution is to use a color with a reflectance that is near the 75 percent reflectance of most commercial ceiling systems.

Mixing metal halide and high-pressure sodium in uplighting can be attractive. The six- to nine-foot distance between the uplights and the ceiling of the gym allows both colors of light to combine enough to produce a homogenous yellow-white light that reflects off the ceiling and down to the floor.

Some operational concerns were revealed in the course of DELTA's evaluation. Immediately after the school opened, a few teachers reported lights turning off in their classrooms when the rooms were still occupied. Once the sensitivity of the ultrasonic occupancy sensors was adjusted, however, reports of "false offs" in classrooms were reduced dramatically.

The DELTA team found that despite these minor problems, occupancy sensors do help save energy. The team used input watts from manufacturers' literature to calculate the lighting power density (LPD) for the school. The connected LPD for the entire building came to 1.06 W/ft≤. The in-use LPD during core school hours (8:00 a.m. to 3:00 p.m. weekdays) decreases to 0.88 W/ft≤. Much of the difference reflects DELTA's observation that many spaces, particularly the classrooms, used occupancy sensors that switched lights off during unoccupied periods of each school day. In addition, many spaces adjacent to the classrooms (storage areas, closets, lounges, copy rooms, and restrooms) were lighted only for brief periods during the day.

DELTA's evaluation of Bethune Elementary School suggests that creating lighting for educational facilities with a high degree of visual comfort as well as a large measure of energy conservation is an entirely feasible goal. ■

Sources

Wall and suspended indirect fluorescent fixtures: *Peerless Lighting, National*
Recessed compact fluorescent downlights: *Capri Lighting*
Incandescent track: *Capri Lighting*
HID uplights: *Lam Lighting*
Fluorescent troffers: *Daybrite*
Electronic ballasts: *Advance Transformer, Valmont, Goldstar*
Occupancy sensors: *Universal Energy Control*

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Barbara Kristiansen, Lighting Designer
Light/Resource & Design, Inc., Rhode Island

Lighting designer Barbara Kristiansen knows the ultimate judge of her work is how well it functions. "I design within architectural and interior spaces to accent, reveal and illuminate. To me, dimming is crucial." Ms. Kristiansen also specifies Lutron lighting controls because of the quality of their technical support. "When you call with a question, you talk to an engineer; someone who can help you with even the toughest problems and give you *accurate* information. That's important to me and the electrical contractor."

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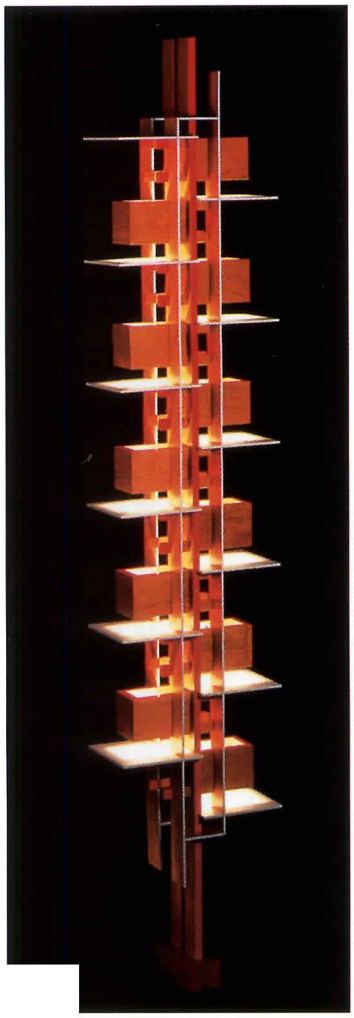
CIRCLE 54 ON INQUIRY CARD

LIGHTING BRIEFS

▼ Sculptural form

Based on Frank Lloyd Wright's Taliesin pendant, Yamagiwa's cherry wood reproduction has 11 incandescent 25W lamps concealed within a series of open-ended boxes. The pendant measures about 7 feet 4 inches high, 16½ inches wide, and 8 inches deep and weighs 35 pounds. 818/879-8611. Yamagiwa, Westlake Village, Calif. **CIRCLE 200**

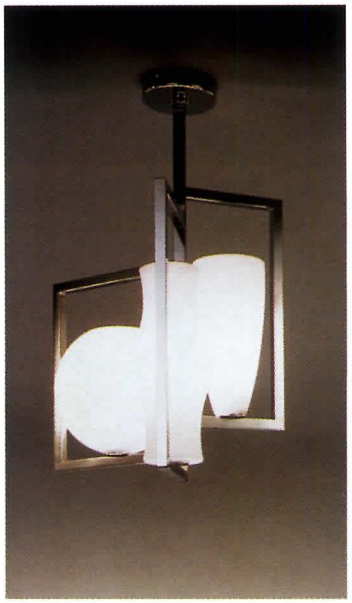


► East meets West

And modern meets traditional with the Diya Lamp (MJL003), part of the Asian Fragment Collection, designed by Michael Jansen, an architect and a Fulbright scholar in Asian studies. Handcrafted in teak, the table lamp was inspired by a Chinese pavilion roof. The details in the handmade cloth shade include imbued natural chlorophyll impressions from the Neem leaf. The lamp is 29 inches high with an 18-inch-diameter shade. 212/254-1645. Michael Jansen Studios, New York City. **CIRCLE 201**

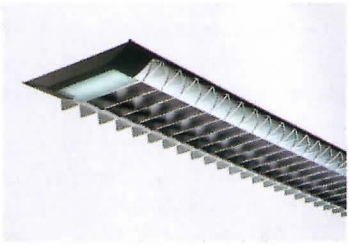
▼ 3D suspension

Designed by Andrea Anastasio, Artemide's Galatea Suspension 3 consists of a polished, chromium-plated metal structure and satinized opaline blown-glass diffusers. Part of the Galatea series, which includes a floor lamp and wall sconces, Suspension 3 measures 29 by 18 inches. 516/694-9292. Artemide, Farmingdale, N.Y. **CIRCLE 202**



▼ Elegant housing for T5

Zumtobel's Liberto can be connected in unbroken runs or capped with stylish end pieces. It has 3½-inch-deep housing and is available in 6- or 9-inch apertures with a low-energy T5 fluorescent source. 800/932-0633. Zumtobel, Highland, N.Y. **CIRCLE 203**



▼ Simple sconce

Neidhardt's 801 S wall sconce is made of extruded metal and textured white glass. This fixture can be outfitted with either two 13W compact fluorescent lamps and integral ballast or two 60W minican incandescent lamps. Optional plastic and metal shades are also available. The fixture measures 8½ by 10 inches. 800/978-8828. Neidhardt, San Francisco. **CIRCLE 204**

◄ High-powered pendant

Designed for high-ceiling applications, Lightolier's Pendalytes can be used with compact fluorescent, metal-halide, or incandescent light sources. The Pendalyte provides either direct/indirect (80/20 percent) light distribution with an acrylic refractor or total direct distribution with an aluminum refractor. The fixture is available with a 9-, 12-, or 16-inch diameter and with a dimming ballast. 800/215-1068. Lightolier, Fall River, Mass. **CIRCLE 205**

▲ Curvy carvings

Emily McLennan's Nina lamp is hand-turned from layers of Baltic birch plywood; it is also available in solid maple and solid alder. Height options range from 26½ to 29 inches. Shades can be either translucent white or opaque black, in paper or corrugated cloth. Available with black or metallic anodized aluminum fittings. 612/339-7746. Emily McLennan, Minneapolis. **CIRCLE 206**

DESIGNED BY MARCELLO ZILIANI

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CIRCLE 55 ON INQUIRY CARD

LIGHTING BRIEFS

► Three-circuit fixture

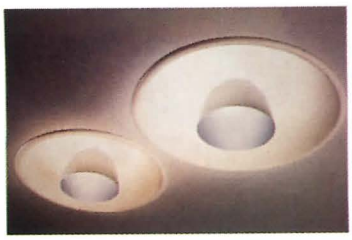
LAM's Mobilé combines T8 and T5 fluorescent uplighting and diffused downlighting with halogen accents. It can be ceiling- or span-mounted or suspended. 714/549-9765. LAM Lighting Systems, Santa Ana, Calif. **CIRCLE 207**

◄ Off the wall

The Glassglass series, by designer Paolo Rizzatto, is a collection of blown-glass diffusers in a variety of sizes, shapes, and colors. The ceiling-mounted fixture, shown here (it can also be attached to the wall), has a 250W double envelope halogen. A diecast metal stirrup-type handle is secured to the circular opening of the various diffusers. The stirrup is secured to a metal socket/cable support. 212/989-6265. Luceplan, New York City. **CIRCLE 210**

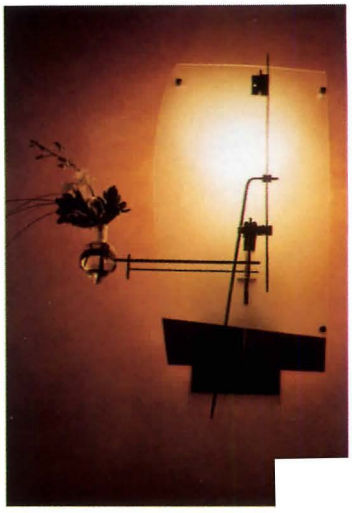
▼ Track heads

The Lazer series from Halo Lighting, a brand of Cooper Lighting, is a group of 41 lighting track heads designed for residential or commercial use. Available in line- and low-voltage, lampholder styles range from roundbacks, flatbacks, and step cylinders to high-tech gimbal rings and low-voltage luminaires. 708/956-8400. Cooper Lighting, Elk Grove Village, Ill. **CIRCLE 208**



▲ Dish-shaped and diffused

Ardee's Indigo Circle lighting fixtures feature two energy-efficient round, semi-recessed, compact ceiling luminaires constructed from natural-finish galvanized steel and spun steel. The trim is an acrylic opal diffuser with a sandblasted plate-glass disk. 704/482-2811. Ardee Lighting, Shelby, N.C. **CIRCLE 209**

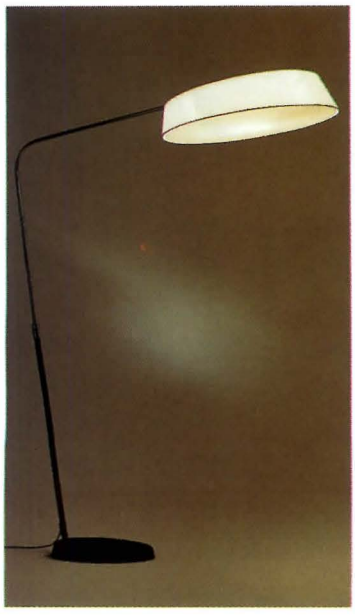


▲ From the deep

Named for the steel piece that pierces through the Lexan screen, the Shark light, designed and fabricated by architect David Celento and Adam Farmerie, combines fixed and moving parts. 412/242-9500. Celento Design, Pittsburgh. **CIRCLE 213**

▼ Long-necked lamp

The asymmetrical Magna adjustable floor lamp, produced by Metalarte in Barcelona for Hinson Lighting and recently exhibited at the Milan furniture fair, is shown here in a black metallic finish with a translucent 22½-inch elongated oval shade. The height of the lamp ranges from 57 to 64 inches, with an extension that includes a 49-inch shade. The lamp requires a 250W bulb. 718/482-1100. Hinson and Company, Long Island City, N.Y. **CIRCLE 211**



▲ Calder-esque

The Spiral-Eye by Rae Douglass, shown here in a Maui residence, measures 10 feet high and 4 feet wide. The sculptural chandelier has an antique copper finish on the arms and fins, and polished aluminum on the lights. 800/206-1327. Rae Douglass, Tucson. **CIRCLE 212**

▼ Pedestrian-scale

Reminiscent of a turn-of-the-century gas lantern, this pole-mounted outdoor area light, designed by Prescolite Moldcast and called Pedestrian ContraCline, is acorn-shaped and provides low-glare illumination from 10- to 16-foot mounting heights. 510/562-3500. Prescolite Moldcast, San Leandro, Calif. **CIRCLE 214**

LIGHTING BRIEFS

▲ Track construction

The Capri ESP track adapter from Thomas Lighting works with the Capri track lighting system and with several other brands, including Halo, Con-Tech, Edison, and Juno. The application is UL-listed when used with these track systems. When the adapter is inserted, sensors determine the inside configuration of the track rail, adapt the contacts to it, and then lock it into position. 213/726-1800. Thomas Lighting, Los Angeles. **CIRCLE 215**

▼ The highs and lows

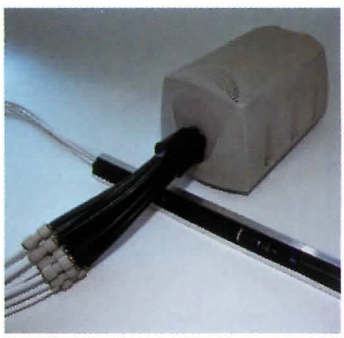
The M03, a high-output, low-wattage metallic gray aluminum pendant, was created in collaboration with Danish designer Mads Odgaard. It relies on 3/18W quad compact fluorescent lamps and has an electronic ballast. 954/349-2525. Poulsen Lighting, Fort Lauderdale. **CIRCLE 216**

▲ Concealed luminaires

Kim's Lightvault collection includes five heavy-duty concealed luminaires for outdoor use. The one shown here is strong enough to withstand a car's weight—it has a reinforced composite housing and is trimmed in heavy-cast bronze. Other optical configurations include narrow flood, spot, HID PAR lamps, wallwashers, and an adjustable eyeball-style trim. 25/7-year limited warranty. 626/968-5666. Kim Lighting, City of Industry, Calif. **CIRCLE 217**

▼ A surge of energy

Designed to work with Unison's Optiflex fiber-optic cable in diameters of 3.2 mm, 5.1 mm, and 7.1 mm, the company's new indoor illuminator offers high light output and low energy consumption. It has a 68W metal-halide lamp, which provides a color temperature of 3500K and a color rendering index of 75. The optical train is sealed in the illuminator to prevent light loss due to dust or dirt. The illuminator has an average lamp life of 5,000 hours. 888/UNISON9. Unison, Solon, Ohio. **CIRCLE 218**



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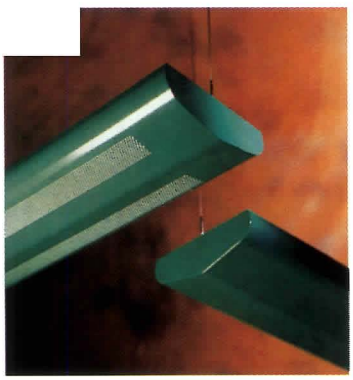
LIGHTING BRIEFS

► The American Dream

The Eugene sconce, from the American Glass Light Company, measures 10 inches wide, with an overall height of 8 inches. Constructed from satin aluminum and white sandblasted glass, the incandescent standard lamp requires two 60W candelabras; one 13W quad fluorescent is optional. ADA-compliant. 212/371-4800. American Glass Light, New York City. **CIRCLE 219**

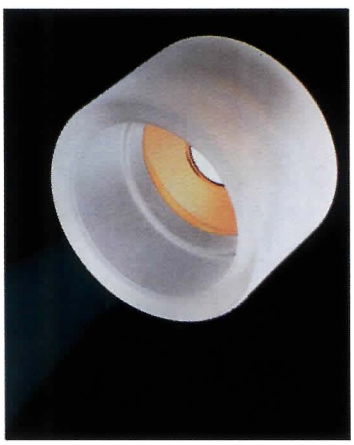
► Transformer integration

The traditional transformer required for low-voltage lamps has been integrated into Philips' ExhibitPAR halogen lamp for museum and gallery lighting applications. With an average life of 5,000 hours, the lamp is available in a 20W PAR 20 (2900K) and 35W PAR 38 (3000K) design. The ExhibitPAR's color rendering index is 100. 800/555-0050. Philips Lighting Company, Somerset, N.J. **CIRCLE 220**



◄ Suspended fluorescent

Made with a perforated or solid housing of heavy 20-gauge steel, Columbia Lighting's Indecon ceiling-suspended ambient indirect luminaire is available in one-, two-, and three-lamp units. The fluorescent tube on the one-lamp model and the middle tube on the three-lamp unit are angled diagonally to maintain consistent fixture lengths. 509/924-7000. Columbia Lighting, Spokane, Wash. **CIRCLE 221**



◄ Cup and saucer motif

Fiberstars' FE-4133-XX accent light is a shallow, cylindrical glass fixture that measures 1¼ inches deep and 1¾ inches in diameter. Designed to look like a demitasse cup, the FE-4133-XX is made of lightweight, corrosion-resistant aluminum with polished gold center rings that mount into the base of each unit. 800/FBR-STRS. Fiberstars, Fremont, Calif. **CIRCLE 222**

For more information, circle item numbers on Reader Service Card

NEW PRODUCTS

TRADE SHOW ROUNDUP: INSIDE THE INDUSTRY'S BOOTHS

The overriding message on the trade show circuit this year has been: "If your business isn't doing well, you shouldn't be in business." A booming economy—with a nod back to the '80s, when manufacturers hosted big parties—made the scene not only informative but fun. There were plenty of new products as well as heavy foot traffic that led to actual sales, making manufacturers happy. This page presents an overview of the trade shows from the first half of the year. The trends spotted most often were mosaic tiles and paneled office systems.
—Elana H. Frankel, Products Editor

The first major show of the year was for the National Association of Home Builders (NAHB). Engineered wood products were everywhere, and companies finally took a clear position on the new product standard, PRI-400 (RECORD, March 1998). At Owens Corning, Mira Vista—a wood shake alternative made of slate and clay, reinforced with fiberglass and bonded with resin—was introduced for the West Coast.

At Orlando's Coverings show and at Cevissama, Spain's ceramic and tile show in Valencia, mosaic tiles were all the rage. At Coverings, the Italians showed combinations of cobalt blue and terra-cotta tiles and brightly colored four-by-fours. The Spanish featured more whimsical, fanciful tiles like the collections from Diago, celebrating the company's 90th anniversary, and from Agatha Ruiz de la Prada for Parmesa.

Owens Corning's latest roofing innovation debuted at NAHB.

In April the Windy City hosted the Kitchen and Bath Show, where Kohler's collection of new hand-painted china bowls and Dornbacht's porcelain plumbing fixtures were among the most elegant introductions. American Standard and Corian led the way in new shower and tub installations.

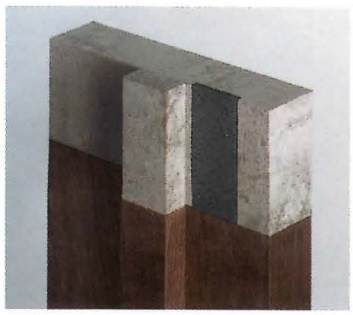
The big news in May: the AIA eliminated entrance fees to its annual convention and exhibition, held this year in San Francisco, and there seemed to be an overall positive feeling about the association's new attitude. Exhibitors from more than 450 companies and architects from more than 50 nations attended.

Also held in May, Lightfair brought manufacturers and attendees to gambling capital Las Vegas. Hundreds of new products were on display, a sampling of which can be found on pages 166–72.

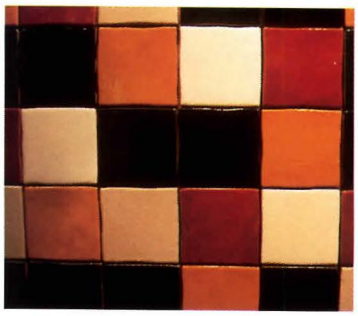
At Neocon in June, Steelcase, Trendway, Herman Miller, Office Specialty, and Panel Concepts showed systems furniture, and Ann Sacks unveiled a new tile installation at the Field Museum store.

At the Construction Specifications Institute show (CSI), Zero announced that its Intumet fire and smoke seal has achieved a 90-minute positive-pressure fire rating for a standard negative-pressure–listed wood door and frame assembly. Also seen at CSI: formaldehyde-free products, including Johns Manville's commercial insulation (see page 178), and SierraPine's line of medium-density fiberboards.

At all of the shows, green, blue, and almond were the forecasted colors. And, according to the Color Marketing Group, these colors are here to stay.



At the CSI show, Zero showed its Intumet fire and smoke seal.

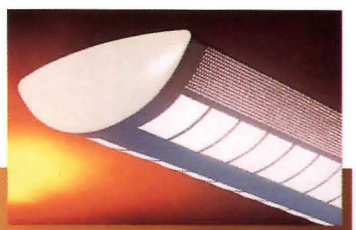


TRV Agaramic is an Italian line of handmade four-by-four-inch tiles.

Ann Sacks Tile, Portland, Oreg.
503/281-7751. CIRCLE 223
Bruck, Tustin, Calif
714/259-1000. CIRCLE 224
Italian Trade Commission, N.Y.
212/980-1500. CIRCLE 225
Ledalite, Langley, B.C.
604/888-6811. CIRCLE 226
Owens Corning, Toledo
800/GET-PINK. CIRCLE 227
SierraPine, Roseville, Calif.
916/772-3422. CIRCLE 228
Tile of Spain, Miami
305/446-4387. CIRCLE 229
Zero, Bronx, N.Y.
800/635-5335. CIRCLE 230

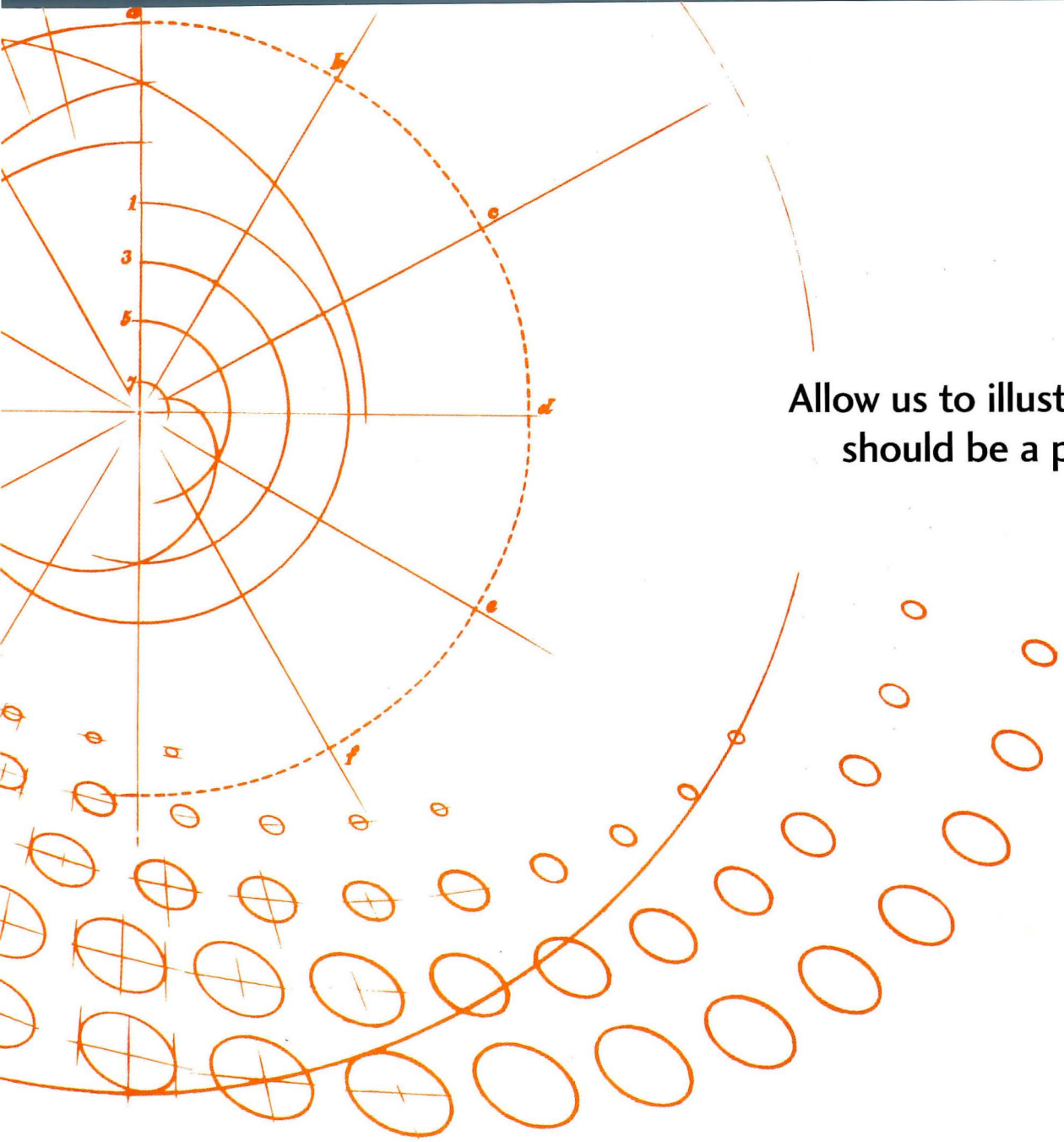
Ann Sacks Tile and Stone unveiled a classic floor tile motif at Neocon.

Bruck (below) and Ledalite (right) introduced new lighting fixtures at Lightfair in Las Vegas.



1999 TRADE SHOWS

NAHB, Dallas, January 15–18, 800/368-5242
World of Concrete, Las Vegas, January 19–22, 800/837-0870
NRCA, Phoenix, February 7–10, 847/299-9070
Coverings, Orlando, March 23–26, 561/747-9400
Kitchen and Bath Show, Orlando, April 16–18, 800/527-0207
AIA Convention, Dallas, May 6–9, 617/859-4475
Lightfair, San Francisco, May 11–13, 404/220-2221
A/E/C Systems, Los Angeles, May 24–27, 800/451-1196
Neocon, Chicago, June 7–9, 312/527-4141
CSI, Los Angeles, June 24–27, 312/527-4141



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PRODUCTBRIEFS

▲ Furniture solutions

Trendway introduced a new set of office products at Neocon this year called Contrada (Italian for community). The freestanding power arch, one of many design elements, is the backbone of the collection. It distributes power and data while also managing all of an office's cabling. 616/399-3900. Trendway, Holland, Mich. **CIRCLE 231**

◄ Carpet connection

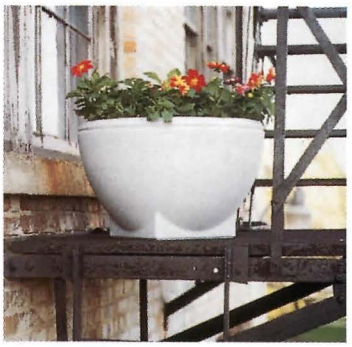
With the introduction of four new designs to the Fundamental Logic carpet collection, Lees, a division of Burlington Industries, has expanded its line of broadlooms. Graphique, shown here in three colors, has a subtle geometric pattern. Also available are Ombré, with an antiqued leaf pattern; Patina, with a linear motif; and Texturale, a cut pile. 910/379-2000. Lees, Greensboro, N.C. **CIRCLE 234**

▲ Lazy working

Philippe Starck's L.W.S. (Lazy Working Sofa) collection for Cassina includes a sofa, ottoman, and armchair, shown here with a side table and lamp. Also available is the Miss C.O.C.O, a pressed-aluminum and plastic folding chair, and the M.T., short for Minimum Table. 516/423-4560. Cassina, Huntington, N.Y. **CIRCLE 236**

▲ Panel products

A new line of interior panel products, EcoColors, from Architectural Forest Enterprises, is made from straw waste. The fiber is pressed into particle board with a nonformaldehyde glue and then finished with nontoxic dyes, sealers, and top coats. Ten colors are available. 800-4-VENEER. Architectural Forest Enterprises, San Francisco. **CIRCLE 237**

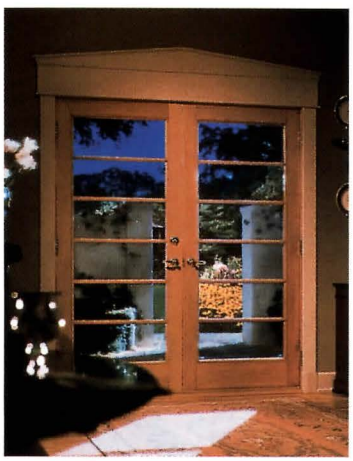


◄ A rosa is a rosa

Landscape Forms has designed a weatherproof polyethylene planter, available in dove, ivy, grotto, millstone, patina, or cobblestone. Called Rosa, the planter comes in four sizes: 24 by 15 inches, 30 by 18 inches, 36 by 23 inches, and 42 by 13 inches. The planter can be specified with or without drain holes. 800/521-2546. Landscape Forms, Kalamazoo, Mich. **CIRCLE 233**

▼ Vive la France!

A new line of in-swing French doors from Marvin Windows and Doors has been tested and certified by the National Wood Window and Door Association to meet performance ratings of air filtration, water penetration, and structural integrity. 888/537-8269. Marvin, Warroad, Minn. **CIRCLE 232**



▲ Component storage

Daven Joy and Travers Ebling, partners in Park Furniture, one of the four West Coast design firms that form Unified Studios for Design and Architecture (USDA), have created a modular storage unit made of birch ply, aluminum, and stainless steel. 800/681-8732. USDA, San Francisco. **CIRCLE 235**

▲ Red leather, yellow leather

The Old Leather collection—for use in *floor tiles or upholstery—from* Teddy and Arthur Edelman, shown here in rich red browns and mellow gold tones, has a hand-antiqued, aniline-dyed finish. 203/426-3611. Edelman Leather, Hawleyville, Conn. **CIRCLE 238**

PRODUCTBRIEFS

▲ Make an entrance

Now available in the United States through Bonar Floors, Nuway Entrance Systems—TuftiGuard Plain, Classic, and Design—consist of aluminum, brass, or high-impact PVC scraper profiles that alternate with nylon wiper strips to clean and dry footwear and wheeled traffic. The systems have antislip surfaces. 800/852-8292. Bonar Floors, Elk Grove Village, Ill. **CIRCLE 239**

▲ Innovative interiors

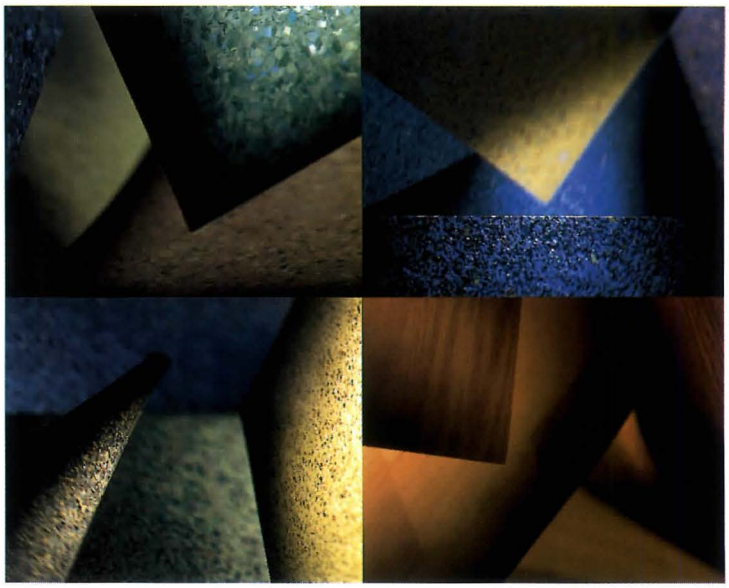
Scofield's Overlay colored concrete was developed for use as an interior floor covering. Available in ash white, light gray, beige cream, tile red, and natural gray, Overlay can be stained to look like terrazzo, marble, ceramic tile, or granite. The material cures quickly to create a strong, flat, hard, and abrasion-resistant surface. The floor shown here features a tile-like design. 800/800-9900. L.M. Scofield, Los Angeles. **CIRCLE 244**

▼ Retractable awnings

The retractable awning shown here combines Sunbrella fabric and a Somfy electric motor. Awning fabrics, available in more than 100 solids and stripes, are woven from 100 percent solution-dyed acrylic yarns. Backed by a five-year warranty. 800/441-5118. Sunbrella, Glen Raven, N.C. **CIRCLE 240**

► Custom inlay

VT Industries uses one of three processes to create custom inlay laminate doors: seamless inlay, silk-screen, or graphic imaging. Company logos and original artwork may be incorporated into the design. 800/827-1615. VT, Holstein, Iowa. **CIRCLE 242**



▲ Sheet vinyl flooring

The Constellation series of sheet vinyl flooring, manufactured by LM Chem and distributed by the International Commercial Flooring Systems company, includes the Ara, Lyra, Columba, and Vela collections, with patterns resembling wood, marble, and terrazzo. The entire collection is backed by a five-year warranty. 888/306-5532. International Commercial Flooring Systems, San Francisco. **CIRCLE 241**

► Acoustical ceiling batts

Johns Manville's commercial insulation division offers Grid-SHIELD Rx, formaldehyde-free, poly-encapsulated thermal and acoustical ceiling batts. These batts, designed for suspended-ceiling systems, resist heat transfer and absorb sound. 303/978-2000. Johns Manville, Denver. **CIRCLE 243**

▼ Water damage control

USG answers the ongoing debate over barrier EIFS with two new products: Insulscreen 2000 and Duroscreen 1000, water-managed synthetic stucco systems that avoid the moisture intrusion problems that have occurred on some of the barrier EIFS-clad homes. Shown left is a close-up detail of a home with moisture damage resulting from the use of a barrier synthetic stucco system. Shown right is another home clad with USG's watertight Insulscreen 2000 system. 800-USG-4YOU. USG, Chicago. **CIRCLE 245**

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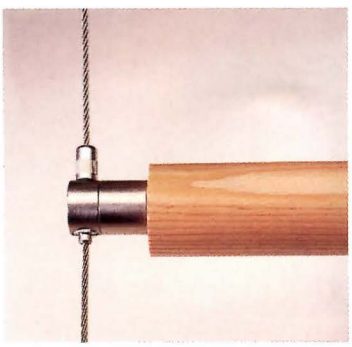
PRODUCTBRIEFS

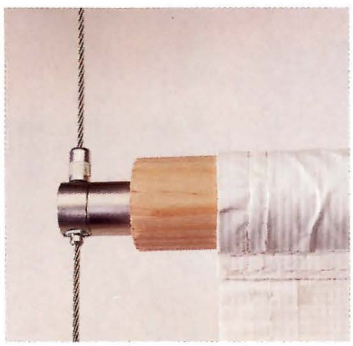
▼ Convection oven

The latest cooking trend is professional-style convection ovens for the home. A recent joint venture between oven manufacturer Thermador and the food industry's research and development center, Enersyst, has resulted in JetDirect ovens. Available with a black, white, or stainless-steel finish, JetDirect ovens direct jets of air directly into the food being cooked rather than into the oven cavity randomly. 714/901-6600. Thermador, Huntington Beach, Calif. **CIRCLE 252**

▼ No more nails

The Arakawa Art Clair Rail system, a ceiling-mounted art-hanging system, is available in two-, three-, and six-foot lengths. Banner and picture hooks are available. The system is specially designed for hanging artwork, fixtures and shelves, and signs and banners, and for suspending lights. Clips can be attached and moved horizontally along the rails. 888/ARAKAWA. Arakawa, Portland, Oreg. **CIRCLE 247**





▶ Sealing the deal

3M FireDam Spray is a water-based coating alternative to firestop caulk. It is applied with an airless sprayer as a ⅛-inch-thick coating to perimeter joints between fire-rated floors (concrete or fluted-steel decks) and walls (gypsum or concrete). 800/328-1687. 3M, St. Paul, Minn. **CIRCLE 246**

▲ Covering new heights

The Wilsonart Wall System for shower and tub surrounds consists of a 5-by-12-foot sheet of Wilsonart laminate or SSV solid surfacing with a crystal or matte finish bent at a 90-degree angle for a custom fit. 800/433-3222. Wilsonart, Temple, Tex. **CIRCLE 248**

For more information, circle item numbers on Reader Service Card

PRODUCTBRIEFS

▼ Historically inspired

At the Chicago Decorex show last June, David C. Bishop designed an English-inspired conservatory with Marvin Windows and an aluminum roof. Bishop has been designing and installing such conservatories since 1988. 800/729-7259. David C. Bishop, Glenview, Ill. **CIRCLE 249**

► Thermal protection

Dow's Styrofoam Cavitymate Plus has a high compressive strength and R-value. Cavitymate Ultra offers an insulation value at least 12 percent higher than standard 1½- and 2-inch-thick Styrofoam. 800/441-4369. Dow Chemical, Midland, Mich. **CIRCLE 253**

▲ Pipe protection

Handy Shield vinyl safety covers from Plumberex Specialty Products are made of closed-cell foam with Velcro sealing strips. The internal foam lining eliminates sharp or abrasive surfaces and meets ASTM standards D-1667 and D-395. Available in eight colors, Handy Shield meets ADA standards and includes covers for p-traps, valves and supplies, and wheelchair/offset tailpieces. Eastern United States: 800/241-5236. Western United States: 800/475-8629. Plumberex Specialty Products, Palm Springs, Calif. **CIRCLE 251**

▼ Window wonder

The Series TR-400 casement and projected window from Traco features a beveled vent exterior. The window has a 3¼-inch-deep master frame, ⅛-inch walls, and dual hollow extrusions in both the master frame and the vent. The TR-400 also has an option for a 4½-inch frame. 724/776-7000. Traco, Pittsburgh. **CIRCLE 250**

PRODUCTLITERATURE

Marlite on CD-ROM

A copy of the Marlite Web site, including product information, is available on CD-ROM. Several CAD drawings are included. AutoCAD users can select files in DWG format; DWF files are also available. Web access is not necessary for viewing. 330/343-6621. Marlite, Dover, Ohio. CIRCLE 261

Lamp poles

W. J. Whatley's new brochure offers architects, engineers, and developers information on how to specify ornamental lighting poles. It also includes information on the company's Web site, which allows users to download post designs and draw them to scale. 303/287-8053. W. J. Whatley, Commerce City, Colo. CIRCLE 262

Energy efficiency

A brochure on energy-efficient lighting products for both residential and commercial spaces, some of which are certified by the Energy Star Program, is now available from Progress Lighting. 864/599-6000. Progress Lighting, Spartanburg, S.C. CIRCLE 263

Color forecast

The 17th edition of the DuPont interior color and design forecast, called Global Language, helps specifiers understand carpet color trends. 800/4DUPONT. DuPont, Atlanta. CIRCLE 264

Fiber optics

Lumenyte's photometric specification sheets provide information on the company's line of fiber-optic products. 949/829-5200. Lumenyte, Irvine, Calif. CIRCLE 265

Isolation equipment

A new brochure from Greenheck, "Mounting Bases and Vibration Isolation," outlines the different types of bases and isolators that are available for use with both utility and centrifugal fans. 715/359-6171. Greenheck, Schofield, Wisc. CIRCLE 266

Distributor news

Angelo Brothers will distribute Westinghouse's new product line, which is outlined in a series of brochures featuring MarineLite, RealLite, NurtureLite, and ReptileLite. 888/417-6222. Angelo Brothers, Philadelphia. CIRCLE 267

For more information, circle item numbers on Reader Service Card

PRODUCTLITERATURE

Duplex systems

The American Galvanizers Association (AGA) has a new brochure describing duplex systems for painting over hot-dipped, galvanized steel. 800/HOT-SPEC. AGA, Aurora, Colo. CIRCLE 254

Tile and stone installation

"Making Masterful Designs a Lasting Reality" is the theme of a new brochure from Custom Building Products. 800/272-8786. Custom Building Products, Seal Beach, Calif. CIRCLE 255

Lighting design software

LitePro for Windows 95 and NT is software for both indoor and outdoor lighting applications that produces 3-D color renderings. Designers can also import and export 2-D DXF files between CAD and LitePro. 509/924-7000. Columbia Lighting, Spokane, Wash. CIRCLE 256

The doors

Simpson's new brochure features the Mastermark collection of exterior and interior wood doors as well as the Designer, Advent, Selects, and Builder's Advantage series. 800/952-4057. Simpson, Federal Way, Wash. CIRCLE 257

Finned-tube heating

A brochure on classically designed finned-tube heating enclosures by Sterling includes information on clear anodized aluminum grilles. 413/568-9571. Sterling, Westfield, Mass. CIRCLE 258

Terrazzo designs

Manhattan American Terrazzo Strip has compiled a collection of new terrazzo flooring designs. 773/471-0700. Terrazzo and Marble Supply, Chicago. CIRCLE 259

Concrete repair

Master Builders' brochure offers information on concrete repair and protection issues in industrial, civil, and commercial building. 216/831-5500. Master Builders, Cleveland. CIRCLE 260

NEW SITES FOR CYBERSURFING

Copper Development Association
www.copper.org

Office Specialty
www.officespecialty.com

C/S Group
www.c-sgroup.com

Wiremold Company
www.wiremold.com

Northwest Energy Efficiency Alliance
www.northwestlighting.com

Herman Miller
www.hmstore.com

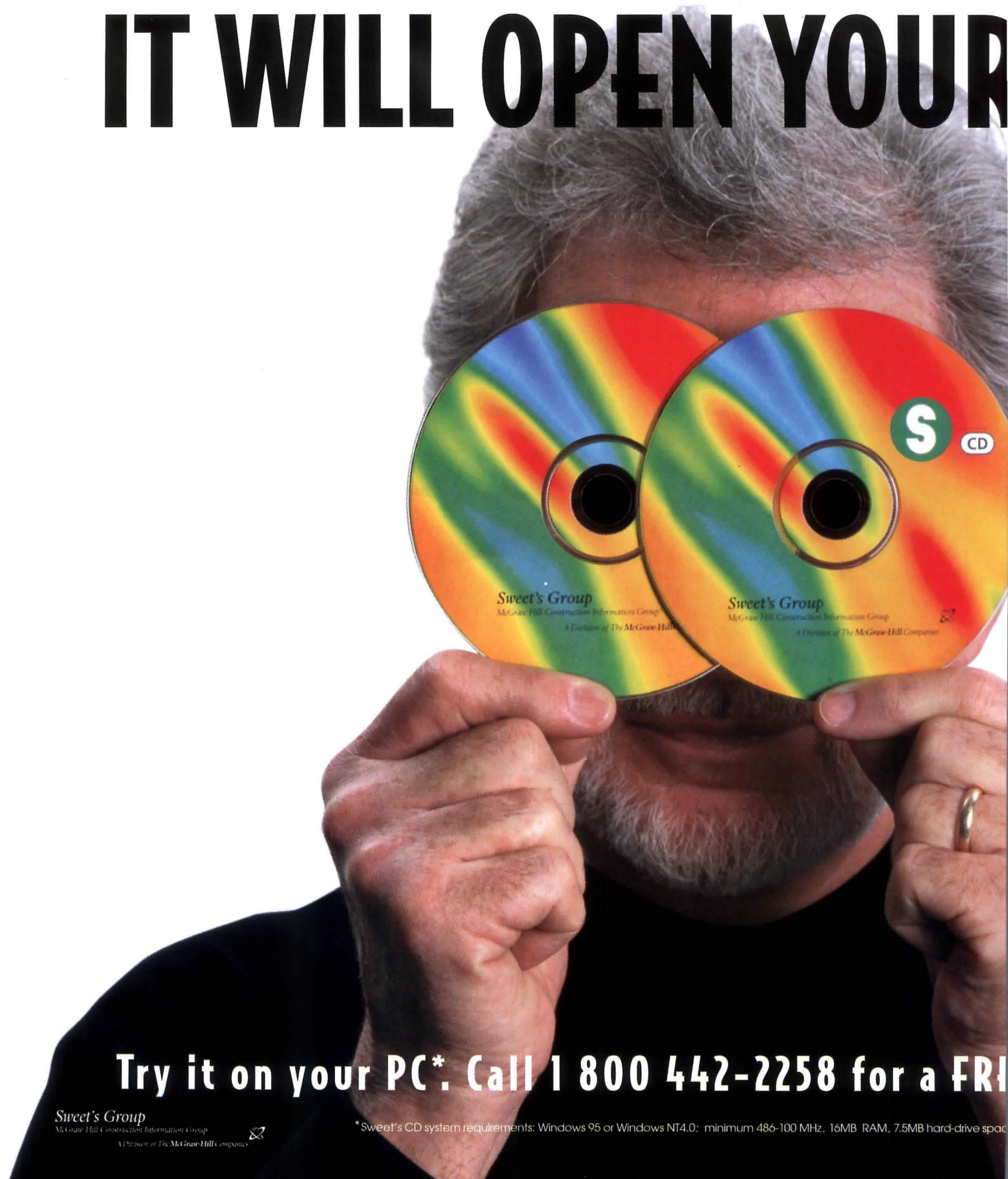
Mosler Security Systems
www.mosler.com

Commercial Carpet Fibers Group
www.nylon6ix.com

ImproveNet
www.improvenet.com

For more information, circle item numbers on Reader Service Card

NEW SWEET'S
IT WILL OPEN YOUR



Try it on your PC*. Call 1 800 442-2258 for a FR

Sweet's Group
McGraw-Hill Construction Information Group
A Division of The McGraw-Hill Companies

*Sweet's CD system requirements: Windows 95 or Windows NT4.0; minimum 486-100 MHz, 16MB RAM, 7.5MB hard-drive spac

(continued from page 33)
Hoover Dam, San Francisco's rapid transit system, and the Channel Tunnel. National Building Museum. 202/272-2448.

Marion Mahony and Walter Burley Griffin in America, Australia, and India
Sydney, Australia
Through May 2, 1999
This exhibition explores the professional and spiritual journey of architects Mahony and Griffin, from their years in Frank Lloyd Wright's office at the turn of the century through their work in Australia and India in the 1920s and 1930s. Powerhouse Museum. 011/61/02/217-0111.

alt.office Conference and Expo
San Jose, California
August 12–14
A major national event focusing on alternative work processes from the combined perspective of people, technology, and the environment. Among the speakers will be Kevin Kelly of *Wired* magazine and William McDonough, dean of the University of Virginia School of Architecture and a practitioner of sustainable design. McEnery Convention Center. For more information, visit www.altoffice.com.

DOCOMOMO Conference
Stockholm
September 16–18
This year's conference of the International Working Party for the Documentation and Conservation of Buildings, Sites, and Neighborhoods of the Modern Movement focuses on the social aspects of modern architecture and urban planning. An international docket of speakers will be presenting papers. Swedish Museum of Architecture. E-mail marina.botta@arkitekturmuseet.se for more information.

Competitions

American Institute of Architects New York Chapter Annual Design Awards Program
Entry form and fee deadline: August 19
Submission deadline: September 9
Licensed architects practicing in New York City are eligible for the AIA NYC Awards Program. Submissions can be entered in three categories: built work, interiors, and projects. Call the AIA NYC at 212/683-0023 for more information.

Membrane Design Competition
Submission deadline: September 2
This year's Membrane Design Competition, sponsored by Taiyokogyo Corporation, honors the creative design of airport structures using membrane. Write Membrane Design Competition, 4-8-4 Kigawa-higashi, Yodogawa-ku, Osaka 532-0012, Japan; fax 011/81/6/306-3154; or E-mail mh_001600@fc.taiyokogyo.co.jp.

Shinkenchiku Residential Competition
Submission deadline: September 10
Kyoto architect Shin Takamatsu will judge this year's ideas competition, sponsored by *Japan Architect* magazine. Winners' work will be published in the December 1998 issue of *JA*. To receive a copy of the rules, fax a request to 011/81/3/3811-0243.

AIA Continental Europe Design Awards
Submission deadline: September 11
Eligible projects are those built on the European continent and completed after January 1, 1993. For submission information, contact Frimmel Smith at frimmel@compuserve.com.

Union Internationale des Architectes Student Competition
Registration deadline: September 15
Submission deadline: January 31, 1999
Student entrants are invited to design a housing project for a city in their home country. In addition to cash, the winner will receive the UNESCO Prize for Architecture. To register, call Liu Kecheng at Xi'an University, in Xi'an, China, 011/86/29/220-29-43, fax 011/86/29/552-78-21, or E-mail LiuKCH@pub.online.xa.sn.cn.

Design a Conservatory, Win a Conservatory
Submission deadline: October 26
Sponsored by David C. Bishop and Co., this contest focuses on a garden room theme, including the creative use of furnishings in both the interior and exterior landscape. The winner will receive a freestanding 12-foot octogonal conservatory created for this event. Call the Merchandise Mart at 847/729-9812 or visit www.conservatories.net.

Rudy Bruner Award for Urban Excellence
Submission deadline: December 18
This award is given to urban places that demonstrate a successful integration of effective processes and meaningful values into good design. The Gold Medal winner receives $50,000; each silver medalist receives $10,000. For more information or an application, call 617/492-8401 or E-mail info@brunerfoundation.com. ■

Please submit information for events and competitions at least six weeks prior to the magazine's publication date (e.g., September 15 for the November issue).

AIA/ARCHITECTURAL RECORD CONTINUING EDUCATION

Instructions

- Read the article "Improving Glass Performance" (page 131) using the learning objectives provided.
- Complete the questions below, then check your answers (page 198).
- Fill out and submit the self-report form (page 198) to receive two AIA Learning Units.

Questions

1. What can be added to glass to change its color?

2. Discuss how glass is tempered and the physical properties that tempering changes. What other techniques can be used to strengthen glass?

3. Describe how glass is made stronger for security applications.

4. Explain what low-emissivity coatings do for glass and how they are applied.

5. Describe how glass can be made to absorb or reflect heat and glare.

An investment in beauty and long life

TCS®

terne-coated stainless steel roofs helping create a farm-like environment

More than 310,000 square feet of TCS–terne-coated stainless steel roofing cover the 22 buildings of the new U.S. Fish & Wildlife Service. This National Conservation Center, designed to be an exceptional learning place for the natural resource conservation professional, is located on a 538-acre campus 4 miles outside Shepherdstown, West Virginia. KCF-SHG Architects modeled the buildings after local farm buildings so that they blended with the rolling countryside as a partner to it. Aiding this partnership is the dull gray finish which the TCS will weather to—a surface which will never require painting.

This Follansbee metal offers not only beauty but the promise of longevity unmatched by any other roofing metal. We will be happy to send you substantiating evidence. Call us toll-free at 1-800-624-6906.

Job Site Architects:
KCF-SHG Architects, Washington, D.C.
General Contractors:
West Virginia Corps of Engineers and Centex Construction Company
Roofing Contractor:
James Myers Roofing Company, Beltsville, MD

Follansbee also produces
TERNE II® – ZT®-coated carbon steel (VIROTIN®)
TCS II® – ZT®-coated stainless steel (VIROMET®)

creating outstanding roofing metals for more than a century

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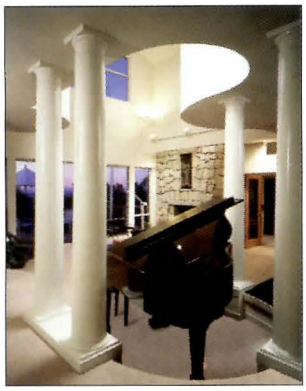
folrfg@lbcorp.com

CIRCLE 74 ON INQUIRY CARD

Chadsworth's 1.800.Columns

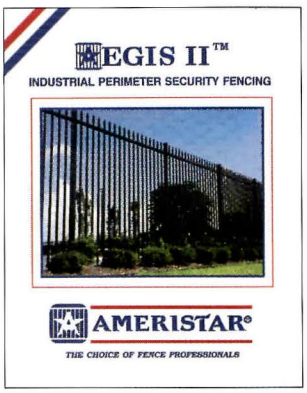


Voted No. 1 in U.S. Columns, pilars, pilasters, & posts available in wood, PolyStone™ & fiberglass. Plain or fluted shafts. In a variety of sizes & styles from Classic to Contemporary, for interior/exterior. Competitive prices. Job-site delivery. Worldwide shipping. 72-Hr Quick Ship Program on stock products. Inquire about our award-winning Idea Book. Includes Columns Product Portfolio. $10 + $3 p/h. Columns Product Portfolio $5. 1.800.486.2118 Telefax 910.763.3191 www.columns.com

Chadsworth's 1.800.Columns

CIRCLE 150 ON INQUIRY CARD

AEGIS II



Aegis ornamental fence systems feature strong Forerunner™ rails, internal retaining rods, & designed panel brackets. Aegis II industrial fence offers the strongest security fence available. Aegis is specified by more architects & builders than any other on the market. Industrial & residential brochures include data on structure, design & options. Easy shipping panel design. (800) 321-8724. POB 581000, Tulsa, OK 74158-1000, F: (918) 835-0899.

Ameristar

CIRCLE 151 ON INQUIRY CARD

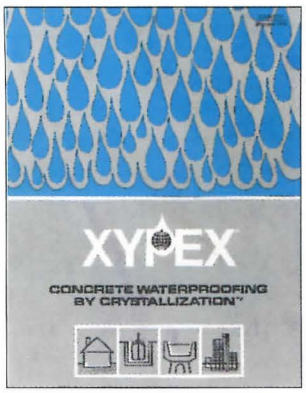
Total Door® The Openings® Solution

Total Door® is a fire rated door assembly that includes all hardware. Pairs do not require coordinators, vertical rods, astragals, flush bolts, or floor strikes. Will retrofit to any frame. Meets all codes and ADA. Wood and metal faces available to 3 hours. Lifetime limited warranty on locks and panics. For more information call 1-800-852-6660.

Openings®

CIRCLE 152 ON INQUIRY CARD

Concrete Waterproofing by Crystallization



Applied as a slurry coating Xypex is a chemical treatment that waterproofs by penetrating the concrete with a crystalline formation that "plugs" the pores of the structure preventing water seepage. Xypex is ideal for use on the "inside" of wet underground structures.

Xypex Chemical Co.

CIRCLE 153 ON INQUIRY CARD

Custom Metal Graphics

These bronze elevator door facings were manufactured by Surface Design + Technology specializing in custom & standard metal graphics. Using sheet metal finishes of a variety never offered before. There is virtually no limit to the types of patterns which can be created by combining multi-directional satin brushing, electroplating of gold, nickel, or copper. For information on custom or standard designs call (800) 537-1127.

Surface Design

CIRCLE 154 ON INQUIRY CARD

Accessible Lavatory Insulation

A full color catalog will explain the different Handy-Shield safety covers offered for the new or retrofit projects that need to comply with the American Disabilities Act. The specific use, sample specifications, drawings and color choice are all summarized in this easy to understand catalog. (800) 475-8629.

Plumberex

CIRCLE 155 ON INQUIRY CARD

New Fireplace Tested as a Wall Furnace

Our products have taken direct-vent technology & incorporated it into a new high performance fireplace. Model 6000 Supreme is a high efficiency fireplace (thermal efficiency up to 74%) & has an AFUE (Annual Fuel Utilization Efficiency) rating of 63%. The 6000 Supreme is standard with a variable regulator to adjust the flame & BTU input with the turn of a dial. Heat-N-Glo, 6665 West Hwy 13, Savage, MN 55378, 1-800-669-HEAT.

Heat-N-Glo

CIRCLE 156 ON INQUIRY CARD

Mortar Net Weep Vents

are inexpensive and easily installed in weep holes to insure masonry cavity walls breath, drain and dry quickly. Made from 100% recycled polyester with a 90% open mesh in 2.5" x 4" x .5, they are available in white, tan , almond, gray, and brown. Weep Vents add to the beauty of the wall by duplicating the texture and color of mortar, thus eliminating open holes and dark shadows while *restricting* entry to insects. Call (800) 664-6638 for more information.

Mortar Net

CIRCLE 157 ON INQUIRY CARD

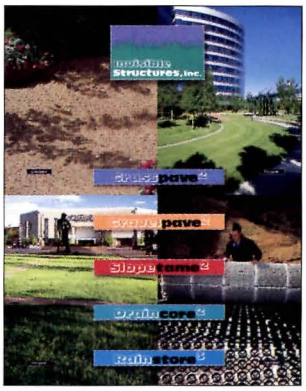
Ornamental Picket Fence with a Purpose

We have given special attention to each & every component of our fence. Every item is designed for strength, durability and low maintenance. No other company builds a complete fence - rail, rivets, brackets, pickets and posts, that are stronger, more durable, have more security or lower maintenance costs than our fences. Monumental Iron Works, 6500 Eastern Ave., Baltimore, MD 21224. Tel: (410) 633-6500, Fax: (800) 239-2963.

Monumental Iron Works

CIRCLE 158 ON INQUIRY CARD

New Invisible Products Roll Out

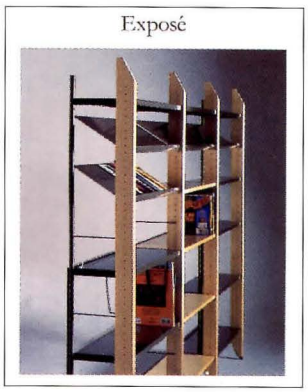


3 new invisible products have been added to the family of Grasspave² & Gravelpave² - Slopetame², Draincore², & Rainstore³. For 16 years we have provided grass paving ring structures with 92% void area for root development. Now we're applying this technology to erosion control, drainage, & water storage with easy installation in 9 roll sizes. Call our knowledgeable staff for CADD details, specs, & product specs at (800) 233-1510. Web Site: http//:wwwinvisiblestructures.com

Invisible Structures, Inc.

CIRCLE 159 ON INQUIRY CARD

Scania® Contract Furniture

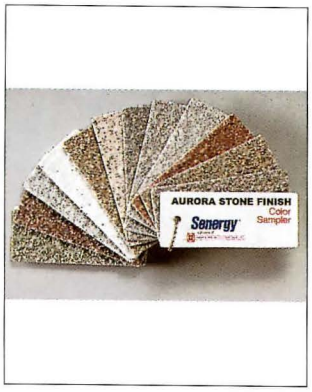


Gressco offers a unique, non-dominating shelving system that lends a feeling of airiness, yet is inherently stable. Expose is a flexible, modular design shelving system with many accessories for the different media. As in other Scania shelving designs from Gressco, Expose offers flexibility and function well suited to public use. For literature and the name of dealer in your area call 800-345-3480 or e-mail our website www.gresscoltd.com

SCANIA® from Gressco

CIRCLE 160 ON INQUIRY CARD

Senergy's New Aurora Stone Finish



The Senergy Division of Harris Specialty Chemicals, Inc. introduces Aurora Stone Finish for EIFS, stucco and masonry. Aurora Stone Finish replicates the appearance of granite or marble, and is available in twelve standard colors. Acrylic-based Aurora Stone Finish is spray-applied, and is also suitable for interior applications.

Senergy

CIRCLE 161 ON INQUIRY CARD

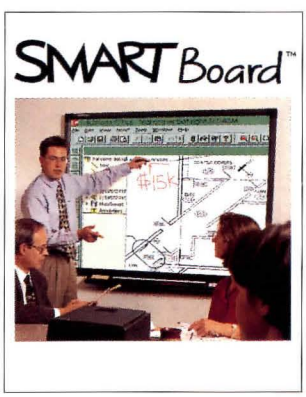
For labs & clean-rooms New Dowcraft Twin Wall

Twin Wall is custom-designed for scientific research and hi-tech manufacturing facilities. Clean lines, durable finishes, optional filler cores permit Twin Wall to perform in categories to Class 10. Acoustical rating: STC 41 up. Self-supporting steel walls shipped ready to install. Heights up to 16 ft. Send for new brochure. Dowcraft Corporation.

Dowcraft Corporation

CIRCLE 162 ON INQUIRY CARD

Interactive Whiteboard

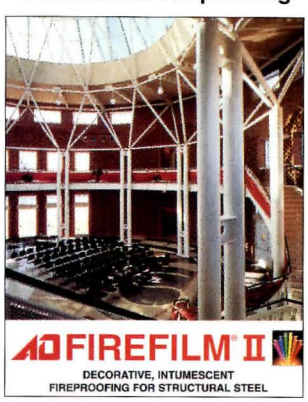


SMART Technologies pioneered the development of interactive whiteboards & has set the industry standard for versatile, easy-to-use Roomware. The SMART Board allows you to control projected Windows® or Macintosh® applications & other multimedia by pressing on the Board's large, touch-sensitive surface. Write over top of applications & your notes are saved for future reference & distribution. For the SMART Product Kit, call 1.888.42.SMART or visit www.smarttech.com/product kit.

SMART Technologies Inc.

CIRCLE 163 ON INQUIRY CARD

Decorative, Thin-Film Intumescent Fireproofing

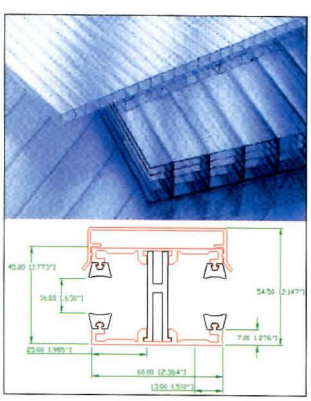


Improved spray characteristics and ratings up to 3 hours! A/D FIREFILM®II permits designers to use the appearance of exposed steel with the steel protected from fire. The product is applied as a thin-film coating 0.4 to 3.3 mm (16 to 130 mils) thick. When exposed to fire it expands to form a meringue-like insulating layer up to 4 in. thick. A/D COLORCOAT topcoat is available in a wide range of colours. Call 1-800-263-4087 or 416-263-4087. Internet: www.adfire.com

A/D Fire Protection

CIRCLE 164 ON INQUIRY CARD

S+P Daylighting System

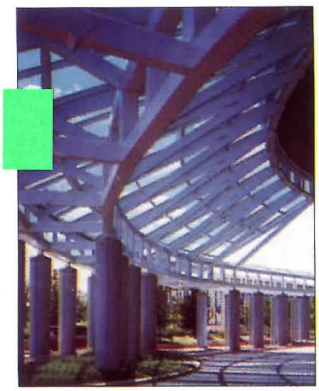


S&P's systems are the result of the newest developments in plastics industries, providing complete architectural solutions for greenhouses, skylights, covered walkways, pool enclosures, solariums, and any vertical or sloped translucent glazing. Our systems utilize Lexan Thermoclear Polycarbonate with a U-value of 0.27. Available stock sizes 6-25 mm, *4' wide, 40' long.*

S+P Architectural

CIRCLE 165 ON INQUIRY CARD

Structural Steel An Architect's Guide

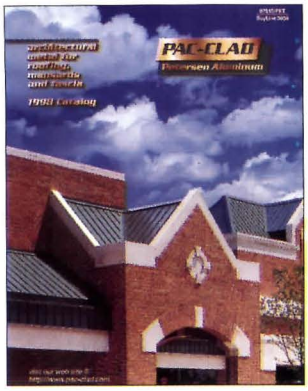


Designing with Structural Steel, A Guide for Architects provides the needed information to design everything from manufacturing facilities to high-rise buildings. Over 300 pages & 100 illustrations, the manual covers design ideas, systems, details, material & a list of industry resources & standards. Published by the American Institute of Steel Construction, Inc., (AISC), & written for architects by practicing architects & engineers. To order call AISC Publications: 800-644-2400 or at: www.aisc.org.

AISC, Inc.

CIRCLE 166 ON INQUIRY CARD

Petersen Aluminum's 1998 Catalog

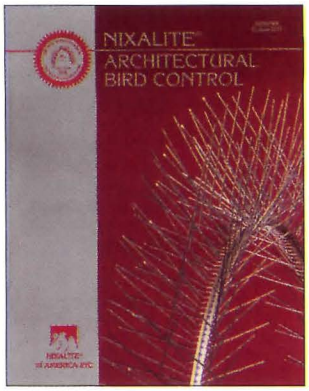


Petersen Aluminum's 1998 catalog includes their complete line of quality metal roofing products. PAC-CLAD®, a full Kynar 500®/Hylar 5000® paint system, backed by a 20 year non-prorated warranty, is available from stock in 25 standard colors. Three production facilities enable Petersen to offer unmatched service, economy and availability. Call 1-800-PAC-CLAD or visit our web site @ http://www.pac-clad.com

Petersen Aluminum Corp.

CIRCLE 167 ON INQUIRY CARD

Architectural Bird Control



Preserve architectural treasures with NIXALITE Bird Barriers. Effective, and Humane, these stainless steel strips provide a simple barrier that is long lasting and inconspicuous. With the addition of COLOR-COAT™, a color powder coating option, NIXALITE is almost invisible. For information, call 1(800) 624-1189, fax 1(309) 755-0077 or visit our website at http://www.nixalite.com.

NIXALITE

CIRCLE 168 ON INQUIRY CARD

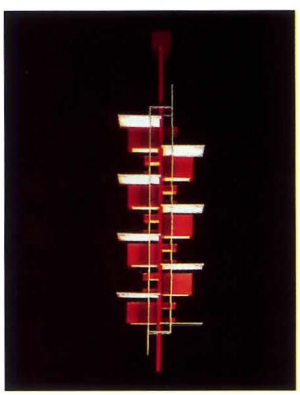
SIMKAR Loading Dock Lights

SIMKAR Loading Dock Lights with high impact polycarbonate heads- take the abuse of industrial use! Select from Incandescent 150watt or Smart Building 50watt Sodium model for up to 500 watts of light! Stocking 40" & 60" models - optional fan. Updated catalog includes IESNA award winning TE3P shallow parabolic & TDPW indirect recessed. www.simkar.com or 1-800-523-3602x 7779.

SIMKAR Corporation

CIRCLE 169 ON INQUIRY CARD

Taliesin® Pendant

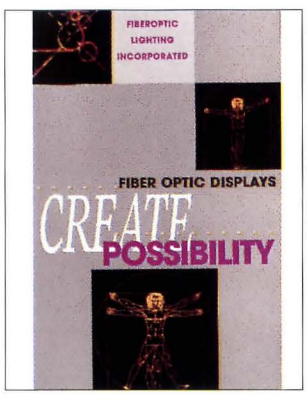


Wright planned the first Taliesin Playhouse, the room required hanging fixtures that would illuminate but not be glaring. Wright denounced the bare light bulb & described it as "electric lighting without glass". When the original theater burned in 1952, Wright updated the pendant design, as reproduced by Yamagiwa USA Corp. Available in two sizes. For further info call 1.888.879.8611 (toll free). Yamagiwa USA Corp, 31340 Via Colinas, Ste 106, Westlake Village, CA 91362.

Yamagiwa USA Corp.

CIRCLE 170 ON INQUIRY CARD

Bright Ideas with Fiber Optics

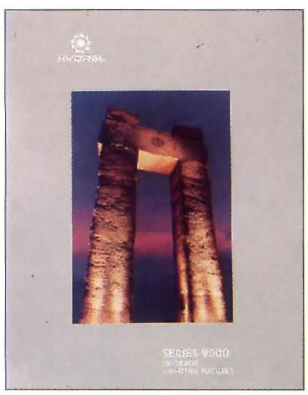


Paint with light! Fiber optic displays are an ideal medium for use in any environment. These low maintenance displays are used for wall murals, ceilings, indoor or outdoor enhancements, hotels, museums, restaurants, retail, office and healthcare facilities. Changing colors and implied motion add to the magic.

Fiber Optics

CIRCLE 171 ON INQUIRY CARD

In Grade Up Lights



This 36 page catalog covers the new, innovative 9000 series Ingrade Lighting fixtures. See how modular design makes a difference in performance, installation, maintenance, and durability. Available in a variety of configurations, this series accepts lamps to 175W HID, 250W incandescent. Architectural and landscape illustrations include recommendations for the most common applications. Hydrel, Sylmar, California.

Hydrel

CIRCLE 172 ON INQUIRY CARD

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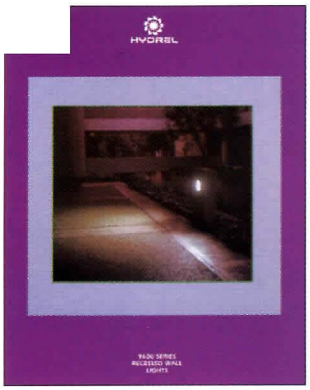

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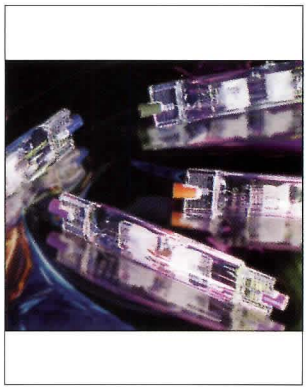

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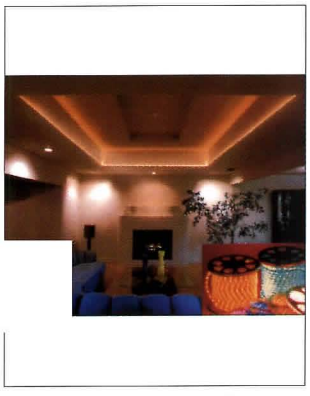

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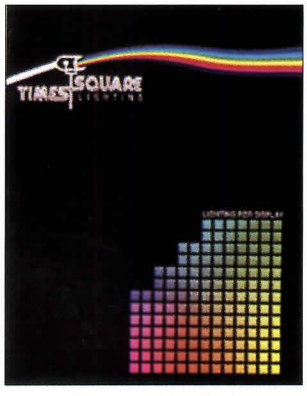

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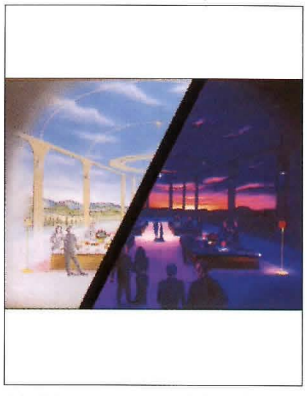

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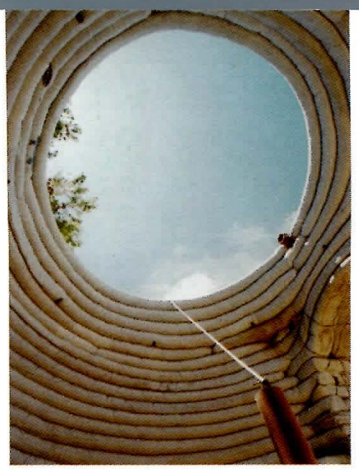

THE FUTURE An architect is devising new processes for building dirt-cheap houses from elemental materials.

BY TED KATAUSKAS

A growing number of apprentice home builders are traveling deep into the California desert for a chance to commune with Nader Khalili, an architect who is trying to wean the world off of two-by-fours, steel, and concrete. "We send our children into the world with the notion that a house must have a pitched roof, a square window, and a chimney," Khalili says. "How can they imagine they can build something beautiful out of dirt?"

The Khalili-designed Rumi Dome (above), made of fired brick, and a superadobe structure (top).

At the California Institute of Earth Art and Architecture, a school Khalili founded in the Mojave Desert seven years ago, the 61-year-old architect from Teheran is helping his students, who typically have no architectural training, do just that. During a week-long workshop, they learn how to build homes from only the most elemental materials—earth, water, and fire. The designs range from sandbag igloos to vaulted adobe structures that are glazed and fired into ceramic.

Khalili's unique vision emerged out of a midlife crisis. In 1975 a 38-year-old Khalili was heading a Teheran firm prospering in the midst of Iran's modernization. Realizing that his profits were coming at the expense of traditional Persian architecture, which was being replaced with steel and concrete, Khalili sold his stake in the firm, bought a motorcycle, and took off on a five-year odyssey through the Iranian desert, searching for a way to preserve his country's architectural heritage while housing the poor.

On the outskirts of Ghaleh Mofid, a remote desert village, Khalili found the solution: a house-sized kiln that was once used to fire clay tiles. Inspecting the abandoned structure, he noticed that in the course of countless firings, the adobe blocks used in the kiln's walls and ceiling had fused together, forming a solid ceramic shell that had withstood earthquakes and the elements.

Within the walls of Ghaleh Mofid, he found villagers living in the open air because the vaulted roofs of their crumbling unfired adobe brick homes had been weakened by rain. Khalili convinced the villagers that he knew of a simple way to turn their unstable homes into sturdy structures. As a test, he repaired a single two-room house. Temporarily sealing its door and windows with bricks, Khalili fired the house from the inside, with a burner gravity-fed by two barrels of kerosene balanced on the roof. The house baked for 17 hours, until the adobe blocks had melted into a shell of earthquake-resistant and rainproof brick, just like the kiln. Soon, every home in the village had been fired. Over the next few years, Khalili toured the farthest reaches of Iran, teaching villagers how to transform their homes into ceramic, a process he called *geltaftan,* a combination of the Persian words for clay and firing.

In 1982 Khalili began teaching a course in ceramic architecture at the Southern California Institute of Architecture. On a field trip to New Mexico, looking for adobe houses to fire, Khalili discovered that unlike Iranian peasants, America's poor lived in trailer homes. Adobe houses built with bricks that cost a dollar apiece were not an option.

"I needed to find a way to pick up soil and build with that, taking into account those who cannot afford clay or firing," Khalili explains. "Then I realized that all over the world there is sand, but nobody is doing anything with it."

So Khalili figured out how to make houses out of sand. Using a mortar of barbed wire, he stacked sandbags into arches and staggered the arches into vaults, forming a sort of igloo that required a total material investment of only a few hundred dollars. For those who could not afford their pitched-roof dream house but preferred something a bit more refined than a sand castle, Khalili developed superadobe, mile-long fabric tubes that are pumped full of moistened soil and coiled into structures resembling beehives. These middle-class superadobe houses cost about as much as a 10-year-old compact car.

Khalili still teaches architecture students in Santa Monica, but he spends most of his time at the school he founded, fielding questions from would-be home designers who have never used a drafting table.

Ultimately, he envisions an earth-friendly Levittown rising out of the Mojave. This summer, Khalili and his students will build a model superadobe home on undeveloped acreage near his school in Hesperia, a bedroom community of pitched-roof bungalows. He then hopes to convince 40 Hesperians to replicate his design—which doesn't seem unlikely, given that the town has commissioned a 7,500-square-foot nature center/museum.

While Hesperia's leaders are quick to compare Khalili with Frank Lloyd Wright or Buckminster Fuller, the architect himself prefers to be measured against an apricot. "Some of my best inspiration comes from the apricot pit," he says. "You put it into the earth, and that pit changes the earth into a tree with branches that flower and make more apricots. That is a true architect." ■

Ted Katauskas is a freelance writer based in Portland, Oregon.

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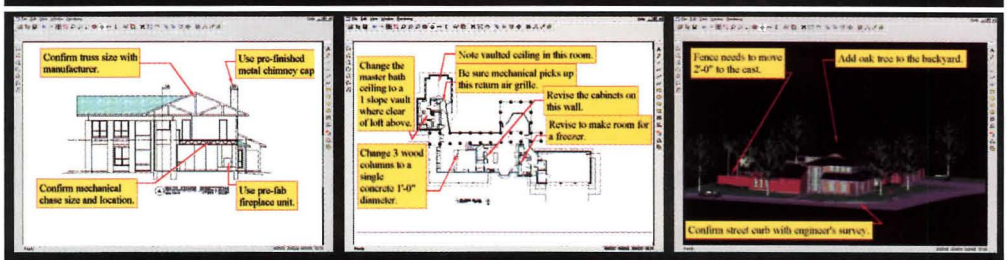

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