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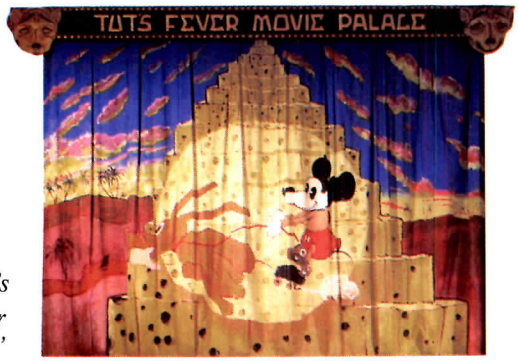

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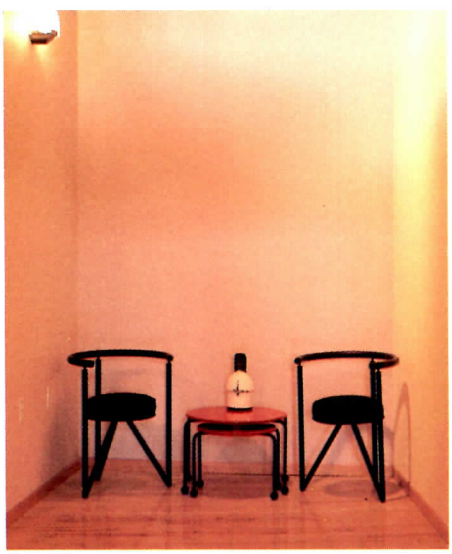

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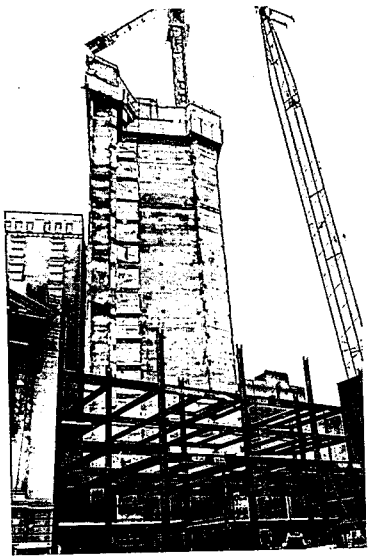
The Cleveland Trust Tower construction shows a common trait of composite structures: erection of the building's concrete portion is far ahead of the steel. Photograph courtesy of Weidlinger Associates.



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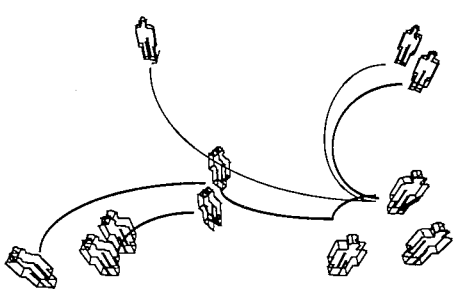
Herman Miller Office Pavilion, Boston, by Jung/Brannen. Photograph © Richard Mandelkorn (see page 50).



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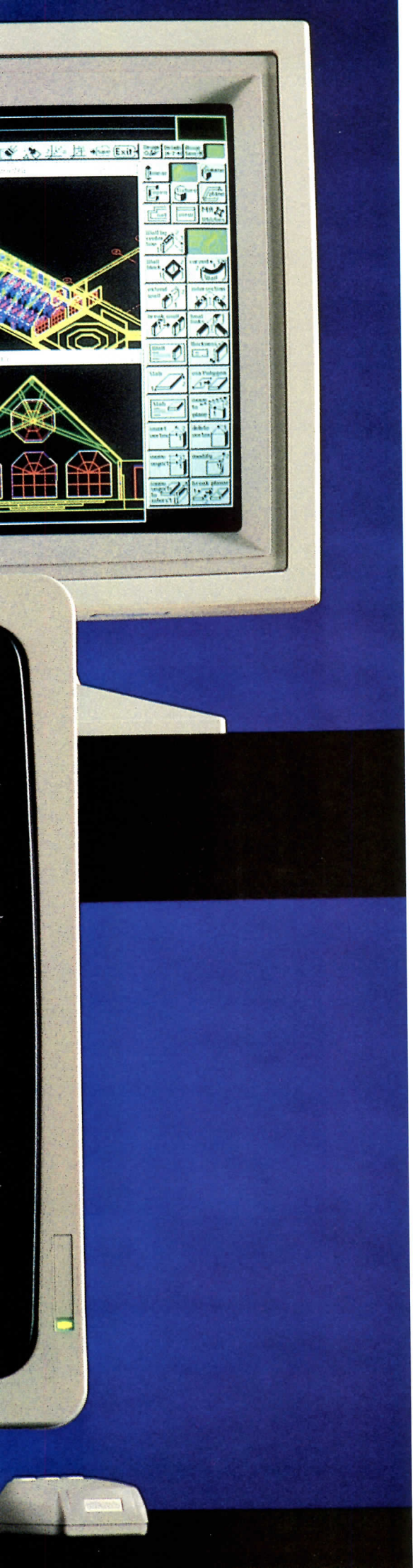
A chair for mind fitness.



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INTERGRAPH

ModelView image of the Pacific First Center, Seattle, designed by The Callison Partnership, Ltd., Seattle and San Diego.

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EVENTS

July 4-8: International Making Cities Livable Conference, Venice, Italy. Contact: Suzanne H. Crowhurst Lennard, Making Cities Livable Conference, P.O. Box 7586, Carmel, Calif. 93921.
July 10-14: Course on Infrared Thermography for Predictive Maintenance of Power Production/Delivery Systems, San Diego. Contact: Paul Grover, Infraspection Institute, 33 Juniper Ridge, Shelburne, Vt. 05482.
July 11-14: Conference on Computer-Aided Design Education, Cambridge, Mass. Contact: Harvard University Graduate School of Design, Special Programs Office, 48 Quincy St., Cambridge, Mass. 02138.
July 26-30: Symposium entitled "Assessing Wright's Legacy: The Reality and Myth of Frank Lloyd Wright," Ann Arbor, Mich. Contact: University of Michigan, Extension Service, Conferences and Institutes, 200 Hill St., Ann Arbor, Mich. 48104.

LETTERS

Canadian Asbestos Study: The Pickering Firm, an A/E firm with a specialty in asbestos management consulting, would like to comment on ARCHITECTURE's news report [Feb., page 24] of the Canadian *Journal of Public Health* study. Our position is that a building having asbestos-containing material does not automatically experience elevated levels of asbestos fibers. In general, we are convinced that any decision regarding abatement should not be based solely upon air-monitoring results, as that represents the so-called snapshot in time.

We are very concerned, however, that in the building cited fiber counts of 0.86 fibers per cubic centimeter not only outside the removal area but on other floors, presumably occupied, were justified as safe by pre- and postabatement fiber counts of 0.01 fibers per cubic centimeter. Had our firm been performing construction observation, we, like William Keane [president of EnviroDynamics, an environmental health consulting firm], would have shut down the building until the situation was corrected.

A fiber count of 0.86 per cubic centimeter outside the containment area is well above the OSHA action level (0.1 fibers per cubic centimeter on an eight-hour time-weighted average) and the permissible exposure limit (0.2 fibers per cubic centimeter on an eight-hour time-weighted average). Requirements of the action level would include medical surveillance if exposure was greater than 30 days; the permissible exposure limit would require a regulated area and appropriate respirators.

If the abatement area was contained and under negative pressure, there may have been significantly higher fiber counts inside, possibly exceeding the protection factor of the respirator type specified for workers on the project. It is important to note that such high fiber counts might indicate improper dry removal of asbestos and/or a breach of the containment.

We concur with Mr. Keane's observations regarding the detection limits of phase contrast microscopy, as well as the concern that the real exposure potential in buildings is to maintenance workers and building engineers, and that apparently went unaddressed in the study.

Our concern is that, while we understand that Canadian asbestos policies do not reflect the level of concern of our national and state policies, we feel that the influence of such narrow perspective studies detracts from prevention of asbestos exposure. If we do not properly deal with asbestos-containing material, buildings continue to age and such material can deteriorate or be disturbed by renovation, tenant improvement, installation, or repair activities, greatly increasing potential liability and likelihood of asbestos exposure. We believe the architectural community should take a professional and responsible position with respect to clients in renovation projects by recommending an asbestos survey by a qualified asbestos consultant. Assessment of asbestos-containing material does not necessarily imply need for immediate removal. It can often be handled by an appropriate operations and maintenance program. Contractually, such asbestos survey, design, and construction observation services can be provided without placing undue professional liability on the architect.

William E. Endelman, AIA
Seattle

Planning in Birmingham: In his essay in your December 1988 issue [page 19], my learned friend Philip Morris laid out a convincing case regarding the climate and tenor of urban planning in Birmingham, Ala. It is unfortunate that your headline writer, who penned the line "Birmingham: Where the Planning Is Easy," was not convinced by Mr. Morris's argument.

I must take (belated) exception to this headline. As Mr. Morris made clear, planning is not easy in Birmingham; indeed, it's an uphill fight. His essay concluded: "The real news about urban design in Birmingham, of course, is that there's any at all. Except for historic districts, consciously managed growth remains a rarity in the region. The South tends to resist anything that smacks of control. And it tends not to think abstractly. It could be that Birmingham's backing into urban design, finding something that works and then doing a little more, may be an adaptable model."

It is easily deduced that your headline writer, upon seeing a manuscript from the Deep South, reflexively recalled a certain tune about fictional life in the South and decided to apply it to this essay. I wonder why he or she didn't shoot the works and say "Where the Plannin' Is Easy."

Obviously, many fine headlines play upon well-known lines. But in this instance, the headline doesn't come close to agreeing with the text. Instead, it shows a preference for cliché over substance and plays upon a stereotype about the South.

Mitch Mendelson
Architecture Critic
Birmingham Post-Herald

The writer of this headline, Senior Editor Lynn Nesmith, responds: As a Southerner born and reared in Tabor City, N.C., I would be the last person to unthinkingly play upon stereotypes about the South. The headline was intended to be ironic: urban planning is not easy in Birmingham just as the living was not easy for Porgy and Bess on Catfish Row.

Rockwell Remembered: With the death last December of Matthew L. Rockwell [see April, page 41], design and planning groups across the country lost one of our most beloved, valuable, and influential friends. Matt Rockwell, with his quiet, thoughtful, unassuming, and pragmatic approach to the inherent problems of regional planning and design, was, and always will be, an inspiration to those of us who are following in his footsteps.

Matt's personal integrity and quiet diplomacy stand as a positive model for all of us. He approached his work and his whole life with a sense of fairness, openness, and honesty. It is said of many but it is absolutely true of Matt: the world, and particularly this small corner of it, will be a much better place because of his presence, guidance, unfailing good humor, honesty, and dedication to improving the life and the environment of his fellow human beings.

Harry Weese, FAIA
C. William Brubaker, FAIA
Lawrence Christmas, AICP
W. Stephen Lincoln, AIA
Robert J. Piper, FAIA, AICP

V'Soske's Contribution: In your March issue [a news report on 1988 Institute honors, page 26] you report that Stanislav V'Soske "invented the hand-tufted wool rug." If true, this news will set Oriental rug aficionados on their collective ears, because numerous papers, articles, and books have been written in the last century or so indicating hand-tufted wool rugs have been woven for centuries, perhaps for millennia.

Russell S. Fling
Columbus, Ohio

The report referred to V'Soske's 1924 introduction of a method to hand-tuft wool rugs, an alternative to the traditional loop pile method. V'Soske perfected a way to tuft wool through a strong cotton base, using a needle that could provide various pile heights and densities.—*Ed.*

Clarification: Environmental Planning & Design is architect of record for renovation of the Climatron in the Missouri Botanical Garden, shown on page 88 of the March issue.

Competitions

Eisenman/Trott Wins Competition For Columbus Convention Center

Eisenman Architects of New York City in association with Richard Trott & Partners of Columbus, Ohio, has won a limited design competition for the new $80 million Franklin County convention center in Columbus. The other firms participating in the competition were Princeton architect Michael Graves with the local firm Acock Schlegel Architects and Holt Hinshaw Pfau Jones of San Francisco in association with John B. Foster & Associates of Columbus.

As tourism and conventions become an important source of revenue in even mid-sized cities, local governments are starting to realize the importance of their convention centers. And Boston's new Hynes convention center (see May, page 92) proves that the building type is not limited to the anti-urban concrete-and-glass boxes that have proliferated around the country in the last 20 years.

Columbus considers its proposed 527,000-square-foot convention center an important addition to the urban landscape. "This building will be, for many national and international visitors who will pass through it, Columbus's living room," said competition adviser Edward C. Wundram, AIA. "Because it will very likely be Columbus's image, the community should have a choice and an opportunity to discuss the architectural options." The building is scheduled to be completed by 1992 for the 500th anniversary of Christopher Columbus's discovery of America.

The jury was chaired by Robert S. Livesey, AIA, of Ohio State University's school of architecture, and included John Burgee, FAIA, and Paul A. Kennon Jr., FAIA, as well as members of the community. Before the jury reached its decision, the three proposals were displayed in an exhibition that encouraged visitors to respond to the schemes, and these public comments were forwarded to the jury.

The jury cited Eisenman/Trott's scheme as the most "innovative and creative" solution to the program, saying that "the design provides a well functioning building that both respects the scale of the neighborhood and is a signature building for Columbus."

Eisenman/Trott incorporated sinuous curves in the roof forms that break down the scale of the massive space while simultaneously recalling the expressway and the curves of the railroad tracks that once occupied the site. The scheme uses laser art and lighting for communication as well as esthetics. Eisenman said, "Light is not merely added to the building—it is part of the very fabric. The lasers in the building will dissolve static space, perpetually forming and reforming space itself."

The proposal by Holt Hinshaw Pfau Jones Architecture with John E. Foster Associates also relies on lights and lasers but takes the concept one step further as the building becomes a "high-tech canvas" displaying ever-changing illumination patterns, three-dimensional imagery, special effects, and sounds. The primary structure consists of posttensioned Cor-ten steel trusses with a wall support of horizontal supports with chords hung from the roof of the exhibition hall at varying center points.

The Graves/Acock Schlegel scheme is far less subtle in its architectural image. The yellow-ocher wall surfaces of the facility are porcelain enamel panels patterned with diagonal grids and clusters of leaves and nuts from the buckeye tree, the state tree. The trusses supporting the exhibition hall roof have decorative "masts" with flags and strings of lights, creating a trio of abstracted ship-like forms intended to recall the *Niña,* the *Pinta,* and the *Santa Maria.* The modulated roof of the hall, which is visible from the adjacent highway, is colored blue and decorated with abstracted wave patterns. A large public fountain in the center of the vehicular entryway replicates Columbus's own ship supported on a column of water.

—Lynn Nesmith

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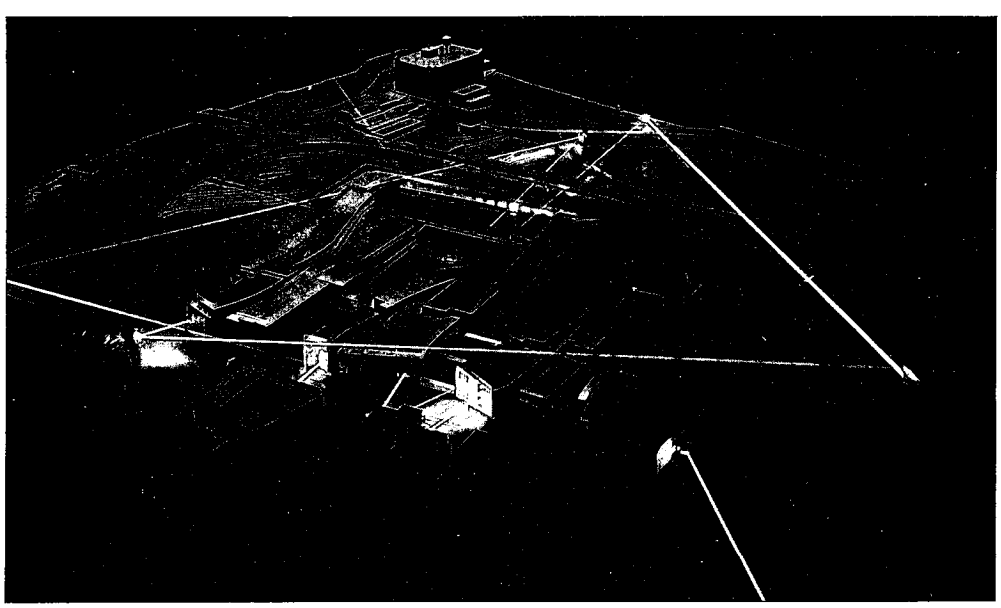
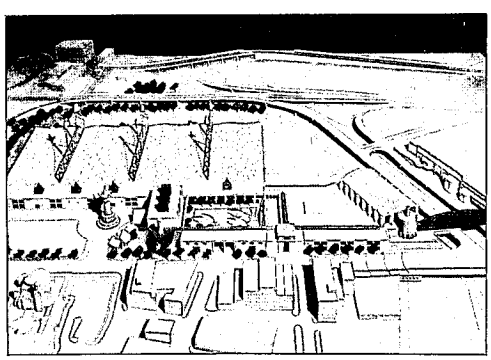
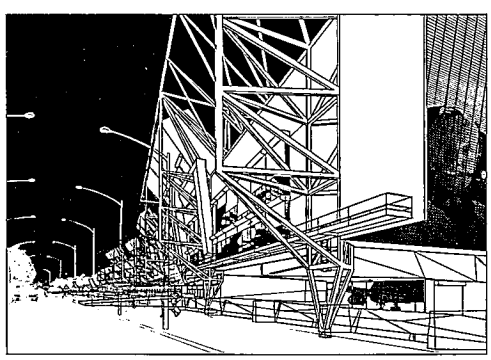
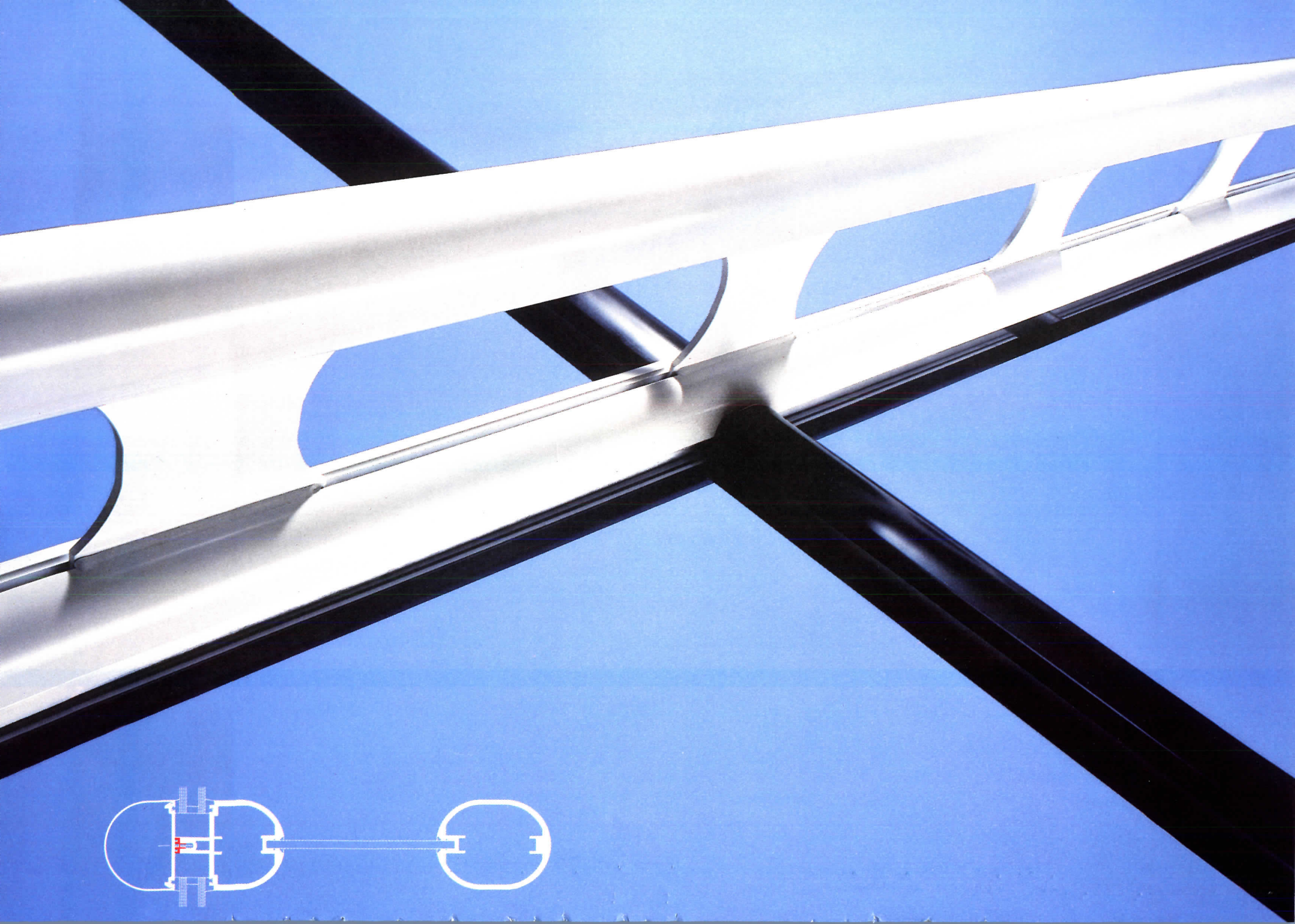
Below, Eisenman/Trott's model uses lasers and lights. Bottom left, Graves/Acock Schlegel scheme; bottom right, proposal by Holt Hinshaw Pfau Jones and Foster.









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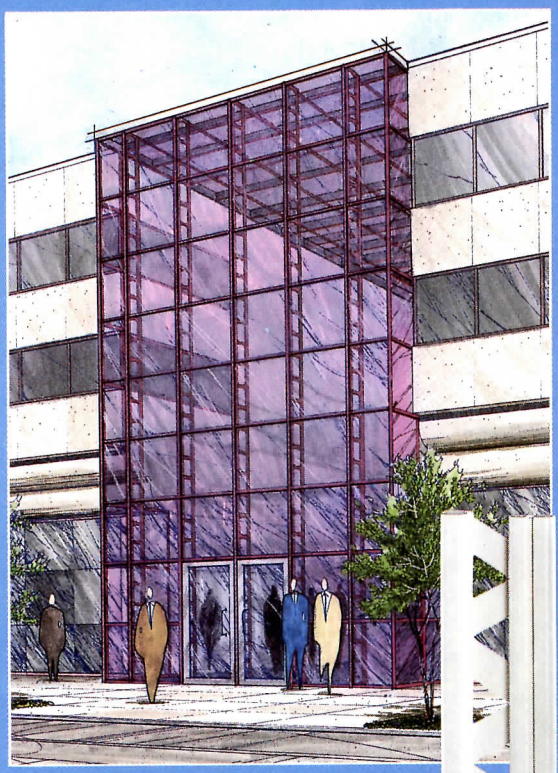

But while the design options offer flexibility, the integrity of the structure remains inflexible. A thermal break, and the flexibility of either ¼″ or 1″ glass attest to Trusswall being ready and willing to take on nature's harshest elements.

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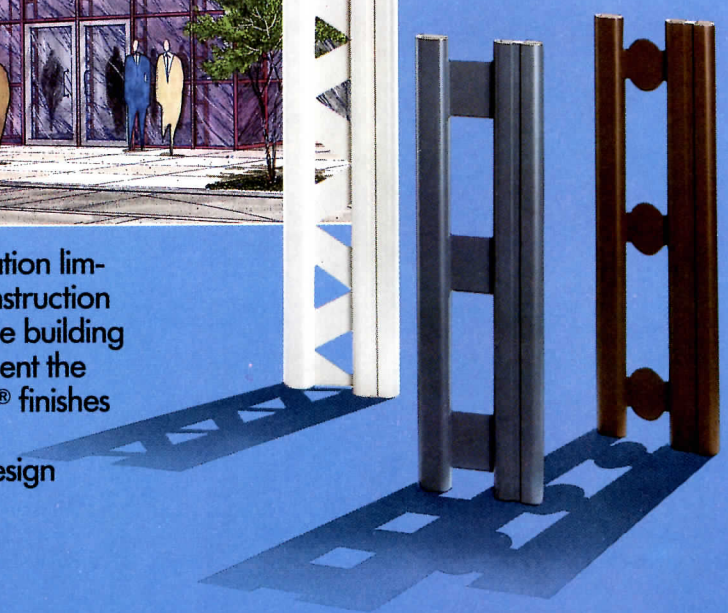

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SOM's Latest Scheme for Coliseum Site Gains Approval

The third and smallest scheme for a major mixed-used project on Manhattan's Columbus Circle was approved in early May by the New York City Board of Estimate, resolving one of the city's most tangled and prolonged development controversies (see Feb. '88, page 13, and July '88, page 38). More than a simple battle about architecture or esthetics, the dispute came to represent the the city's willingness to sacrifice good design and livable neighborhoods for the highest monetary return.

The approval by the Board of Estimate came two weeks after a scaled-down proposal by David Childs, FAIA, of Skidmore, Owings & Merrill/New York, was unveiled by Mayor Edward I. Koch at a press conference where city officials and civic groups vied to express support of the new design. In a city where it is becoming increasingly difficult to placate everyone, this latest scheme appears to have accomplished the impossible. The New York *Times* wholeheartedly supported the new scheme, stating in an editorial the following day, "The compromise does credit to all the parties. The city was willing to reduce its land price. The developer, Mortimer B. Zuckerman, and his architect, David Childs, designed a far more harmonious building. The local planning boards and the Municipal Art Society are willing to accept it without further litigation."

However, the agreement was not reached without a long and bitter fight. In 1979, legislation authorized the construction of the Jacob Javits Center, which rendered obsolete the Columbus Circle center and paved the way for the redevelopment of the site. The controversy gained momentum with a design competition that teamed architects with developers to respond to a program that stipulated that "the criteria for selection will include the amount of the purchase price offered, which will be the primary consideration."

The winning design by Moshe Safdie, FAIA, in association with Zuckerman's company, Boston Properties, called for a complex of 2.7 million square feet with two asymmetrical towers rising 68 and 59 stories and a skylighted retail arcade following the contour of Columbus Circle. The deal would have given $455 million to the city in addition to $30 million for subway station improvements.

Safdie's scheme immediately met with widespread opposition from community and preservation groups, including the Municipal Art Society, which joined forces to bring a lawsuit to halt the project. An emotional demonstration drew thousands of protesters who unfurled black umbrellas to simulate the mile-long shadow the skyscraper would cast across Central Park. Although the Board of Estimate approved Safdie's design in February 1987, less than a year later a court ruled against the city, declaring the sale of the Colesium site "null and void."

Scale renderings of the three schemes: left, Safdie's; center, Childs's first proposal; right, Childs's latest design.

The furor continued when, in late 1987, Safdie was replaced by Childs. Working with a scaled-down program, Childs proposed in June 1988 a cluster of two towers, 75 feet shorter than Safdie's. The mix of uses also changed, with 800,000 square feet of offices subtracted and 300,000 square feet of housing added. This first scheme by Childs was viewed as an improvement, but civic groups still lobbied for an even smaller complex.

The widespread acceptance of Childs's second proposal is a major victory for Zuckerman. This latest scheme is similar to Childs's first in its relation to Columbus Circle, where it curves and rises to approximately 85 feet with shops opening onto the sidewalk. A concentric retail galleria traverses the large entry rotunda. The new building is about 100 feet shorter than Childs's first, with the tallest tower rising to 752 feet, or 59 stories. The overall volume of the scheme is 620,000 square feet less than Safdie's original. However, the most significant design change is the insertion of an archway 10 stories high between the two towers, extending the vistas along 59th Street and reducing the apparent bulk of the building.

The new scheme also provides 120 single-room-occupancy units for the homeless and 4,000 square feet of public space for community meetings and performances. The financial returns to the city, however, were reduced. Under this latest plan Zuckerman would pay $337 million for the land and $4 million for subway improvements.—Lynn Nesmith

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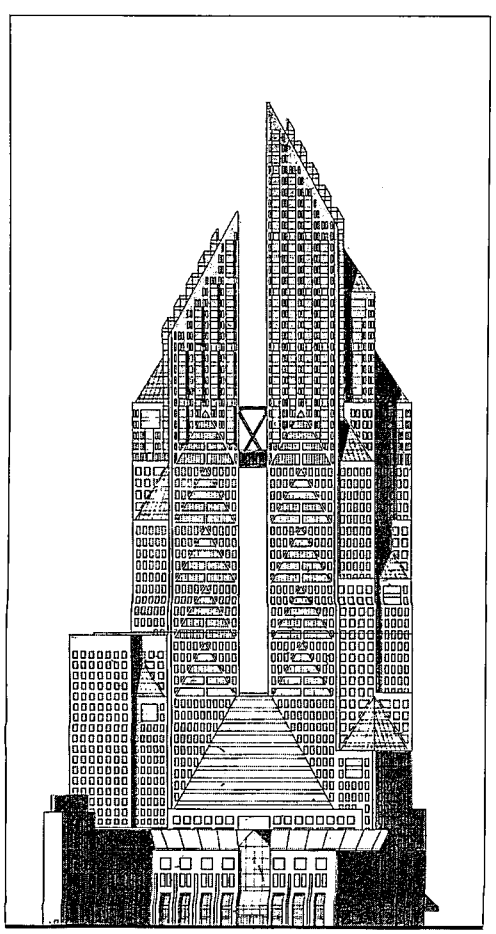

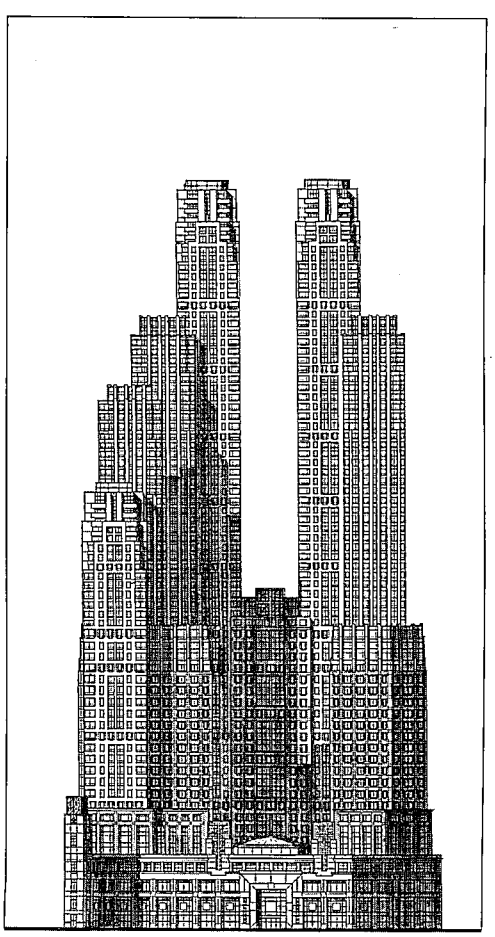

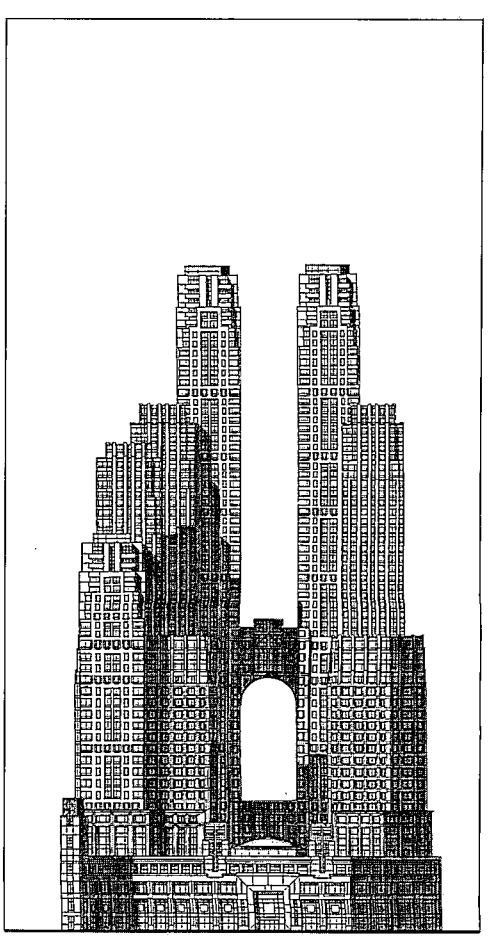

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Conferences

Architecture as Image Debated At Monterey Design Conference

How images are derived and then manipulated through the design process to create the art and artifice of architecture was the focus of a provocative Monterey Design Conference, sponsored by the California Council/AIA. Architects, authors, design critics, and educators gathered amid the wind-sculpted pines and sea-carved beaches of Julia Morgan's Asilomar conference center to explore the subjective, poetic aspect of design.

Images are so powerful in our culture that these mental constructs frequently are mistaken for reality. Since architects translate people's feelings and aspirations into form, they are susceptible to the occupational hazard of confusing image with reality, artistic invention with substance. Margaret McCurry, AIA, of Tigerman McCurry in Chicago, cautioned against this tendency, reminding her colleagues of Plato's observation that art exists in the shadow of truth.

The seductive power of illusion was captured in the work presented by Jon Jerde, AIA, of the Jerde Partnership in Los Angeles. Since the favorable public response to Horton Plaza and the 1984 Olympic Games, Jerde's efforts to revitalize deteriorated communal spaces have grown in scale to encompass literally thousands of acres of urban development.

Image as commodity is central to the marketing effort required to sustain Jerde's projects over the years it takes politicians, bankers, and developers to build, and then to attract users to the projects once they are realized. Collaboration with filmmaker George Lucas on "Luminaire," a retrofit proposal for Houston's convention center, has advanced Jerde's vision of the urban environment as an interactive theme park centered on consumerism and entertainment.

The notion of architecture as performance art to distract consumers from the emptiness of their culture disturbed George Hoover, FAIA, of Hoover Berg Desmond in Denver. He recalled Louis Mumford's thesis that human development is advanced by the unprogrammed interaction of people in cities. Hoover suggested that among the human needs supported by architecture is the quest for transcendence.

The appropriate images for the regeneration of American cities spurred a keen debate on the polemic of innovation versus continuity. Thomas Beeby, FAIA, of Hammond Beeby & Babka in Chicago and dean of the Yale school of architecture, deplored "the endless intervention into the city at the expense of what's there."

In a presentation rich with visual imagery and historic detail, Beeby reviewed how the political image of a modern, democratic society was manifested in Chicago's commercial and public architecture. His investigation supported the observation of Mies van der Rohe that architecture is the will of an epoch, translated into space.

How the old and the new can reinforce rather than deny each other in the urban setting was discussed by Hugh Hardy, FAIA, of Hardy Holzman Pfeiffer Associates in New York City. Hardy observed that the buildings that hold our cultural memory are transformed in the context of time.

Given the collision of values inherent in an urban situation, Hardy suggested that neither preservation nor imitation resolves the issue of how to build upon the remnants of the past. Instead, he proposed a sort of architectural reincarnation. "To be of value, architecture has to be about the here and now," Hardy said. "What counts is our own moment. We must be secure to speak in our own voice without too much respect for the voice of the past." *continued on page 23*

Conferences *from page 18*

California, the epicenter of the here and now, is so frequently confused with its media image that it was refreshing to hear some of the region's architects and planners discuss its physical and social realities.

Few places are as auto-motivated as California. A humorous show of vernacular images by Jim Heimann of Santa Monica, illustrator and author of *California Crazy,* documented the role of building form as advertising billboard in the most literal sense. Among the more benign effects of the car culture he showed were goofy dairy stands in the shape of giant ice cream cones and two-story stucco doughnut emporiums dispensing their wares from drive-through doughnut holes.

The less sanguine aspects of the automobile as a generator of urban form and image were addressed by a studio of architecture students taught by Barton Phelps, AIA, associate professor at UCLA's graduate school of architecture and urban planning. Los Angeles emerged as the first horizontal city with the superimposition of a freeway system onto its urban grid, the students reported. The insertion of an arterial system indifferent to its surroundings fractured neighborhoods and created a still-unresolved duality at the places where small-scale residential neighborhoods meet the colossal roadway.

Focusing on 9.4 miles of the Santa Monica Freeway between Interstate 405 and the Harbor Freeway, the UCLA students identified sites where design intervention could cauterize the wound inflicted on the neighborhoods. Their prelimary investigation generated funding from the National Endowment for the Arts to develop a network of proposals for the development of discarded spaces adjacent to freeways.

The remains of another transportation system, the railroad, provided both the image and the opportunity for San Diego to link its yup-scale downtown to the waterfront with a grand park and public garden. The worn tracks, dilapidated warehouses, and rusted debris of the Santa Fe Railroad will be transformed into the five-acre Marina Linear Park through a competition-winning scheme developed by an interdisciplinary team headed by Peter Walker of Peter Walker Martha Swartz Landscape Architects and Patrick O'Connor of Austin Hansen Fehlman Group.

The park is conceived not as a backdrop for art but as a horizontal sculpture in which colors, textures, and structures combine to reinforce the rhythm of the rails that will remain on the site as a reminder of San Diego's history.

The symbiotic dance between architecture and landscape was seen in an evocative slide presentation by San Francisco artist and architect Beverly Willis, FAIA, of Beverly Willis Architects. Natural and artist-derived images shown simultaneously

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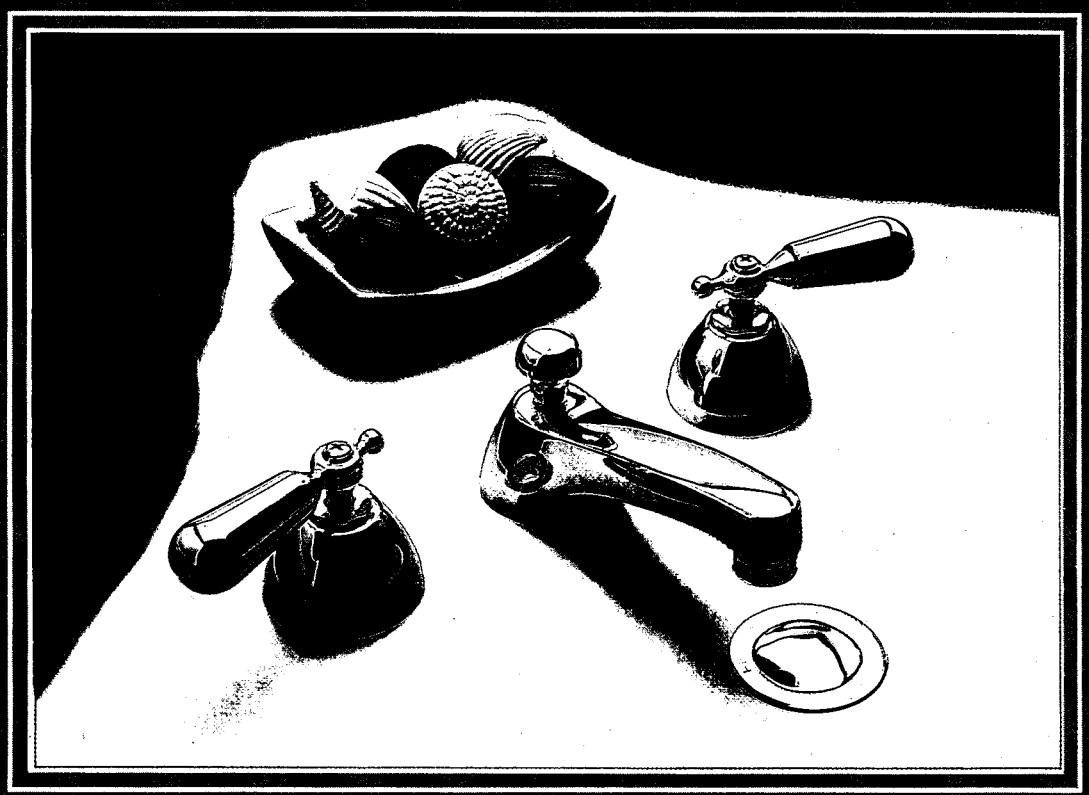

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with the built forms they inspired illustrated Willis's thesis that "nature, the great illusionist, is the first architect." Because natural laws—including those of human nature—are fundamental, not merely esthetic, she said, they confer a sense of continuity, heritage, and belonging when expressed in design.

The prevalent attitude in California that the built environment should respect and enhance its natural setting was celebrated in the selection of Bull Volkmann Stockwell of San Francisco to receive the 1989 firm award, presented by the California Council/AIA to honor a consistent body of distinguished architecture.

The award jury, chaired by 1989 gold medal recipient Joseph Esherick, FAIA, complimented BVS for its commitment to an architecture that is not just fashion. In accepting the award, Henrik Bull, FAIA, noted that the firm's architecture is "romantic, regional, and responsive—the dirty words that you can't talk about in architectural education."

The power of image to help people feel and express the rapture of being alive was conveyed in a riveting, rambling talk by Antoine Predock, FAIA, of Albuquerque. "Mere rigor, for me, is a blind alley," he said. He also described building as a spiritual event.

A pantheist who absorbs and synthesizes a stunning array of conceptual images, Predock produces architecture uniquely attuned to its environment. He uses a metaphor to describe architecture as the point at which "excavation meets astroprojection."

Predock's work is rooted in the desert, which he sees as a palpable force that strains an architect to understand the psychic as well as physical dimensions of place. His desert architecture is a pragmatic response, a defensive system in which surrogate land forms are articulated in a collision of geometries wrapped in an exoskeleton of shade. "Program is a cloak—an excuse to make architecture," he said. "I make naked buildings; take away the skin and the city of dreams is within."

Dreams have turned to nightmares in many American cities. Margaret McCurry raised the issue of how architects respond to the disintegration of our culture and the collective amnesia of the upper classes with regard to the plight of the poor.

"Architecture is an art and science that exists to meet human needs, not to make pretty pictures for other architects," noted Donald MacDonald, FAIA, of MacDonald Architects in San Francisco, whose "city sleeper" shelters garnered national media coverage and a lawsuit from the State of California. MacDonald said that the image of buildings and the codes that govern their design and construction are dictated by politics. The middle-class values that underlie the politics have little

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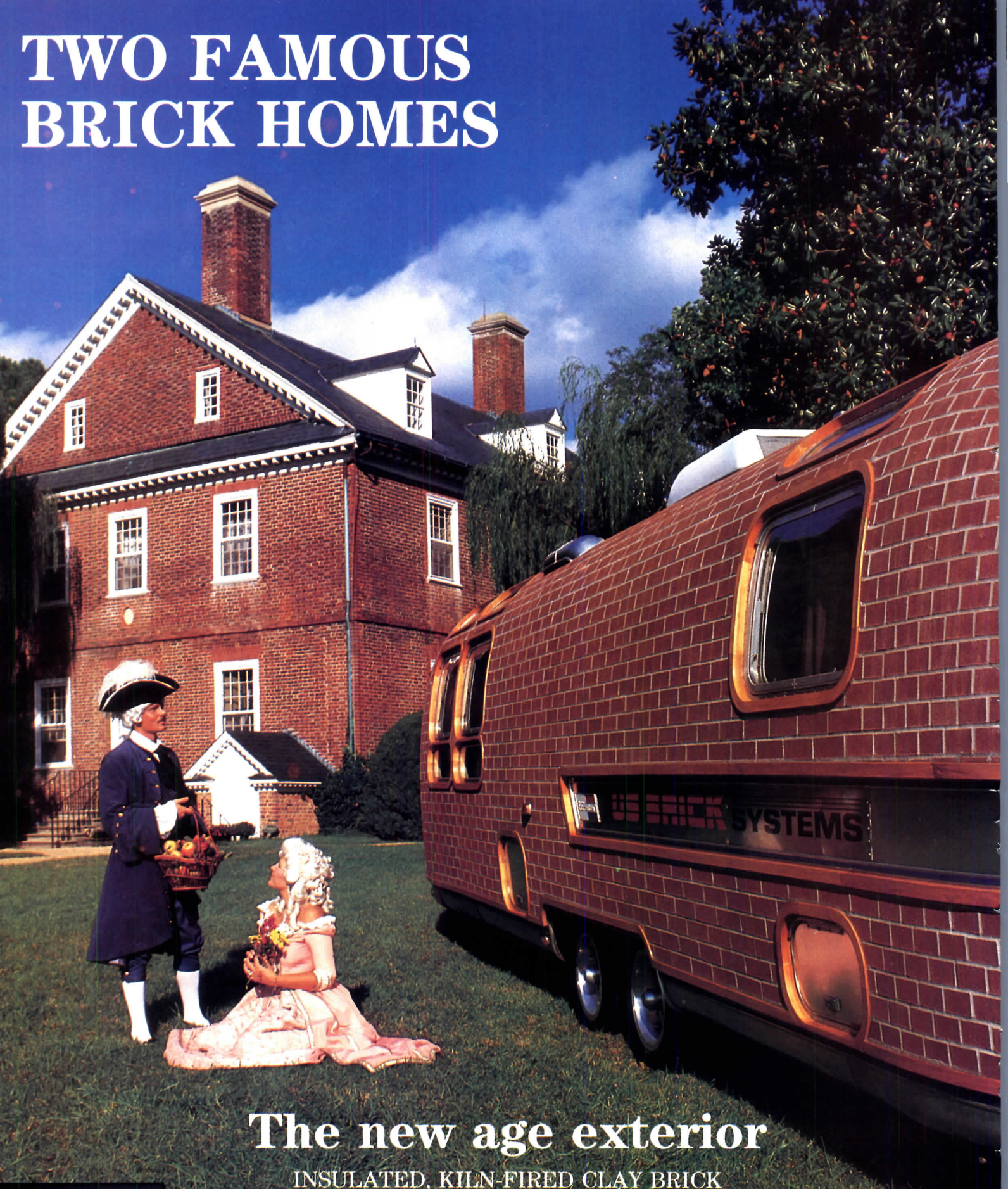

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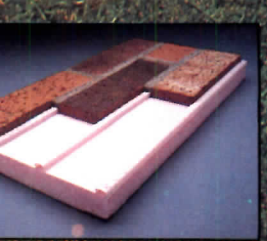

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to do with the economic and social reality of America's underclass, he said, and they conspire against realistic solutions to affordable housing.

The process by which imagery is united with function and transformed into physical reality was the focus of an introspective talk by MacDonald about his personal search for original thought. Each of his projects begins with a series of fantasy drawings that incorporate subliminal images and realistic forms in a loose composition, he said. The intuition is employed to refine these abstract images to solve real problems with architecture that is integrated into its built and natural contexts.

Problem-solving is an image-based process, but James Adams, chairman of Stanford University's program in values, technology, science, and society, suggested that architects rely too heavily on visual nourishment. Existing in a building involves all the senses, he said, and incorporating smell, sound, taste, and touch into the design process can add dimension to the built environment.

A multisensory awareness that perceives and realizes both art and truth is fundamental to architecture. As Antoine Predock observed, "Architecture is about the poetry of the solution, the relentless pursuit of vision."—Janice Fillip

Ms. Fillip is a freelance architecture writer based in Sacramento, Calif.

Architectural Historians Meet in New CCA Building in Montreal

Five years ago Phyllis Lambert, director of the Canadian Centre for Architecture, invited the Society of Architectural Historians to hold its 42nd annual meeting in Montreal. That meeting, held this past April 12-16, coincided with the completion of the CCA's new building. Designed by Montreal architect Peter Rose, the museum and study center are intended to establish Montreal as something of a mecca for architects.

At the sneak preview and reception on Friday night, architectural historians reeled at the museum's massive permanent collection and dreamed up ways to solicit a guest curatorship. Other extracurricular activities, of a more local flavor, included a reception in the Beaux-Arts Château Dufresne (now the decorative arts museum) and a tour of Montreal's satellite "cities beautiful," which were designed in an "emerald necklace" network by a student of Olmsted.

The academic sessions were held in the Meridien Hotel, a megaplex containing shopping, banking, movie theaters, etc., injected with artificial light, air, and sound, in the heart of the lifeless downtown. Surely there must be convention facilities in the city that do not assault esthetic sen-

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sibilities. The Canadian Society for the Study of Architecture, meeting there at the same time, was on hand to point out peculiarities of architectural heritage and urban form. A joint session addressed Quebec's connections with Europe and North America from the 17th century to the present. Other sessions spanned architectural history from "The Palatine Tradition in Fact and Fiction," in which Joseph Rykwert and James Ackerman participated, to "Paris in the Jazz Age," which looked at literary texts as well as building forms to expand our interpretations of the era.

While most sessions were organized according to a point in history, Stanley Tigerman, FAIA, took a different approach. His session, "The Precedents of Disjunction as a Working Strategy for the Designing of Buildings," premised that architects have created visionary schemes, largely unbuildable, at times of historical rupture or closure. For example, the deconstructivist "movement" today, which is realized mostly in ideological drawings, reflects an abrupt shift in people's world view. Participants in the session scavenged history for correspondences from the Bauhaus to Akhenaten and to a paper on the Polish wooden synagogue, whose complex program, laden with mysticism and messianism, reflected the experience of Jews in that culture.

The CCA meeting called attention to the Western bias of our architectural historians. The few sessions that studied Eastern architectural tradition considered it from the foreigner's perspective (as in "Islam and the West" or papers that followed Le Corbusier to the Orient or to Chandigarh). This Western orientation, I imagine, is due to the fact that historians in pursuit of a degree learn only two or three languages, usually Romance, in order to read original documents. Facility with a language presupposes an intimacy with its culture, while illiteracy breeds distance, mystery, and superstition—not the stuff of architectural history.

—Rosanna Liebman

Ms. Liebman is a writer and photographer in New York City.

Black Architects Termed 'An Endangered Species'

"Black architects are an endangered species," warned Robert T. Coles, FAIA, in his inaugural lecture this spring as the University of Kansas Langston Hughes visiting professor. "Those who are practicing are cut off from the mainstream of society that controls the resources necessary for architecture, just as the black community is isolated from those resources."

Coles, a black practictioner with offices in New York City and Buffalo, served as AIA's deputy vice president for minority affairs from 1974 to 1976. In his Kansas lecture he mentioned AIA's efforts on behalf of black architects, beginning with Whitney Young's 1968 AIA convention speech in which the Urban League director scolded the profession ("You are most distinguished by your thunderous silence and your complete irrelevance"). In the early '70s, Coles noted, the Institute encouraged black architects to join AIA, elected a black to its board of directors, established a minority scholarship program, and tried to identify and encourage potential minority architecture students.

"Unfortunately, it all came to a screeching halt in the late '70s with the recession that swept the architectural profession," he said. In his AIA staff position, his "task was not to bring more blacks into the profession but to develop new programs to keep those who were" in practice. The post was later abolished, Coles said, "perhaps a reflection of the organization's lack of commitment to an ongoing effort to increase the number of blacks in the profession."

Quoting Labor Department figures, Coles noted that in 1970 approximately 2 percent of the 50,000 architects in the United States were black. By 1984, although the total number of architects had more than doubled, the proportion of blacks in the profession had risen to only 2.4 percent of the total.

But Coles finds it difficult to substantiate even this small gain, based on his observations. And he noted a decrease in minority enrollment in schools of architecture from almost 10 percent in the late

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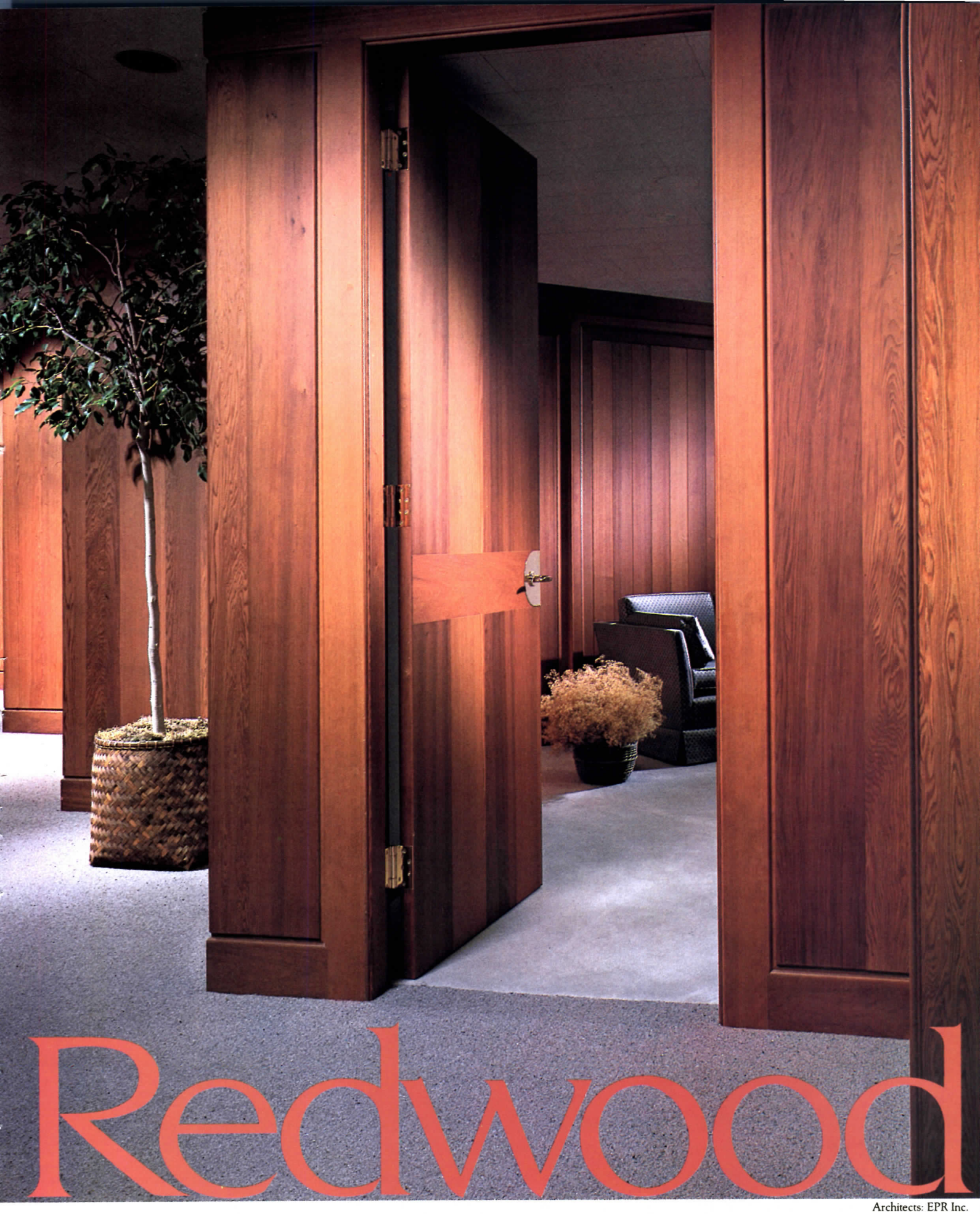

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'70s to fewer than 5 percent today. "When I first taught in Kansas in 1969, I met with a dozen black architectural students and saw many other black students on campus," he said. "Twenty years later I am told that there are 10 black students out of 600 in the school of architecture, although in my three visits I have seen less than half that number. It is the same at Ohio State University, where I spoke last fall, and [there are] even less at the University of Buffalo, New York State's only public school of architecture."

The clients of black architects are not the IBMs, the GMs, the GEs, Coles noted. Instead, blacks are focused on public projects.

"But in 1973—in one of his first acts after taking office for the second time—Richard Nixon put a moratorium on low- and moderate-income housing, one of the mainstays of black professionals," he continued. "Fortunately for black architects, Nixon's transportation secretary was William Coleman, a black Philadelphia lawyer who initiated the most effective affirmative action program in public works by mandating that 15 percent of all federal funds for mass transit go to minority firms. As major new mass transit systems were built in Washington, Atlanta, Baltimore, and even Buffalo, black architects began to thrive again. However, President Ronald Reagan, elected in 1980, dismantled the remaining low- and moderate-income programs as well as drastically reducing funding for mass transportation projects in this country as resources were directed toward building up the defense establishment."

During a conference on blacks in architecture at Howard University in Washington, D.C., Robert Coles is seated at right.

New opportunities were opened with the rise of black political power in urban centers. However, Coles said, this source of work is now threatened with last January's 6-3 Supreme Court ruling striking down as unconstitutional a minority subcontracting program implemented by the City of Richmond, Va. The court ruled that Richmond's minority business utilization plan, which required the city's prime construction contractors to set aside 30 percent of each contract to one or more minority firms, violated the 14th Amendment's equal protection clause. A similar law was declared unconstitutional in Atlanta.

Coles is the first person in the University of Kansas's school of architecture to hold the Langston Hughes professorship. Previous holders have been in the university's humanities departments. Named for the black poet, playwright, and historian, the professorship brings "a mentor and role model for minority students" to the campus for one semester.—ALLEN FREEMAN

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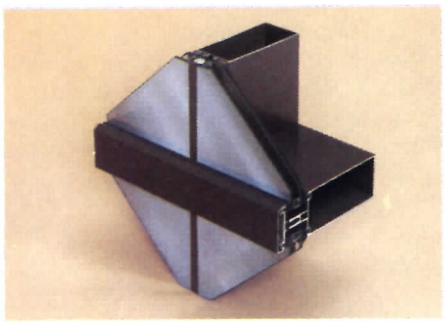

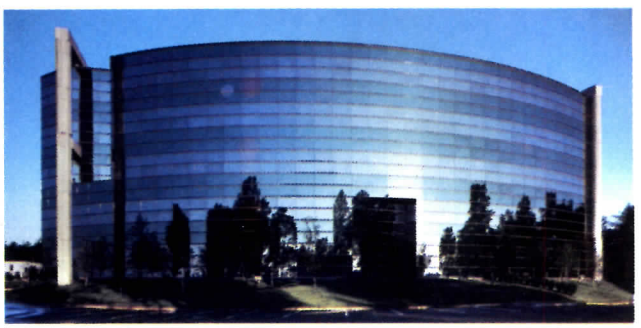

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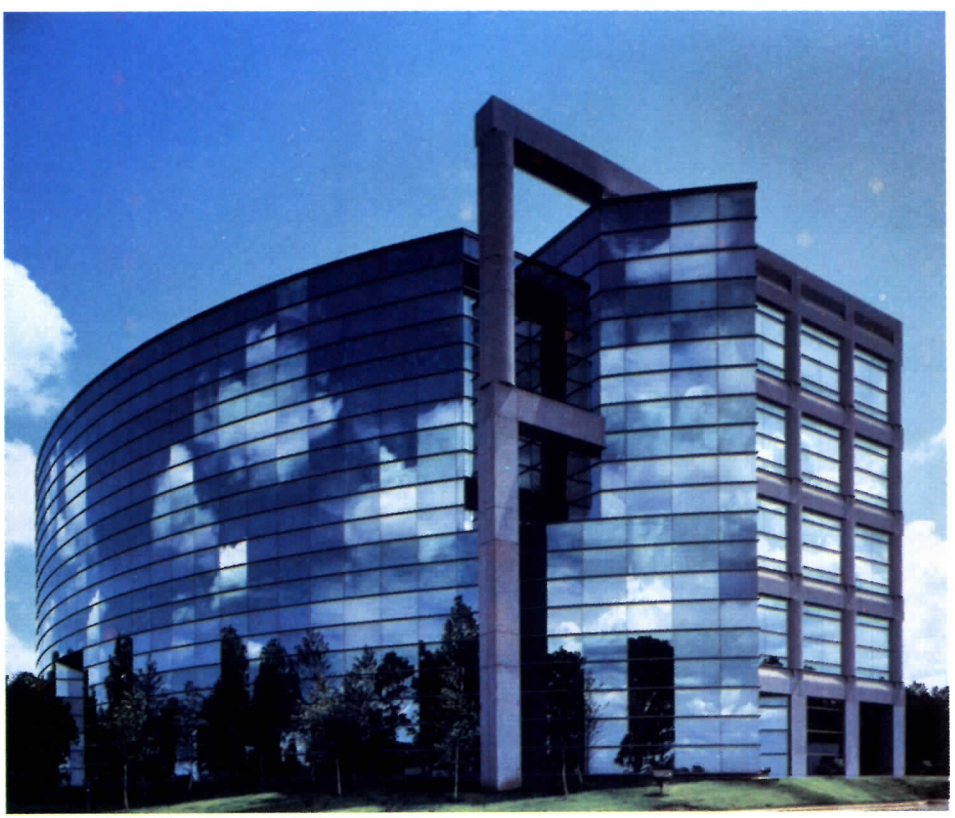

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The Institute

Convention Delegates Adopt Revised Resolution on Licensing

Licensure of specialized disciplines within the building industry was the most hotly debated topic at AIA's national convention in St. Louis last month, as delegates voted to retain the Institute's present position until more study can be conducted.

The action calls for AIA to "to examine the long-term implication of the regulation of design specialists and the recognition of specialized competencies within the profession." To be examined, among others, are the categories of responsibilty, the classifications of specialized competencies, and the education, internship, and professional development in specialized disciplines.

An alternative resolution, offered by past-president Donald J. Hackl, FAIA, was vehemently debated. It called for the suspension of all AIA policies and accords until the 1989 licensing law task force has studied tiered registration and long-term implications of title registration. Hackl argued that the issue is not architects versus interior designers but the whole concept of tiered registration.

The debate over licensure of building industry specialists has been raging since the early 1980s, when conflicts between architects and interior designers began to increase. In 1985 AIA adopted a policy stating: "In the building industry the design responsibility for the public health, safety, and welfare demands the education and experience required for the licensing of architects and engineers. . . . AIA opposes any dilution of this responsibility."

In other business the convention delegates adopted resolutions calling upon AIA to:

- Expand the influence of the architect by encouraging members to pursue nontraditional areas of practice that provide leadership opportunities to influence all levels of government, business, and industry.
- Conduct roundtables for practitioners who specialize in small projects.
- Make building codes more understandable to practitioners and urge the model building code organizations to adopt a common code format.
- Develop an environmental resource guide to "better enable architects to educate and influence their clients, the public, and elected officials to act responsibly in considering the ecological impact of planning and design decisions."
- Offer expertise to future victims of catastrophic disasters, such as the recent earthquake in Armenia.

Delegates also offered support, in the form of a resolution, to the St. Louis Chapter/AIA and the AIA historic buildings committee in opposition to the proposed demolition of the Cupples Station Complex. Located in close proximity to Busch Stadium, the complex is a group of 10 warehouses constructed between 1894 to 1917 and designed by Eames & Young of St. Louis. The Civic Center, a subsidiary of the Anheuser-Busch Co., wants to replace the warehouses with a hockey arena, offices, residences, and a hotel.

Another locally sponsored resolution called upon AIA to support the adoption of legislation by the U.S. Congress to extend the Jefferson National Expansion Memorial to the east bank of the Mississippi and to conduct a design competition for its design.

The Jefferson National Expansion Memorial now consists of the west bank's green carpet and Eero Saarinen's Gateway Arch. Perhaps the most emotional moments of the convention occurred at the arch during a dedication of the memorial plaque to Eero Saarinen. In attendance were Saarinen's daughter and one of his two sons.

Overall, the convention program offered a smorgasbord of views and challenges. Most spirited were those of Robert H. Schuller, founding pastor of Los Angeles' Crystal Cathedral and the "Hour of Power" television program, who began his oratory at the AIA convention with the confession, "I would have been an architect if I hadn't had a calling."

Architecture must generate joy, Schuller says, for "without joy the human being cannot survive." Schuller added emphatically that it is crucial for architects to practice "the four Hs—humility, humanity, hospitality, and honesty." Schuller worked closely with Richard Neutra in the late 1950s and Philip Johnson in the late 1970s in the design of his two churches.

A panel of representatives from 10 national and international organizations, including AIA President Benjamin E. Brewer Jr., FAIA, and Yuri Platonov, president of the Union of Architects of the USSR, explored ways to strengthen international cooperation through the UIA and bilateral exchanges on issues, such as education, affordable housing, technology, professional standards, and preservation. The program also addressed the ever growing international economic interdependence and discussed the possible effects of the removal of trade barriers among European nations in 1992. In addition, three members of the Armenian earthquake reconstruction urban design assistance team reported on their recent trip to the Soviet Union.

Most disturbing was the assessment of the world's ecological health by Peter Raven, director of the St. Louis Botanical Garden and an expert on tropical rain forests. Raven argued that architects have an important role in developing an international understanding of the earth's changing ecology. Critical are practices relating to waste disposal, the buildup of chlorofluorocarbons and the greenhouse effect, the breakdown of the ozone layer and climatic warming, and the extinction of plant and animal species in tropical rain forests. Architects should be involved with developing new methods of energy conservation, Raven said.

Most discouraging was the continuing call for architects to help mitigate the nation's affordable-housing crisis, which continues to grow with no end in sight.

Most encouraging was the enthusiasm of the young architects and an architect-to-be. Thirty-six young architects proclaimed, "The challenge to ourselves and to you is to be visionaries, to be community leaders, but also to be producers of relevant solutions to the problems that affect our quality of life as we move into the next century. . . . It's time for us to take action—to make Vision 2000 become Action 2000." Meanwhile, 8-year-old Joseph Caporale of San Jose, Calif., told the convention about his commitment to becoming an architect. Caporale won the McDonald's "Hold Onto Your Dreams" speech contest in the Grades 2 to 3 category. His enthusiasm for architecture drew an enthusiastic ovation.

New AIA Officers Elected

C. James Lawler, AIA, of West Hartford, Conn., was elected AIA's first vice president for 1990 at the Institute's annual convention last month in St. Louis.

Lawler is a national vice president of AIA and chairs the AIA design committee. He served as president of the Connecticut Society of Architects for four years and cochaired the Connecticut Architectural Foundation. He also served as president of the New England Regional Council.

Convention delegates also elected three new national vice presidents: Richard W. Hobbs, FAIA, of Seattle, senior director for the Northwest and Pacific Region and former president of the Seattle Chapter; Warren Douglas Thompson, AIA, of Fresno, Calif., board member and former president of the California Council; and Thomas P. Turner, AIA, of Charlotte, N.C., director from the South Atlantic Region and former president of the North Carolina Chapter.

Lawrence J. Leis, AIA, of Louisville, was elected to a two-year term as AIA treasurer. Christopher J. Smith, AIA, of Honolulu, continues in his two-year term as secretary. *News continued on page 34*

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Government

Bush Slowly Fills Top Posts At HUD, EPA, Transportation

The first 100 days of the Bush Administration ended with housing and environmental issues highly visible but with few Bush lieutenants in place in sub-Cabinet posts at either the Department of Housing and Urban Development or the Environmental Protection Agency.

Meanwhile, despite some anxiety in congressional oversight committees about soon-to-expire leases on agency buildings, there was no new leadership in place at the General Services Administration.

HUD Secretary Jack Kemp continued to express support on Capitol Hill for expanding housing stock. He suggested to a House appropriations subcommittee that he might not resist fund increases that run counter to Bush's budget request.

Although few posts requiring Senate confirmation had been filled by press time, a HUD middle-management team with diverse backgrounds was waiting in the wings, presumably preparing to assume administrative roles. Confirmation had been sought for Alfred DelliBovi, administrator for the Urban Mass Transit Administration, to be undersecretary. As head of UMTA, DelliBovi was a firm advocate of private solutions to transit problems.

Still awaiting signals from the White House to start the confirmation process were the following designees to be assistant secretaries:

- John Weicher, policy development and research, an economist, and author of numerous studies of housing issues published by the Urban Institute.
- Anna Kondratas, community planning and development, who headed the Reagan Administration's food stamp program at the Department of Agriculture.
- Francis A. Keating II, general counsel, former associate attorney general, and counsel to the Oklahoma NAACP.
- C. Austin Fitts, assistant secretary for housing and Federal Housing Administration commissioner, a partner in the Wall Street investment banking firm Dillon, Read & Co.
- Joseph Schiff, public and Indian housing.

Several of these appointees, while awaiting White House steps to gain their confirmation, were occupying offices near Kemp's suite in the HUD building. They were undergoing extensive briefings and conferring with leaders of Washington-based associations representing housing and local government interests. As a group, says one HUD career analyst, they have an enormous appetite for new ideas.

Some veteran observers, however, find this manifest enthusiasm hard to reconcile with budget constraints facing these would-be officials. Richard Nelson, executive director of the National Housing and Redevelopment Organization, has discussed his group's comprehensive proposals for strengthening housing programs. But, he notes, "most of our new ideas cost money." The bleak prospect for significant expansion of HUD's budget prompted Brookings Institution fellow Anthony Downs to conclude gloomily that the new team there is "far more vigorously pursuing nothing than the one it replaces."

The Alaskan oil spill overshadowed the EPA debut of William K. Reilly, who brings to the job of administrator nearly two decades of experience as a practicing environmentalist. Reilly also faced fierce regional reaction to his decision to withhold federal approval of a Colorado dam and resistance from the Washington infrastructure lobby for his defense of Bush's proposal to halve, to $1.2 billion, funds authorized for sewage-plant construction.

Other appointments to agencies that influence decisions on design and construction include:

Brian Clymer, vice-chairman of the Southeastern Pennsylvania Transit Authority, was chosen administrator of the Urban Mass Transit Administration. His boss, Transporation Secretary Samuel Skinner, was chairman of the Regional Transportation Authority of Northeastern Illinois.

Randolph McAusland, president of a New York firm, Design Publications Inc., was selected to head the design arts program of the National Endowment for the Arts. —Simpson Lawson

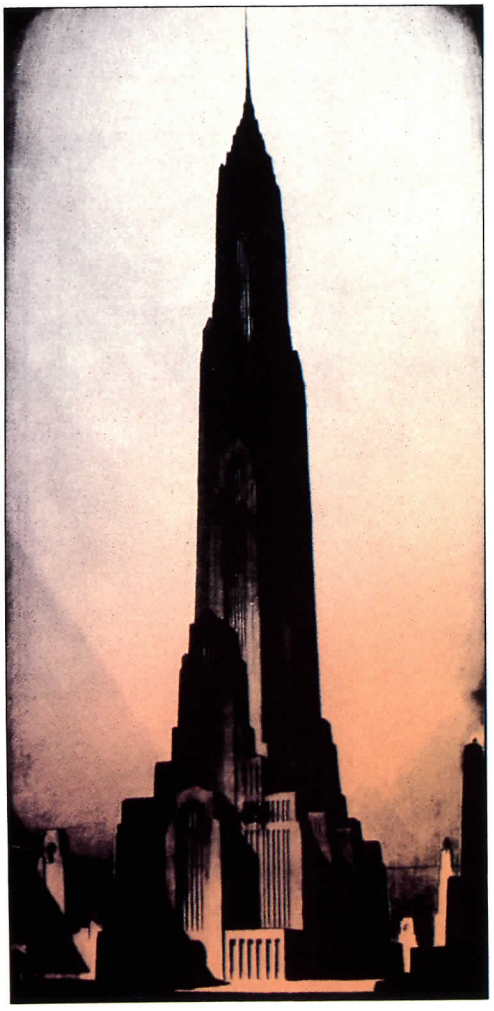
Mr. Lawson is a freelance writer.

Analyzing the 'Metaphysics' of Skyscrapers

The Skyward Trend of Thought: The Metaphysics of the American Skyscraper. Thomas A.P. van Leeuwen. (MIT Press, $25.)

Until Rem Koolhaas investigated the phenomenon in his book *Delirious New York* (1978), explanations for the skyscraper's appearance tended toward what was soberly expected. Certain technological advances, most notably the evolution of the metal frame and the invention of the elevator, increased the potential bonanza to be realized from centrally located real estate. Such rational explanations often were augmented with arguments stressing the psychological euphoria of height for height's sake (Sullivan's "proud, soaring thing") and the client's bid for visibility and perhaps a piece of immortality. Koolhaas's approach was more fanciful. Among other ideas he emphasized that the secret agenda of the New York skyscraper was the deliberate congestion of the city simply for the sheer carnival gaiety of congestion itself, a condition of which he thoroughly approved. One didn't have to buy the whole of his argument to recognize its brilliance, to which Koolhaas added the fireworks of some surreal skyscraper images of his own, based on zany symbolism suggested by the zaniness he found in the actual state of things during what he termed the "golden era" of the Manhattan skyscraper—1920 to 1935.

Now another witty Dutch observer follows Koolhaas's example (and acknowledges his inspiration). Thomas A.P. van Leeuwen analyzes what he terms the "metaphysics" of the American skyscraper. Whereas Koolhaas masked his scholarship in the breezy guise of a movie scenario, van Leeuwen exaggerates his academic point of view to celebrate the "Apokatastasis" of the skyscraper in its "final Cosmetropolis" in, among others, its "Paedomorphic," "Theomorphic," and "Acromegolic" aspects. As he says, he pays "more attention to the 'vague' side than to the 'clear' side" of his subject. In other words, like Koolhaas, he jettisons most



'Religion' by Hugh Ferris, circa 1929.

of the conventional wisdom on skyscrapers to ferret out their catacomb meanings. He shakes up familiar icons, such as the famous photograph of an architect poking his finger into an exposed pier of William Le Baron Jenney's Home Insurance building in Chicago shortly before its demolition in the 1930s, demonstrating that the metal frame supports the building—a "miraculous first" in skyscraper construction. Van Leeuwen juxtaposes that photo with one of Caravaggio's painting of St. Thomas, who incredulously pokes the wound of Christ.

Van Leeuwen transfers even the most prosaic pieces of skyscraper lore to his metaphysical "skyward trend of thought." Indeed, the metaphysical title is itself an inflation of the thoughtless boosterism of a New York City guidebook of 1906. Again, one doesn't have to accept the whole of van Leeuwen's argument, nor perhaps find the pose of the pedant quite so engaging as that of the scenarist, to appreciate his wisdom and wit.

True to his emphasis on the symbolism of the skyscraper, van Leeuwen repeatedly alludes to the mythical towers of the past—Babylon, the Temple of Jerusalem, the Colossus of Rhodes, the "Urbs Turrita" of Athanasius Kircher—and to actual towered towns such as medieval Bologna and San Gimigniano as the "Urthrust" of the skyscraper. They receive their spectacular Apokatastasis (or return) in the final Cosmetropolis (New York), although van Leeuwen casts a wider net than Koolhaas and tangentially includes skyscrapers from across the country. In fact, he demonstrates that tower myths from the past often appear in allusion, and even occasionally as projects, in connection with American skyscrapers of the 1920s.

This "return" of the skyscraper from the mists of the past occurred in the euphoria of the American frontier spirit, as manifested in its new metropolis. From this theme van Leeuwen moves on to the skyscraper as "cathedral," then as analogy for "natural growth." Natural growth, in turn, appears first as "tutti" (or jungle), as "hortus congestus," and as "hortus speculativus." Then, natural growth appears "solo," as the colossal specimen—the evolution of the form in quest of overweening tallness and the symbolic themes around the quest. Along the way, van Leeuwen springs surprises and puts accepted wisdom into new perspective. Although ideas and whimsy pull at one another occasionally, this is a key work on the early history of the skyscraper, not only for what van Leeuwen says but also for the array of images he brings to his bumptious subject.

The period he covers, 1870 to 1935, he terms the "Skyscraper Era," and again his

continued on page 40

Books *from page 39*
frame is larger than Koolhaas's. In that period the skyscraper was awesomely popular. And today? Looking at the skylines —if they in fact deserve the term—of American cities across the country, who any longer is thrilled? The skyscraper has dwindled to a dull necessity. Where is the excitement of the silver telescoping tip of the Chrysler Building? Or the fantasy dirigible nosing into the Empire State's needle? Or the drama of the rise of Rockefeller Center's RCA slab at the end of its corridor space, as though born of the Promethean spirit celebrated in the gold fountain at its base?

As for more recent images admired by the public and profession alike, Citicorp may come the closest, and like its most admired predecessors it is truly a tower, not a lumbering ox. Other buildings, shaped to a colossal unified image, seem less memorable by comparison—the World Trade Center, for example, or Chicago's Hancock Tower, and, for laughs, San Francisco's Transamerica. The Hancock in Boston, and perhaps some few others like it, are truly handsome, but aloof, lacking the easy recognition of the old classics. Recalls of the "stepped" massing of the 1920s? Houston's Transco, by far the best of them, seems a mere ghost of the originals, even though it is in some ways more sophisticated than any of them. Another lost cause is the clumpish piling of cylinders, triangles, and circles as though they were really columns, pediments, and medallions. What of such one-time vaunted audacities as the "Chippendale" skyscraper? Who now takes the furor seriously, or can even see the building in its cooped-up situation on Madison Avenue? Sears, the world's tallest building? How many could conjure its image in memory, and who cares? Soon it may not even be Sears.

Does all this suggest that the Apokatastasis of the skyscraper is a phenomenon of the past? If so, then studies like van Leeuwen's are all the more significant for providing a sense of the psychic and cultural milieu that makes the first 60 years of its development, and most especially the final decade of that period, a time to savor in its history. Or does another phase of remarkable achievement wait in the wings? What might produce it? Where might it occur?—William H. Jordy

Dr. Jordy is professor emeritus of art history at Brown University.

George Ranalli: Buildings and Projects. George Ranalli. (Princeton Architectural Press, $19.95.)

This monograph on the work of George Ranalli, who also teaches architecture at Yale, presents 13 projects, ranging from the architect's own studio apartment of 1975 to his exhibit in the 1986 Milan Triennial. The book is appropriately modest in scale and consists chiefly of black-and-white photographs of drawings and built work. Essays by Michael Sorkin and Princeton professor Anthony Vidler introduce the book, and a brief text by the architect accompanies each project.

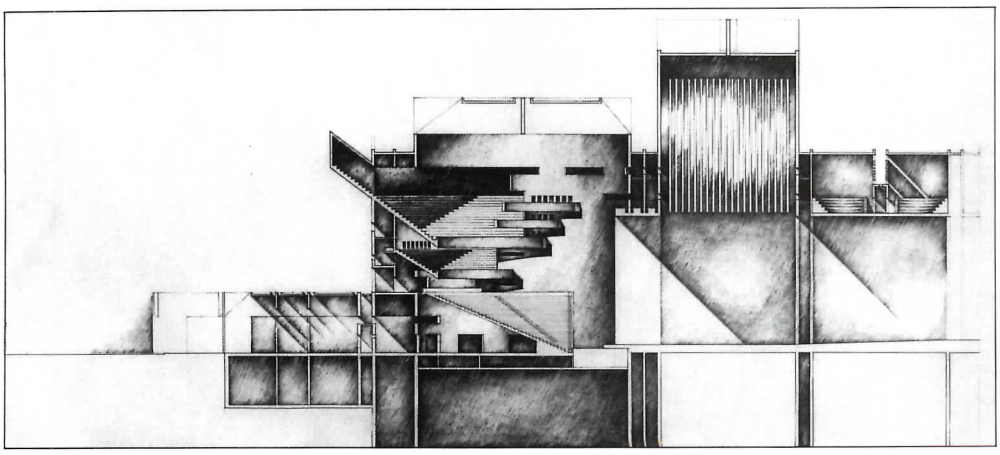
Powerful sculptural forms inhabit Ranalli's work. The *Chicago Tribune* "Late Entries" and *Times* Tower competitions demonstrate the architect's attitude toward the tall building as a freestanding object. Both towers are bizarre, their iconography mysterious and provocative.

Ranalli's residential interiors work generates sculptural force on a smaller but no less iconographic scale. The architect typically locates a core-like element with flat, planar surfaces within the shell of an existing space. He breaks the solidity of this object by cutting and piercing its surface, often crenelating the edges to cre-

ate an abstracted urban backdrop. Rather than a "house within a house," we see a fragment of the city within a house.

The wall profiles and associated detail elements are pure inventions. Some of these forms tantalize, some merely frighten. Ranalli's New York loft features a magnificent brass bed canopy—winged like a great metallic bird. The same apartment, however, contains sinister elements—a projecting steel shelf, a knife-edged cantilevered beam, and a hooded steel window frame. His New York apartment project displays a desk and chair enclosure fused to the window wall and opening itself to the light, like a throne of inspiration. But the furniture designs generally look stiff and uncompromising.

Italian architects such as Gaetano Pesce and Carlo Scarpa have influenced Ranalli's design philosophy. When Ranalli writes that Pesce "moves forward, constantly exploring the relationships between material and form," his projects "dedicated to disturbing the status quo of a world barely alive," he could be summarizing his own approach. While some of the projects appear monochromatic in photographs, Ranalli's unbuilt work, often larger and more complex, seems pregnant



with his search for new connections.

The architect's vision emerges most directly in his exquisite drawings. They are evocative, full of light and texture, and his oblique projections especially reveal the sculptural essence of his work. The stunning section cut through his Paris Opera project (above) could stand alone to represent his entry. His drawings of the Frehley house reveal a fantastic world: its underground entry sequence recalls the approach to an Egyptian pyramid, and its plan shows passageways and stairs embedded in thick walls, conveying the release into a huge, light-filled atrium. The variety of scale and spaces are reminiscent of Sir John Soane's house. And, since the house is literally moated, the crenelated imagery works more aptly here than in a New York apartment.

As an artist's portfolio, *George Ranalli: Buildings and Projects* proves that his work merits wider appreciation. The experimental quality of this architecture is remarkable.—Donald London, AIA

Mr. London practices with Kohn Pedersen Fox in New York City.

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ARCHITECTURE

In accepting AIA's 1989 gold medal, Joseph Esherick called for "a reshaping of the way we work—not an internal reshaping but one that brings more people, more ideas, and more concerns into what we do."

Advocating "a more inclusive approach that admits everyone into the process in a positive and creative way," Esherick said that "we should shape our day-to-day professional activities not as a separated, isolated undertaking but as an activity more deeply integrated with the social, cultural, and political surrounding, looking outward to the real world rather than inward to our own private professional world, perhaps even relaxing our grip on the evaluation of our own efforts and listening to others' ideas for changes for the better, striving for integration and a pluralistic inclusiveness rather than for separation and identity.

"We need to focus on what we have in common, and there is more commonality in overall objectives than there are differences, and, furthermore, there is more commonality among all of us—architects, clients, and users of architecture—in the ways we go about making decisions than we may acknowledge.

"We share with our clients and the users of our buildings common problems. We are, I hope, not a self-appointed elite, nor are we apostles of any particular esthetic. Our goal should be work that is liberating, that makes the quality of life better for all. Architecture is analogous to learning, and the products of architecture, the buildings and the settings we design, should open up processes for greater learning by everyone involved. Architecture as learning implies architecture as discourse, and discourse not only involves speaking up but listening."

His words deserve hearing and heeding, not just by those who happened to be in the audience at the recent AIA convention in St. Louis, but by all of us concerned with architecture's future direction.—*D.C.*

Photographs © Richard Mandelkorn

Showroom Melds Art and Architecture

Its surfaces are canvases. By Nora Richter Greer

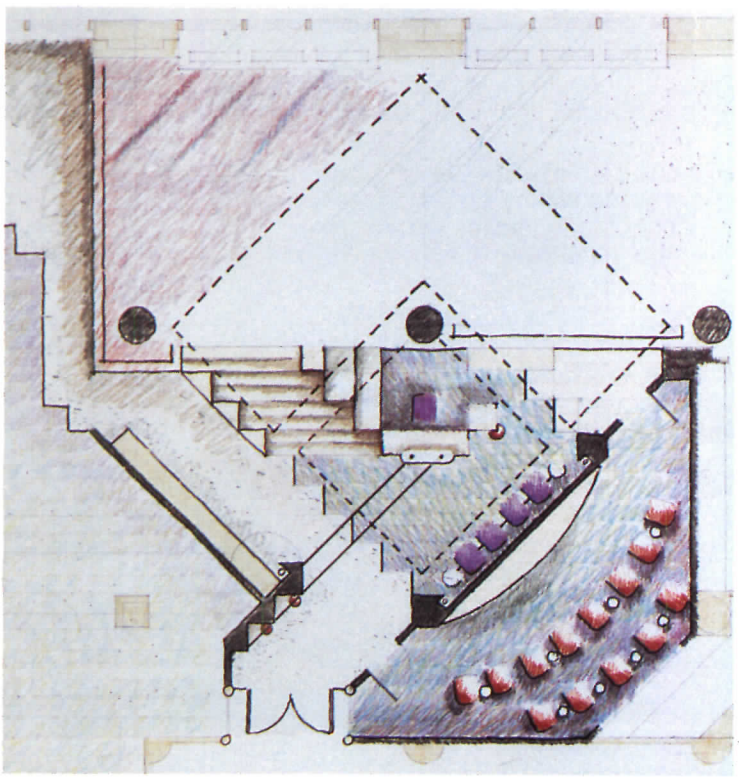
To visit the Office Pavilion in South Boston is to visit the theater. For tucked in a historic warehouse there is a Herman Miller showroom that could double as a multilevel stage. The stage's scenery is spectacular—floors, walls, and columns unusually colored and textured by local artists.

The Boston architecture firm of Jung/Brannen Associates wanted to create an environment that would make a lasting impression on the customers. And from the beginning the 9,300 square feet of raw space seemed ideal for the theatrical metaphor, particularly since the main space has two levels—one an open space with a 14½-foot ceiling and the other a mezzanine 9½ feet high.

Great emphasis was placed on creating exotic decorative surfaces. A scheme was developed calling for four different finishes for the walls and floors, in addition to the two carpet patterns. An open design competition was held for artists to collaborate with Jung/Brannen; the local firm of Blossom Mako was chosen. The artists' scheme literally explodes the showroom into a chromatic stage of soft greens, blues, and lavanders. Applied with brushes and sponges, overglazing produced extra depth, sparkle, luster, and on some areas a copper patina. Most striking are the green-blue walls, columns, and floor. Contrasting with these surfaces are the less showy, tan upper walls and the stained

Left, monumental stair with decorative pedestals leads from the reception desk up to the mezzanine. Above, looking over the reception desk toward the mezzanine and its metal railing.

Photographs © Richard Mandelkorn



reception desk, stair pedestals, and column bases. Four 11x11-foot ceiling screens provide a soft cover for the ductwork, pipes, and sprinkler systems, which are painted dark blue. The wrinkled aluminum screen panels are tinted by track lighting.

The drama of this dual-level stage is heightened by the monumental stair leading up from the first floor. At the far end of the showroom is a more typical staircase to the second floor (a space that virtually works as a backstage area would). Cutouts in the far wall above this second staircase provide shadow-box staging for furnishings from Herman Miller's rich history.

To tie the disparate portions of the showroom together, an overall theme was developed—that of the office pavilion breaking into a new market. To achieve this, portions of the interior were cut into fragmented halves. These sections appear on walls, on the stair columns, and on the main-level concrete columns. General lighting is provided by a network of track lighting split into four zones, each of which can be operated individually.

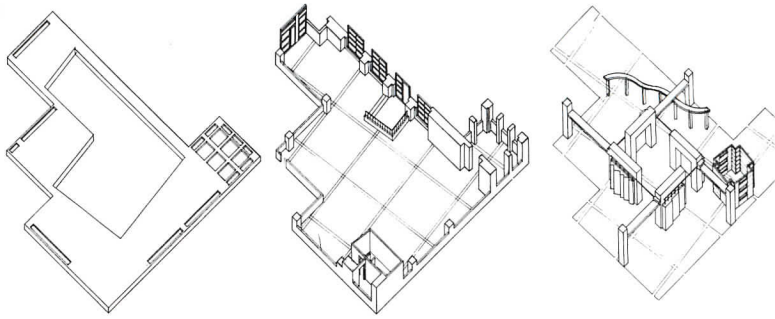
When customers enter the showroom they are led into a small conference room with a glazed wall. Then the show begins. After a sales presentation the window wall curtains part, revealing the theater. The tour leads through the showroom, where Herman Miller furnishings are used by Office Pavilion personnel. □

Upper left, on the opposite side of the monumental stairs are half-columns with fragmented edges; right, the columns seen from floor level with conference room in the background. Above, shadow boxes in the stairwell that leads to the second floor.

Photographs © Hanan Hamburger

An Assemblage of Sculptural Shapes

Herman Miller Office Pavilion. STUDIOS. By Lynn Nesmith



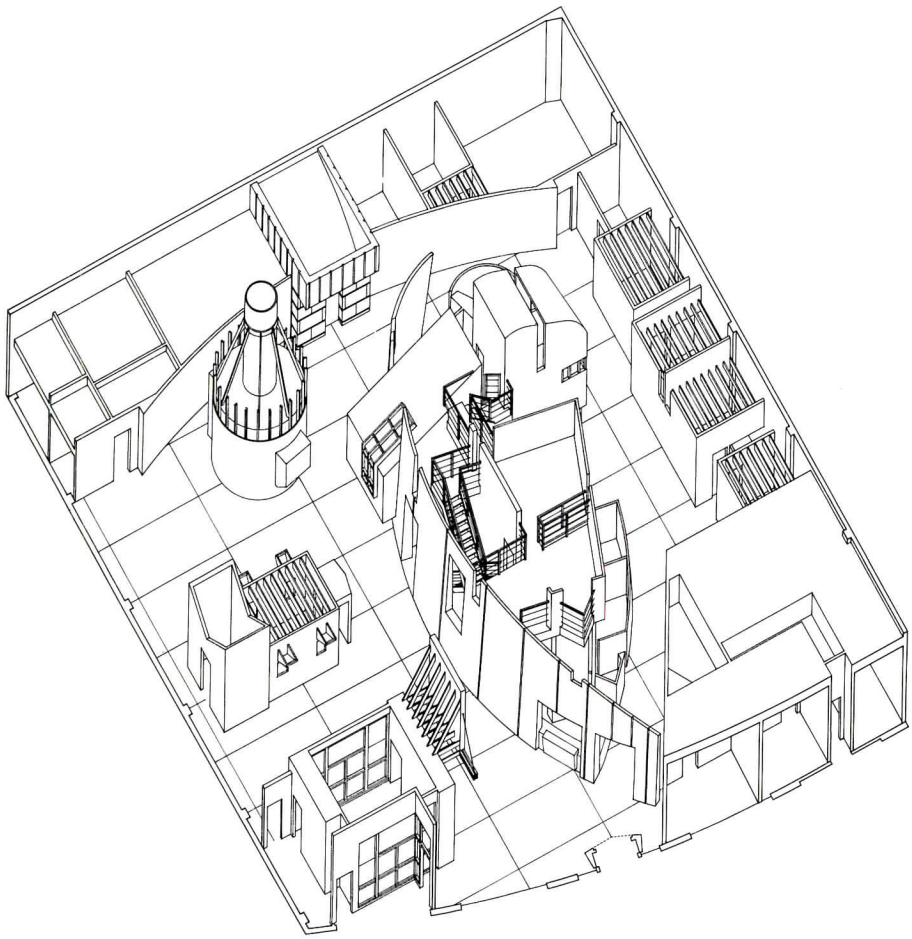
STUDIOS Architecture used bold forms in bright colors to create a showroom and work space for the Herman Miller Office Pavilion in Washington, D.C. Each of the company's Office Pavilions around the country operates as an independent franchise and reflects its own individual design approach. In constrast to the Boston pavilion (see page 51), which emphasizes surface decoration, this project is a simple structural sculpture of formal elements arranged like a set of building blocks.

Unlike showrooms buried within a maze in the typical design center, this Office Pavilion takes advantage of its unusual street frontage. Located in one of the city's more successful attempts (1250 24th St., by Don Hisaka, FAIA) at integrating a new office building behind a historic facade in the name of preservation, the showroom opens onto a sunken, landscaped terrace created in the void between the existing, low-scale brick facade and the new construction.

STUDIOS project designer Bruce Skiles Danzer Jr., AIA, says the exposed brick and steel beams of the building provided the background for a structure within a structure and the freedom to be playful in a way that wouldn't have been appropriate in a more traditional office building.

The space is organized in a pinwheel plan around the central conference room, defined by four movable partitions, each a different form and color. These massive partitions also serve as screens for storage units and structural piers while dividing the 5,000-square-foot space into quadrants without creating a series of boxes. The serpentine colonnade running throughout the space hints at a separation of the reception area from the workstations. The raised platform provides an arena to display furnishings and draws attention to a secondary entrance directly to the outdoors. In addition to Herman Miller furnishings, the Office Pavilion features more than a dozen ancillary lines, which benefit from the graphic elements that create a vague division while encouraging interplay between complementary products. □

Left, from the reception area looking down the main axis of the space. Below, workstation with conference room beyond the curving yellow doors in a half-open position.



© Tom Bonner

Film Studio Swings with Its Users

Propaganda Films, Los Angeles, Franklin D. Israel Design Associates. *By George Rand*

Propaganda Films is the first and largest music television production firm in the United States. In its two years of business it has produced works by Bruce Springsteen, U2, Sting, Rod Stewart, and a list of new-wave performers too long to cite. The firm creates the entire film or video product—from development and administration to production/direction, editing, dubbing, storage, and distribution. Propaganda's success lies in its ability to vector the impulses and harness the frantic energy of young creative artists. Only a few employees, including cofounders Joni Sighvatsson and Steve Golin, have reached the venerable age of "thirtysomething." Most are still in their early or mid-20s.

There is freedom to try crazy things but with a standing commitment to delivery of product on time and on budget. Imagine a multimillion-dollar business with the speed of Domino's Pizza, the sense of mission of IBM, the street-wisdom of a "hip-hop" club—all in an atmosphere as comfortable as a college coffeehouse. There are about 25 on staff, plus freelancers brought in for specific projects, and there are at least 50 people in the building at any time in addition to casting call groups.

Sighvatsson and Golin have their offices perched atop a three-story structure in the center of the volume. Other principals are nestled in private niches off the main floor. The bulk of the roving, freelance staff can be found seated in the open at a series of large communal tables doing financial spreadsheets or project schedules on their Macs and laptop computers. Often, they are on their feet, walking around, in and out of meetings, or jabbering over partitions.

Franklin D. Israel Design Associates was asked to create this lively, enriched work setting within the shell of an old Hollywood warehouse. After an investigation of the building to determine what was underneath the rubble, it was gutted and gently sandblasted to avoid a raw look and preserve a patina of the past. The project was designed to flow under and through the aging, graceful bow-string trusses.

The program called for a complex array of sound and editing facilities, a film vault, screening rooms, meeting rooms for project teams and clients, work areas, lounges, and a casting room. Many spaces had specific technical directives for equipment layout, sound insulation, and static control that stretched the limits of the $35-per-square-foot budget.

Frank Israel says he set out to create a "working village" with the cool sensibility of a "Hollywood dream" built on images of the film industry that date to the studio era in the '30s and '40s. Dream images are amplified through use of color and choice of materials: painted drywall is a soft "foam green" that resembles fading coats of old stucco facades; exposed redwood-stained framing recalls craftsman bungalows in the area; refurbished 1940s

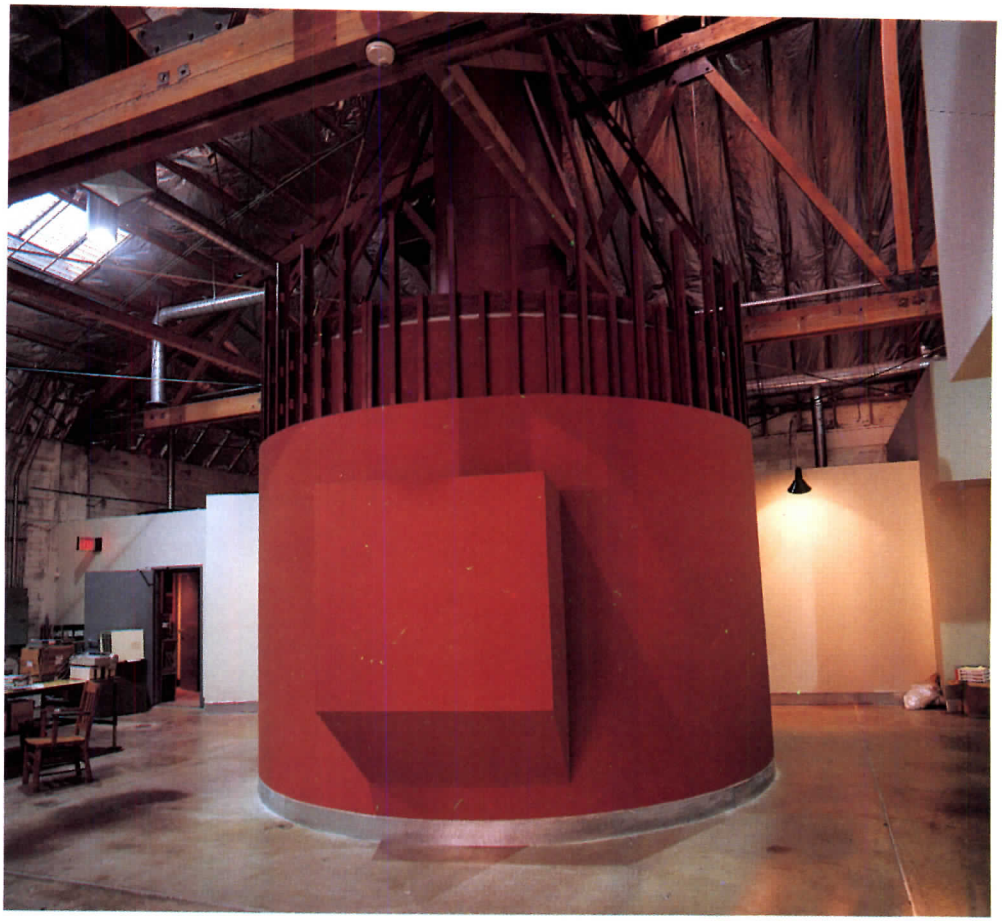
Above, pavilion on pilotis. Right, the same area modified for a workstation. Above right, open zone in front of casting office.

Professor Rand teaches architecture and planning at UCLA.

© Randall Michelson

© Randall Michelson

Below, 'silo' conference room with protrusion for video equipment, and two views of the ship's ragged port side. Facing page, the principals' offices high amid bowstrings, and the ship's stern at rear of space.



steel office furniture used throughout helps to turn the mental clock back to Hollywood in its heyday.

The trick was to create a series of set pieces inserted into and defining the major space. These include the large, three-level "ship" structure anchored in the center of the volume and a cluster of smaller "buildings" that give life and character to the left-over areas. With the basic functions contained inside, under, and on top of these structures, the remaining ground area became available as a delightfully sunlighted, acoustically controlled, weatherized series of "lanes," "plazas," and "open spaces."

The design had to maintain a loose fit with known functions. A tight fit would have amounted to straightjacketing. After all, this is not a typical 9-to-5 environment. It has to accommodate an avant-garde group, often bivouacing round-the-clock. Israel says, "Imagine people working 48 hours without leaving the building. It gets completely messed up. Other days it is immaculate and you can eat off the floor."

In the background several dot matrix printers run nonstop. There is a six-pack of Henry Weingart on the floor. Distinctive clothing styles are in evidence. Men wear pleated pants, rolled sleeves, pinstripe dress shirts. No tie, of course, and T-shirts and sneakers are *de rigueur.* A young woman walks by in black lace pants, pink tank top, and western boots.

Israel used a limited palette of inexpensive materials in a highly consistent manner (lattice trellises as ceilings, storefront glass à la Frank Gehry, wood-frame stairs, steel-cable railings, galvanized sheet metal base around drywall), creating maximal architectural presence with a small number of actual gestures.

The "ship" piece is made of a thick wall canted six degrees. The three-story structure provides controlled access to its topmost level, where the two principals have offices linked by an opening in the central truss. This area feels like upper decks open to a metaphorical sky.

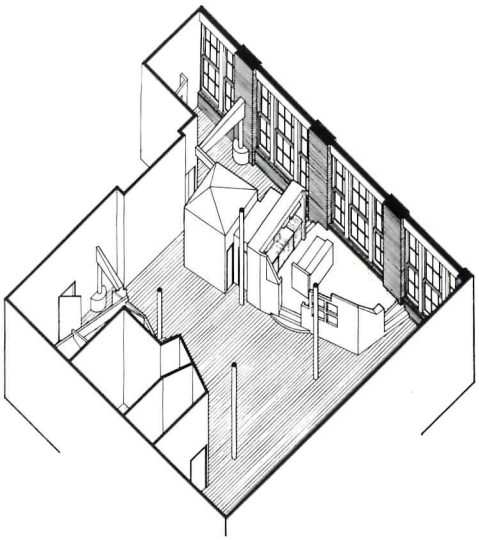
The "ship" is a complex piece in section and elevation. There is a series of narrow stairs of steep ascent. A light bridgeway continues the path through the truss and down to the main level. The upper floor frames the knuckles of the giant truss. At grade, the "ship" accommodates a variety of functions from conference rooms to photocopy production. It also becomes a means of funneling movement across the main axis of the space, as does the cross aisle in a cathedral. The axis tapers at one end into the shape of a square arch. In the other direction it flows out to an office work with a series of low partitions. The function of the "ship" is similar to that of Gehry's Loyola Law School, in that it creates lively forecourts between the main structure and a series of small buildings on the edge of the space.

First, the entry zone is formed by juxtaposing the curving wall of the "ship" with a small building used for casting, which includes a cafe and signboard (the clocks above read "Burbank, Brooklyn, Brixton, Bombay, Bora Bora"). The casting room is set behind the cafe and has thick slatted venetian blinds and a half-frosted glass facing the street, resembling an industrial personnel office adjacent to a factory floor.

Second, there is a little templelike building currently occupied by an entertainment group. A light scoop draws light in; protruding, browlike elements send light upward.

Third, the round "silo" building is a small conference room. The chimneylike steel tube brings dramatic light in from above and provides focus to the round, glass-top conference table that serves as centerpiece. The flat roof has a beehive shape suggested by metal studs carried upward from the framing. The protuberance is formed by the video unit inside.

The film vault is on axis with the entrance to the building. The curved rear wall of the project separates function spaces from the main room, for example, video and film editing and accounting offices. The curved wall itself is lighted by billboard lights originally intended as a storyboard area but, like everything else in the project, adapted for other uses. □



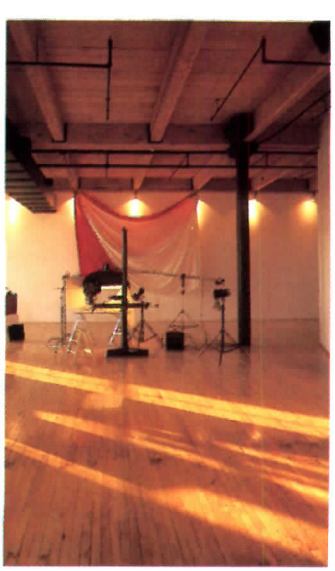
Professionalism And Playfulness

Thomas Twining studio, Pfister Architects.
By Amy Gray Light

Thomas Twining's commercial photography studio in the old Merchandise Mart building in Minneapolis is the culmination of a highly creative and collaborative effort between the young freelance photographer and the local firm of Pfister Architects, which garnered a 1988 Minnesota/AIA interior design award for the project.

Twining had definite ideas of what he needed, and Peter J. Pfister, principal in charge, and Sixto J. Beltrandy, project designer, worked with him to create the postmodernist and playful yet professional-appearing studio from the expansive, 3,000-square-foot raw space.

Twining needed the majority of the area open to accommodate different shoots and large props, so the studio is organized around a large shooting gallery 50 feet long that runs in a central T-shape, gradually widening to about 60 feet. Parallelogram arches mark the entrance to this main area and also divide private office space from a conference area. Sculptural half-walls and enclosed spaces on either side of the shooting "canyon" define production and other functional areas such as a kitchen, client sitting room, and the office and conference rooms. Storage areas and workroom walls are the only places with walls reaching to the 15-foot ceiling. The focal point of this stage-like setting is an enclosed darkroom with a steeply pitched roof that resembles a tiny house. The geometry of the half-walls provides a crisp contrast to the existing patter of columns, beams, and 13-foot-high, double-hung, north-facing windows; and use of vivid color with these geometrical forms further defines the various areas and their functions.



Twining acted as general contractor on the studio, doing much of the labor himself. The construction materials were relatively inexpensive. Wood frame and gypsumboard were used extensively, and custom plastic laminate cabinetwork was designed for the entry, kitchen, and bathroom. □

Photographs © John Hall

Prairie Style Apartment in Manhattan

David Hannaford Mitchell's 'homage to Wright.' By Lynn Nesmith

Located on the 11th floor overlooking Park Avenue rather than the landscape of the Midwest, New York architect David Hannaford Mitchell's homage to Frank Lloyd Wright is nonetheless appropriate. It is deftly scaled and meticulously detailed. The reference to Wright's prairie houses is strong, yet Mitchell successfully used the forms and spatial techniques in his own idiom to create a complex interior composed of distinct rooms woven together into a spacious whole.

A typical 1920s New York apartment comprising small, boxy rooms has been transformed into a 1,200-square-foot space with a newly perceived openness and spaciousness, although the basic layout and size of the rooms remains essentially the same. The trio of public spaces, the entry hall/living room/dining room, is defined primarily by a series of horizontal bandings as well as by the layering of the walls and differentiation of the ceilings.

Not merely applied as decorative trim, the moldings of natural oak are continuous, and built-in elements such as the bookshelves, cabinets, fireplaces, and mirrors are treated as "events" developing out of this linear continuity. Running the length of the living room and foyer, a grilled trellis cleaves the vaulted ceiling, which appears to float above a double horizontal banding accentuated by incandescent lighting. The lower one wraps around the living rooms, while the upper band encircles the living room and foyer.

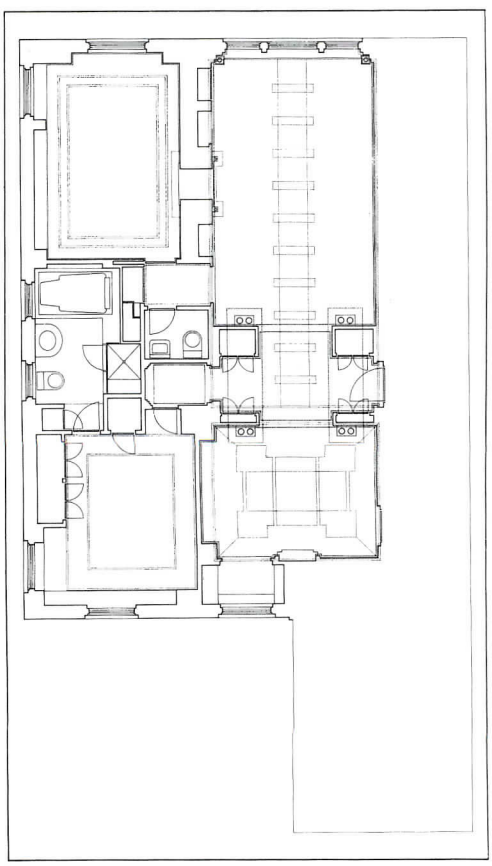
However, not all the components respond to a rigid consistency. The columns and beams that flank the entrances to the living room and dining room and span across the entry vestibule are deliberately detached from the walls and moldings, as if the pieces were all pulled apart and loosely established next to each other in an integrated assemblage. "This is a modern technique, almost postmodern," said Mitchell, "a technique Wright would never have used."

In the dining room, a new, coved ceiling has a three-component skylight detailed with an elegant geometrical pattern and backlighted with scores of little one-watt bulbs. A large, framed mirror opposite the entry but slightly off-center interrupts the horizontal continuity of this space. Originally an L-shaped room, the dining room was transformed into a rectangle with a new alcove; a built-in sideboard fills the void.

The vestibule leading to the library and bedroom is lengthened by a mirror at the termination with a telescoping effect framed by a stepped banding. From the larger spaces down to the smallest detail, Mitchell says he attempted to absorb the various forms but avoid a static consistency. The fireplace in the library is set back-to-back with its counterpart in the living room and detailed in reverse. But again the hearth interrupts the wainscotting, and the corner trim is pulled away from the corners, helping the relatively small room to "break out of its box," as Mitchell says. Throughout, every attempt was made to take advantage of space for storage, and in the bedroom built-in bureaus and shelves line two walls.

As a crafted object the apartment is remarkable. The sophistication of the concept was only enhanced in its execution. □

Above, the double fireplace, open to the living room and study, uses an early American vocabulary. Facing page, above, looking through the foyer to dining room table designed by Mitchell. Right, pilasters define the tripartite window.



Showhouse Made a Celebration of Space

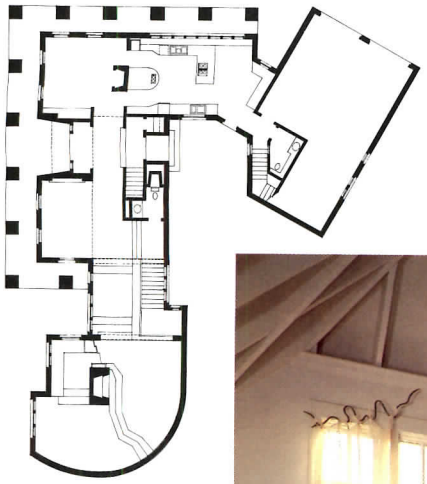
Designed by Charles Moore, FAIA, for the NAHB convention.
By Amy Gray Light

Each year a house that focuses on a specific market segment of the building industry is built for the National Association of Home Builders' convention. This year's model, built in Atlanta and designed by Charles Moore & Associates, was described as a "luxury house for the older, achievement-oriented family," said Mitchell Rouda, editor of *Builder* magazine, one of the three organizations involved in the project. "We envision it as being the final rung on the move-up ladder, the next step for the owners being an empty-nester house," he said.

Above, antebellum exterior. Left, view into great room; below, pyramidlike arches define the central spine of the hallway.

"I'm interested in spaces inside objects," Moore said, and that is where the interest in this house lies. From the entrance the space immediately opens up to the right, sweeping around a 180-degree curved wall at the far end of a long hall and then out of sight, much as a bubbling brook or a path through the forest twists in the distance, giving the impression of an exciting discovery just around the bend. A two-story main gallery with a 30-foot-high ceiling is the central spine of the house. The gallery also brings a second source of light to the surrounding ground-level rooms and turns the second-story hallway into an overlook. Here, half-walls and cutouts create interesting angles. Not content to be merely the circulation path, the gallery adds interest by means of pyramidlike arches with mirrors attached to the bottoms of the arches for additional light.

The feeling of being carried away in a stream is reinforced by a series of open sitting spaces along the hall, eddies in the kinetic force of the swath of open hall. Off to the immediate right of the entrance and main hall is a small, open dining area, more of an alcove than a room, and just beyond a sitting area is sandwiched between two walls of ganged windows. Levels in the large living space flow into one another, forming three separate sitting areas through the use of the steps and furniture groupings, or combining into one large area when the occasion calls for it.



Ground floor

Facing page, gaming area; below, window seat before inglenook; view from second floor; kitchen with counter-height cabinet.

After that sweeping curve in the living area, the house culminates in a final tier of steps behind the fireplace column to reveal an inglenook. While the floor rises at various levels in this open area, the ceiling remains the same height, contributing to the feeling of an increasingly intimate space as one progresses through the house. "The notion of the big, open living space evolved from an Irish country house that featured lofting spaces that seemed to drift up gently in an uplifting way," Moore said.

A profusion of windows contributes constantly changing and expanding views. Many of the windows are banked and ganged or juxtaposed in unfamiliar ways, so that on a sunny day artificial light is not necessary except in intentially darker sitting areas, such as before the fireplace in the great room. On the upper level, the windows are placed high to concentrate the sightline on the sky and surrounding pine trees and to block nearby houses from view.

The left-hand side of the house is described as the hub because it contains the family room and kitchen area. It is treated more informally than the more public area of the house. Directly left from the entrance is the casually comfortable family room, containing a wall of built-in shelving, large sunny windows on the south wall facing the street, and a white fireplace decorated with hand-painted tiles that pick up the color and fabric designs of the furniture in the room. From either side of the fireplace column, one steps into the 360-square-foot kitchen designed to accommodate entertaining and catering.

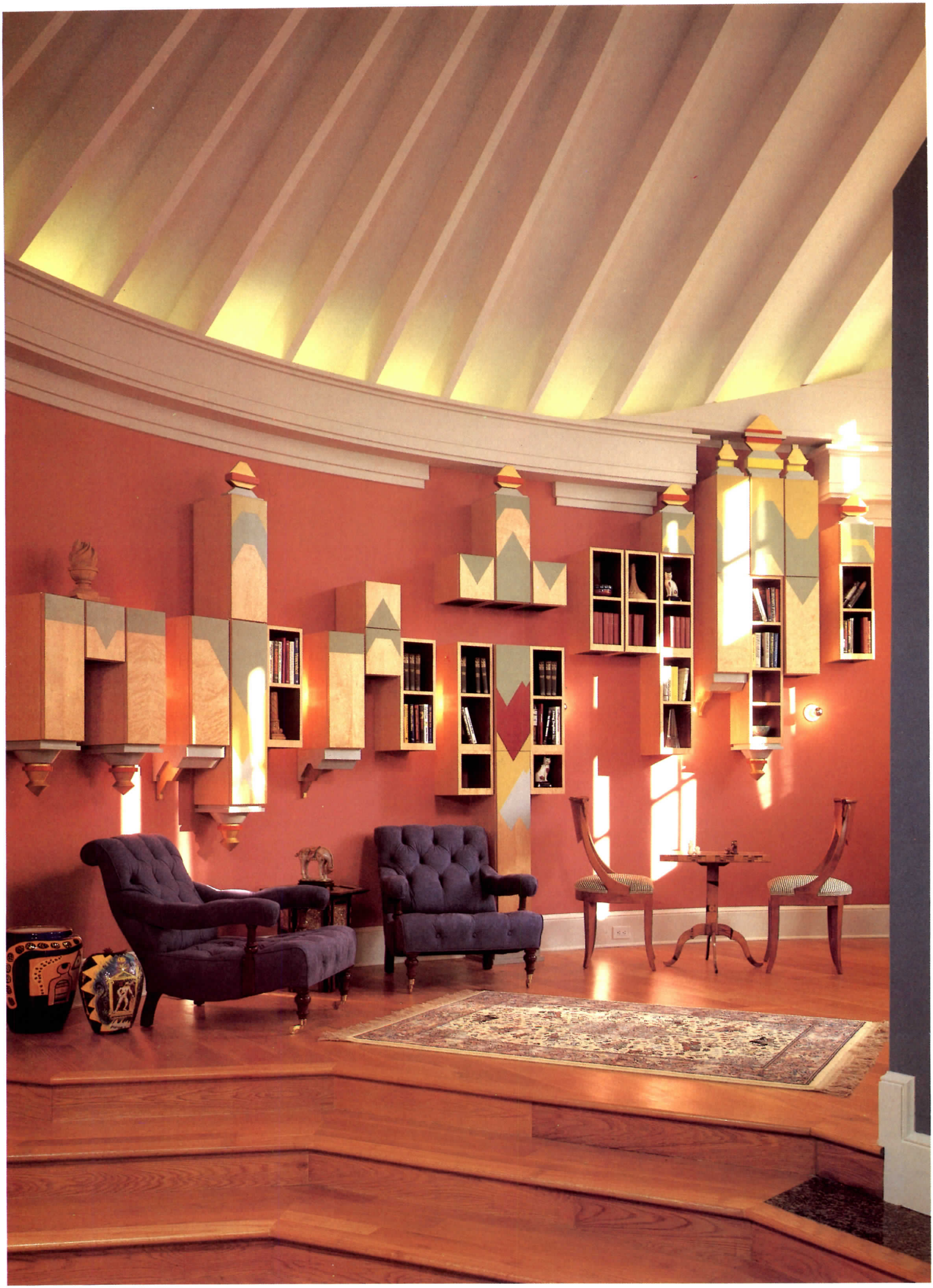
The master bedroom suite is tucked underneath the living area, fitted into the slope of the site, so it shares the sweeping curve of the wall of the great hall. The suite is completely self-contained, with its own laundry facilities, gym, and even a refrigerator. The bedroom has 14-foot-high ceilings and three sets of French doors that wrap around the curved wall and open to an outside deck.

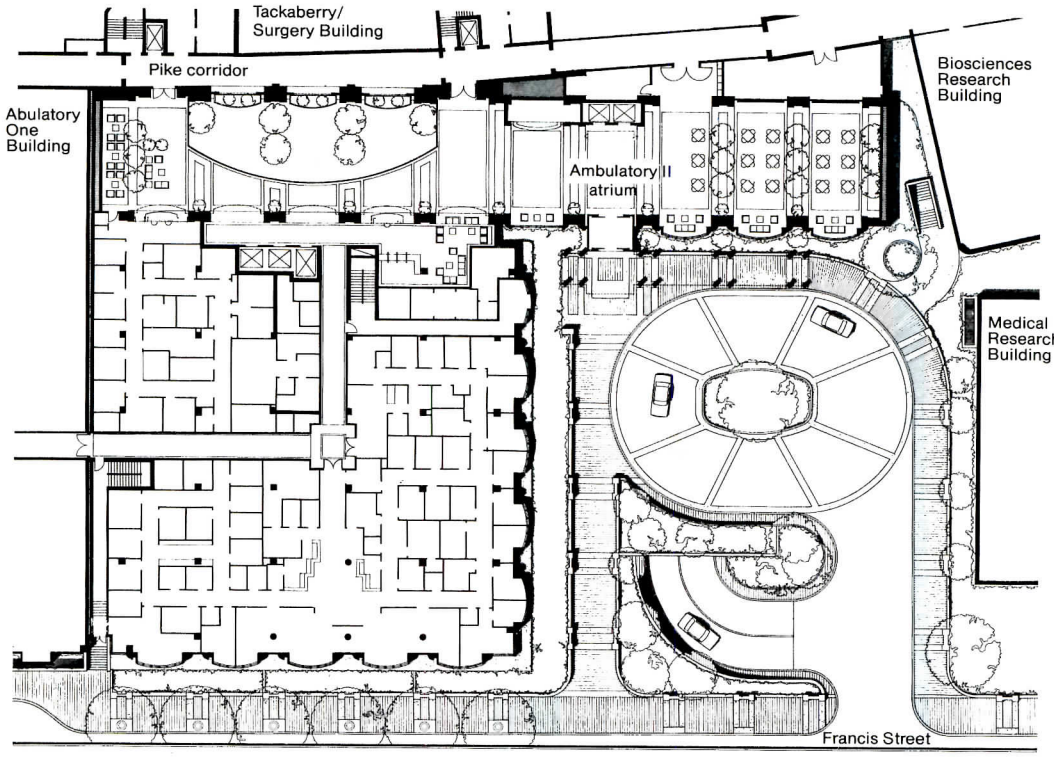
Up the central staircase on the second level is a gallery hallway with interior wall cutouts for overlooking the main floor. This hall enables the smallish rooms on the floor to remain somewhat private from the main part of the house, yet still share its public center. Along this hallway a window seat recessed into the wall (with bookshelves built into each end) becomes a rather solitary spot that benefits from light through the many windows on the wall across from it and doubles as a spare guest bed.

The interior design team of Bauer-Moore (no relation to the architect), interjected colorful elements throughout the house and blended old treatments with contemporary twists so that the interiors hold their own with the powerful architecture.

The house is uniquely a Moore project, perhaps even more so given that the design culminated from a particularly demanding agenda of disparate concerns of the three sponsoring organizations. *Builder* magazine essentially acted as the client and commissioned the architect; *Home* magazine commissioned the interior designers and paid their expenses; and the National Council for the Housing Industry, an affiliate of NAHB, was responsible for providing the products to be used in the house, all donated by various American manufacturers. John Wieland of John Wieland Homes, an Atlanta builder, fronted the money and actually owns the house.

Moore acknowledges that the house is not meant to be a typical residence, being "fully loaded . . . with everything that anyone could think of that would say what houses might be. The house ended up fully twice as big as when we started out because we were making something that was showing off a lot of things. . . . It just kept growing and evolving as more things were added . . . so there is more going on than we would ordinarily put into a house of this size," he said. □





Reassuring Introduction To a Medical Center

Kaplan/McLaughlin/Diaz's Brigham and Women's Hospital addition.
By Nora Richter Greer

Walk into a typical large, older, metropolitan hospital and you likely will encounter a confusing maze of corridors as you hunt for a patient or doctor. You may also notice a dearth of lounge space for patients and visitors. Such was the case in Boston's Brigham and Women's Hospital, where some 500,000 square feet of interior space was scattered among several buildings, connected by a long corridor known as the "pike" because the volume of traffic resembled the Massachusetts turnpike at rush hour. (See "A Physician's View of Hospital Design," Dec. '88, page 121.) Moreover, to respond to changing medical practices the hospital needed more room for outpatient care and accommodations less dreary than those of the complex's older buildings.

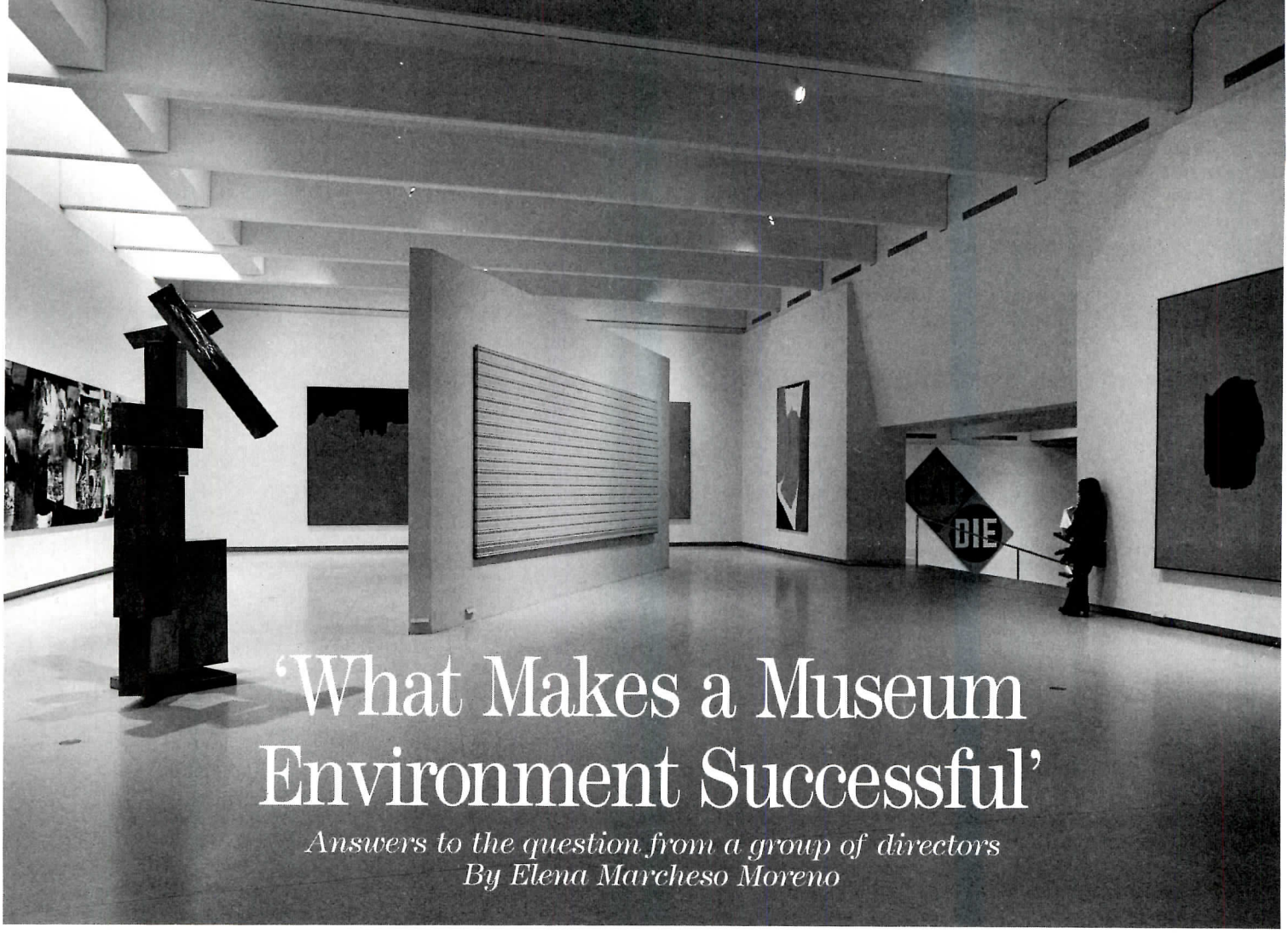
The task for Kaplan/McLaughlin/Diaz of San Francisco was threefold: develop a new master plan for the hospital, provide a consolidated and cheerful outpatient clinic, and delicately relate this new clinic to the surrounding residential neighborhood. In fact, during an early visit to the hospital Herbert McLaughlin, FAIA, was asked whether the plan could reverse existing conditions and create an emotionally supportive environment; whether implementating the plan could change the basic perceptions of patients, visitors, and staff without wholesale demolition and replacement; and whether the plan could help communicate the hospital's sensitivity to the neighborhood while building a sense of identity and loyalty that would embrace the hospital's many activities. Kaplan/McLaughlin/Diaz would prove that it could.

Most surprising to hospital administrators was McLaughlin's recommendation that the pike remain. Built over a 50-year period, the 1,000-foot corridor had a variety of widths, heights, and materials. But, however crude, it did connect the disparate buildings on the hospital grounds. It could also connect the new building to the old ones, KMD decided, and in fact doorways on the south side of the pike were opened onto the grand atrium of the new outpatient building. In the end, KMD's master plan places the inpatient activities at the west end of the site, administration and research at the east end, and a new building for ambulatory services between.

In this scheme the 300-foot-long atrium of the new building becomes the heart of the hospital, offering a noninstitutional respite for inpatients and outpatients, visitors, and hospital staff. The two-story atrium is light-filled. In its eastern half are three full-height bay windows that overlook the patient drop-off plaza; skylights are above. In the western half a curving cutout to the lower floor lets in natural light below. This time the window walls protrude into the atrium, opening it to views from clinics above. An information desk sits along the pike wall in the middle of the atrium; directly across the atrium is patient registration. The bay windows also repeat those found on the exterior. And in turn the exterior bays are a gesture to the three-story clapboard houses directly across Francis Street.

To make the 108,000-square-foot ambulatory services building appear much smaller than it actually is, two stories were placed underground. On those levels are a 250-car garage plus hospital-based services—blood bank, physical and occupational therapy, rheumatology, radiology, and three magnetic resonance imaging units. The ground and upper levels house medical and dental clinics in well-appointed, cheerful offices. □

Facing page, clockwise from top: a cutout in the two-story atrium allows light to penetrate below; a typical hallway in the outpatient clinic; a clinic reception area; the exterior's bays, repeated in the atrium.



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'What Makes a Museum Environment Successful'

Answers to the question from a group of directors

By Elena Marcheso Moreno

More museums have been built in the United States and abroad over the last 15 years than were built in the previous seven decades. At less than 200 years old, the concept of an institution to display art is relatively new. Until fairly recently, rarely was a new museum planned; it was much more likely that an addition would be designed to house some newly acquired permanent collection. Museums tended toward a typical look—grand and ornate and usually attractive, but predictable nontheless.

Then a new phenomenon took hold. Museums began to provide educational activities, social gatherings, and peaceful havens for escape from the hectic pace outside. These innovations, as well as generating income for the museums, led to experimentation in the design of this building type. Despite the expansion of programs, however, the main function of a museum, old or new, is still to exhibit art and artifacts, and not all of the newer museums are doing this well, according to museum directors interviewed by ARCHITECTURE.

What makes a museum design successful? That question was posed to the directors: Gudmund Vigtel, director of the High Museum in Atlanta; Harry Parker, director of the San Francisco Museum of Fine Arts; Stephan Prokopoff, director of the Krannert Art Museum; Duncan Robinson, director of the Yale Center for British Art; Earl Powell director of the Los Angeles County Museum of Art; Walter Hopps, director of the Menil Collection in Houston; Richard Koshalek, director of the Museum of Contemporary Art in Los Angeles; and Martin Friedman, director of the Walker Art Center in Minneapolis.

Many facets of museum architecture determine quality, some more tangible than others. A few museums stand out as examples of quality design as well as quality places for displaying art.

Edward Larrabee Barnes's Walker Art Center was mentioned repeatedly by the curators as a beautifully conceived stage for modern art. Its exterior is nondescript, but it unfolds inside with exceptional logic, Prokopoff said. He described the interiors as almost perfectly proportioned, functioning wonderfully for art, and not intrusive in any manner. The Walker is modeled on the spiral shell of a conch, a design that "leads the visitor through galleries to end up in paradise, where he can have a hot fudge sundae at the restaurant," said Prokopoff.

Powell called the Walker the most clean-lined, functional, and perfectly scaled modernist treatment for the presentation of art that he has seen. The building is a modern white box that is very accommodating to art, from the point of view of both the public and the museum staff.

The Walker is a relatively inexpensive construction, Koshalek pointed out, but an absolutely inspired building in terms of its concept, detailing, and the proportions of its spaces. "I have heard a well-known artist say that he seldom sees beautifully proportioned museum spaces, but that rare quality does exist at the Walker," Koshalek said.

Barnes's recent sculpture garden (see Feb., page 64) provides a dramatic entry to the museum and a strong connection between the art inside and the urban fabric outside.

"With the use of temporary partitions, we have been able to make good use of the architecture of this building, successfully showing even small works in large galleries," said Walker director Friedman. And the building is assertive in terms of space—the helical plan moves the visitor through by half-levels, which relate the seven galleries to one another. The galleries are defined by strong, geometric character, but walls and materials are simple. Special shows are built into the walls. Precast concrete T-beams in the ceilings provide coves for lighting. Like the walls, floors are understated. Overall, "it is a tough building that depends on interior vistas," said Friedman.

The Menil Collection of Art and Historic Artifacts (see May '87, page 84) was designed by Piano & Fitzgerald to fulfill the request of its patron Dominique de Menil for a building "small outside and big inside," respecting the scale of single-family houses nearby. Hopps said that for the first time in his life he is directing a museum that is truly a desirable environment for art. At 110,000 square feet, it is a small jewel of modernist

architecture. "Mies would understand it; Johnson admires it," Hopps said. "It is in the tradition of Craig Ellwood, Rudolph Schindler, Irving Gill, or Charles Eames's experiments."

The Menil's small scale is generally appreciated by the public, although it means that only a small portion of its collection of more than 10,000 pieces can be seen at any one time. However, the works not on exhibit are available to the art community by appointment in the building's second-floor "treasure house," a series of secure rooms controlled for climate and light. A hybrid of typical gallery and storage spaces, the treasure house is considered by some to be an ideal way to view art.

Again and again, the curators cited spatial variety and light as factors determining their favorite museum designs. The Hood Museum at Dartmouth College (see Jan. '86, page 32), in contrast to a number of other new museums that house art in neutral or warehouse-type galleries, accommodates different styles and periods of art in varying spaces. Charles W. Moore, FAIA, and Chad Floyd, AIA, of Centerbrook Architects, designed the Hood, Robinson believes, to make intelligent use of space and proportion, a quality he rarely finds in museum buildings. "As visual architecture, it is a very effective piece of design," he said. "It is a building I would love to know more about."

Prokopoff admires the Hood's elegant layout, with all its interior elements in perfect proportion right down to the beautifully wrought cabinetwork. "The only real flaw in the Hood is its entrance, which is too small in scale and tends to be a bottleneck," he said. "Otherwise, it is a pleasurable space to be in."

Intrusive details have been minimized or avoided, so the Hood does not have moldings, diffusers, lighting fixtures, and openings everywhere. The space is peaceful and hospitable to the art, which, as it does not have to compete with architectural decorations or ducts or ventilation, can be displayed in myriad configurations, Prokopoff said. Most of the galleries are fixed in place, and, although it is possible to move some of the major partitions, it is rarely necessary.

The Hood's Lathrop Gallery, devoted to 20th-century art, is perhaps its most successful space. The great volume of the gallery is modulated by a combination of natural and artifical lighting, establishing a kinetic sense of illumination that varies with passing clouds and changing atmospheric conditions. Thematically, all the light comes from a single source—a catwalk crossing at the gabled ceiling. Attached to the catwalk is track lighting, and above it is clerestory fenestration. The natural light lends an almost residential intimacy that is appropriate to many 20th-century artworks.

Louis Kahn's 1972 Kimbell Art Museum in Fort Worth pays allegiance to its site with its natural surface materials and color. Its hallmark is a series of linear vaults that provide spaces both intimate and grand, defining galleries and uninterrupted clear spans. From the apex of each vault, slender light monitors extend the length in one long, continuous line.

To the curators, siting and circulation stand out as the Kimbell's most important successes. And, they said, its size and scale are suited to the art displayed. "The quality of the building matches the quality of the works of art," said Koshalek. Robinson declared the Kimbell a "triumph" of museum architecture. Not restricted by an urban site, Kahn had no limit to the directions he could stretch the building, Robinson said. Vigtel likewise is enchanted with the Kimball. "The elegant design of the barrel vaults and the wonderful invention of the slits in those vaults to bring light inside in a controlled fashion take on qualities of artistic expression," he said. "If the building itself conveys a sensitivity to art, you have gained something." The architecture of the Kimbell is much more than functional—in Vigtel's opinion it is naturally suited to the artworks. But, he

Baffled ceilings at the Walker Art Center, left, Menil Collection, below, and Kimbell Art Museum, bottom, provide the artificial and natural lighting preferred by curators. Easy circulation of the Hood Museum, right, was favored.

© Paul Hester

© Michael Bodycomb

added, "when you try to achieve this through expensive materials, you defeat the purpose." Kahn's design of spaces that relate to each other not statically but with surprises of changing from open to closed gives the Kimbell its strength, Vigtel said.

The curators favor small, residential-scale museums for private collections. The Phillips Collection in Washington, D.C., Friedman said, is perfect for highly specialized art or for a collection that closely emulates the personality of its original collector. The Phillips has a serious yet comfortable setting, Hopps said. "Art lives best in the artist's studio, or where the most enlightened, bourgeois society of Western culture lives with it—a house or a salon. I think the modernist notion is still struggling."

New York City's small Frick Museum is similarly respected. One of the main issues with museums is light, and, according to Powell, it is hard to identify a better lighted space. "I do think there is a symbiotic relationship between the art and the building," Powell said. Friedman agreed, adding that he sees the Frick "as a place of serenity, reassurance, and of good spaces, great for the presentation of masterworks."

Although many of the curators oppose warehouse-type space for viewing art, they mentioned the Temporary Contemporary in Los Angeles, a remodeled warehouse by Frank Gehry, FAIA, as a successful museum, employing industrial materials to create elegant and fluid spaces.

The Temporary Contemporary is two buildings of vast, generously daylighted spaces that celebrate the materials and nature of industrial warehouses by such schemes as leaving steel beams exposed above a point that would identify the ceiling plane. The inherent grace of the hardworking buildings is acknowledged outright, in deference perhaps to the places where many artists have their studios. The generosity of scale and the eccentricity of the buildings that Gehry had to work with brought out the best in him, said Friedman, who in general favors anonymous spaces so that idiosyncratic design does not later thwart curators putting together a show.

Both buildings of the National Gallery of Art were cited by the curators and directors as exemplary architecture and good places for seeing art. John Russell Pope's West Building seems to have been created for the art that is shown there, said Powell, who voted the building one of his "top three" museums. Except for the lower level, which tends to be "labyrinthine," Vigtel said, he is impressed with the large spaces and the controlled lighting in the West Building. "Even when there is no daylighting you have a sense of lightness and openness. The light courts with plantings in the galleries are wonderful," he said, because their variety "helps you fight museum fatigue. It is the endless museums where you can see a mile ahead that are defeating. Here you feel refreshed."

Likewise, he said, the open, light-filled space of the National Gallery's East Building, where I.M. Pei allowed for large crowds, is full of surprise and variety and lends itself to easy installation of exhibits, particularly of contemporary art. A few of the galleries are too closed in, Vigtel said, but generally throughout the newer building varied spaces make it easy to organize an exhibition in groupings that seem naturally to fall into place, thanks in large part to the flow of open gallery spaces into intimate ones. And, he added, frequently exhibitions can be mounted for only the cost of a new coat of paint.

Traditional museum qualities have changed. Many museums now have no permanent collections, instead depending completely on traveling exhibitions; therefore, many museum buildings no longer are designed for a particular collection. Curators often must design exhibits to fit a building and its spaces, so then the scale of the spaces becomes an important issue.

Friedman wants a work of art to stand out in a visitor's consciousness; therefore, the space around it must recede into the background. "I have a proclivity for large, anonymous spaces," he said. He does not like idiosyncratic interior museum design that is itself a focus of attention. He believes space for temporary exhibits is better left undefined, able to change in character.

© Durston Saylor, courtesy of the Phillips Collection

Courtesy of Frank O. Gehry & Associates, Inc.

Allen Freeman

Far left, a domestic gallery setting at the Phillips Collection. Left, fluid spaces provide good circulation at the Temporary Contemporary, and the lightness and openness of galleries in the West Building of the National Gallery can be seen above.

But it can be frustrating for an architect to try to satisfy contemporary museum programs on the one hand and provide for unknown exhibitions on the other. Until the recent rise in museum marketing to court the public's attendance, 90 percent of a typical museum building's space was devoted to displaying art, but today that portion is closer to one-third and could continue to shrink. Adding to the unknowns that exasperate architects is the fact that the museum building being planned today might not be occupied for another 10 years, according to John D. Hilberry, a Detroit architect who has worked with more than 40 museums in the program stage of design. Most of the art professionals who will use and run the museum are probably not part of the current staff planning it. No matter how capable the planning staff, they usually are not able to articulate future needs in the detail that architects require, Hilberry said.

Since museum space even for permanent collections is rarely static or unchanging anymore, what is needed is architecture that is flexible and neutral in spatial configuration, yet also either historic or modern and either intimate or flowing.

According to Hilberry, spaces that unite the exterior of a building with its site and with interior galleries are the single design element most likely to distinguish the building architecturally. Many museums have striking, architecturally prominent front entrances, while people tend to use other entrances more convenient to transportation. This is due partly to siting and partly to the shift in museums' philosophical emphasis away from philanthropy and toward money-making. In the old days it was understood that a museum would be tucked into a parkland setting, but now most are squeezed into tight urban spots just as likely to sprout a commercial office tower. Museums are trying to attract masses of people, not just a few individuals.

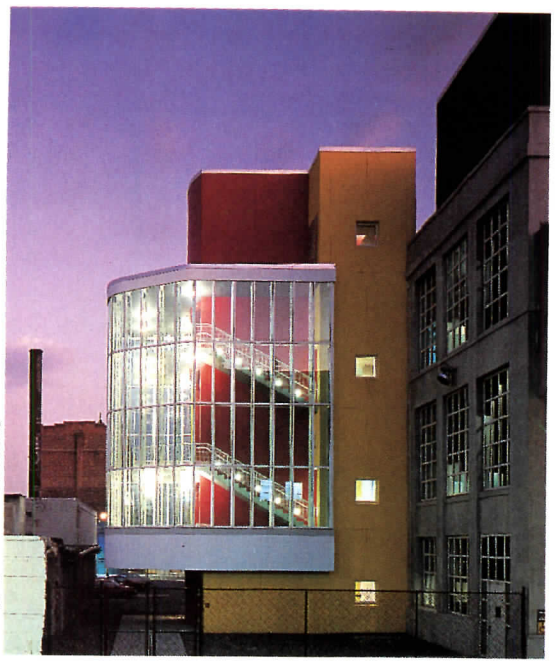
Two important aspects of museum design are circulation and orientation. Yet many new museums, some built in stages, "are architecturally and spatially incoherent and confusing," said Hilberry. "Disorientation and discomfort by the visitor run counter to the museum's esthetic and intellectual purpose."

A museum visitor should know where he is, where he has come from, and where he is headed, Friedman said—he should not feel trapped in an infinite, albeit esthetic, prison. One way to design for orientation is to include enough interior vistas—focal points such as windows, stairwells, and great halls—so that movement through the spaces can be gauged. Orientation also can be accomplished graphically through signs and literature. "It is very important to remember that a museum constantly has first-time visitors, and they should be at ease and intrigued and want to return," said Friedman.

Architects nowadays tend to favor daylighting. If handled correctly, controlled natural light can enable a museum space to model the environment in which the art was created and first displayed. But, as with environmental controls, there is a fine line between a pleasing architectural experience and the point where ambient conditions are harmful to the art on display.

Many of the curators' concerns regarding modern museum design have been addressed by Vivian Loftness and Volker Hartkopf of Carnegie Mellon University in a guide they prepared for evaluating the performance of museums from the points of view of visitors, curators, and architects. Loftness and Hartkopf studied 12 recently designed and built museums worldwide in order to develop almost 50 field performance tests that can be used to evaluate a museum design prior to construction. Their results, published under the title "Architecture for Art's Sake," will be the subject of a future article in this magazine.

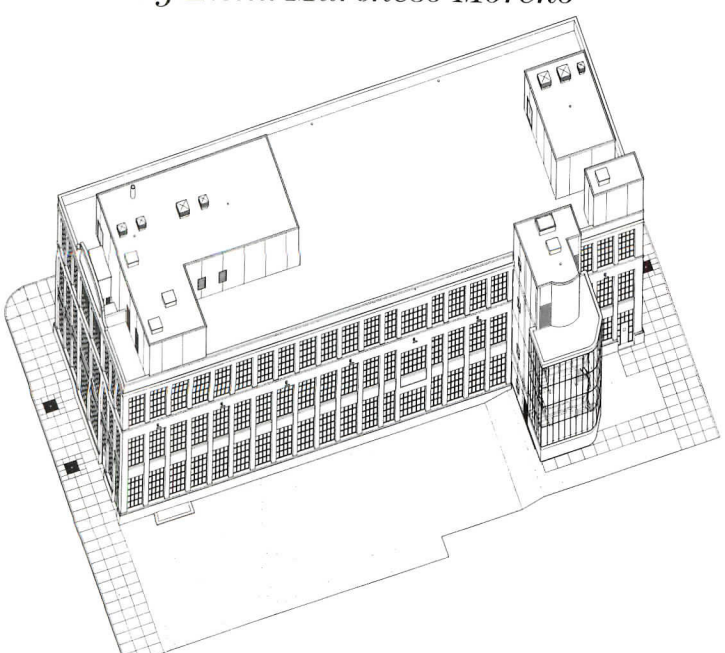
Of the museums Loftness and Hartkopf evaluated, none was found to be superb in terms of serving both art and the people who come to see it. Some museums performed relatively well and had more positives than negatives on their checklists. Many, however, were "studies in contradiction." □



Photographs © Jeff Goldberg

A Museum That Invites Participation

American Museum of the Moving Image, Gwathmey Siegel.
By Elena Marcheso Moreno



Look but don't touch may be the message at many museums, but not at the American Museum of the Moving Image. Nothing about the building or its exhibits is off-putting. Even the softened grays and greens of the museum's industrial facade are inviting, not somber or cheerless. A polychromatic rear stair tower rising above the roof and a brilliant red movie-house marquee at the front entrance hint at the prospect of fun inside.

The building, part of the silent-era Paramount Studios complex in Astoria, is now a landmark owned by New York City. Like its neighbors, the building was in serious decay. In a joint venture, the city and a private developer turned the complex into a multimedia center for film and television production, music videos, and radio. Although the original deed of the property to the city specified that a public facility of some sort be included in the complex, the purpose of that facility was never specified. A showcase for the culture of film was conceived to fulfill that requirement, and eventually the American Museum of the Moving Image was born.

Instead of hiding its warehouse origins, Gwathmey Siegel &

Left, the rear stair tower was the one modern element added to the historic exterior. Above, exposed structural elements in the gallery space maintain the building's industrial origins.

Associates' renovation of the 50,000-square-foot building exploits its industrial-loft qualities. Throughout the three stories the contrast between old and new elements is celebrated rather than concealed, partly because of a shoestring budget that brought the project in for $130 per square foot and partly from a sensitivity to the museum's purpose to provide information about the culture of film and the environments in which its artists live and work.

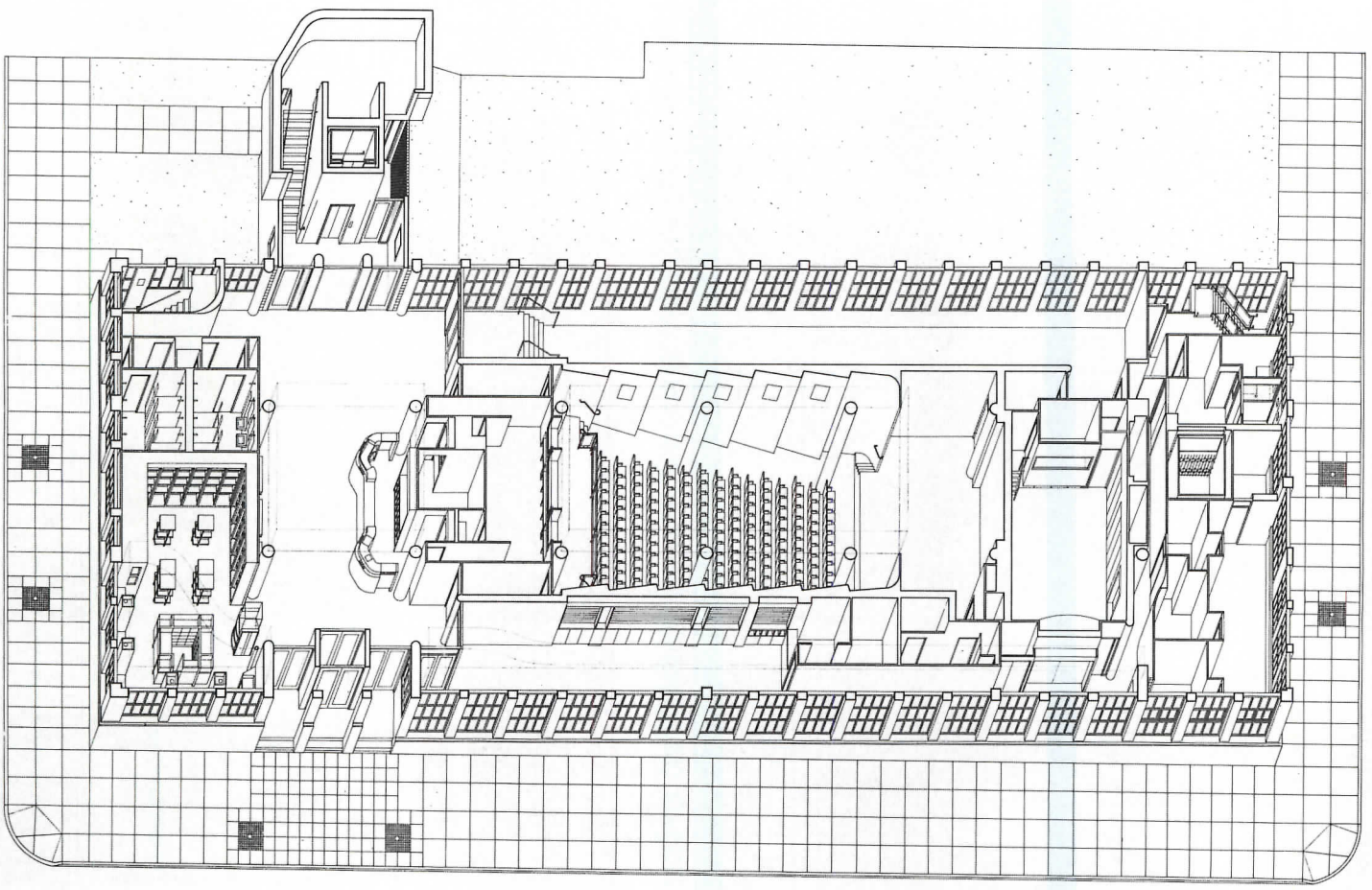
Inside, the hard, weathered concrete of the structure is left exposed, except for a coat of paint, and contrasts sharply with the crisp sheetrock that adjoins it. Charles Gwathmey, FAIA, says that the tight budget did not allow the designers the custom fixtures typical in their work, so instead they looked to the off-the-shelf marketplace. The standard fixtures, reminiscent of a warehouse, are in character.

The building was originally a garage for Paramount Studios (and later used to make films for servicemen during World War II) with a large freight elevator to move vehicles between levels. Of all the buildings in the complex, this one, with its reinforced concrete column, girder, and beam structure, was best suited to the museum functions of theaters and galleries, which support heavy loads and large floor areas. In addition, the central area of the first floor, with 25-foot bays, was already sloped and needed to be dropped only another four to five feet to comfortably house one of the museum's main attractions, a 200-seat, state-of-the-art theater with optimum viewing lines and the perhaps the best acoustics among movie theaters in the city, according to museum staff.

Because of the building's landmark status, the two-story pilasters and expansive window openings of its three street elevations were repaired and reglazed but otherwise left intact; the one exception was a cutout for the main entrance. It is on the rear elevation, facing a courtyard, where the architects were given free reign. Rather than cut into the building and use up precious museum space, they placed a monumental stair and elevator tower

Photographs © Jeff Goldberg

Far left, dropped ceiling soffits are pulled away from the building envelope so that the full height of the structure is evident even from outside. Left, contrasts of old elements against new are evident in gallery.



on axis with the entrance. The tower is a pivotal element, referring to the studio complex across the street and to the courtyard, which later will be developed as an outdoor movie theater and exhibition area.

At first sight of the building from the elevated expressway, its color draws attention; not a postmodern hue is in sight, only bold, bright colors. Astoria, when approached from the higher roadways, appears to be a collection of homogeneous buildings, all sienna brown. But, like an entertainer who might stand out in a crowd, the yellow stair tower is vibrant, not necessarily flashy, but grabbing attention nontheless, glowing as a beacon for the neighborhood.

The use of color throughout the American Museum of the Moving Image is important to the overall design philosophy of contrasts and enhances the architectural intention of articulating found intersections—interventions between old and new. Color was the simple and economical solution to elaborate volume and form in the building. The core of entry to the museum is red, echoing the main entrance, but muted, becoming almost terra-cotta. Similarly, the dark green on the rear facade becomes gray-green inside. As the visitor travels into the museum, color works as a kind of memory, intense and then settling into subdued primaries.

Intersections between the architects' new design and the building's existing structure are continually brought to the visitor's attention. Ceiling soffits necessary to conceal massive air ducts are dropped nearly five feet but are kept away from the building perimeter so that the full height of the existing structure remains evident, particularly on the first floor, which makes the initial impact. Vertical glass block gaskets were designed for transition points between old and new in the envelope, to further emphasize the difference.

In addition to the theater, the ground floor has a smaller screening and multipurpose room, a cafe, offices for a local community board, and a gift shop that has one of the highest sales rates

Right, the commissioned video art 'Get-away Car' is a constantly moving image, and, as with the building, its 'workings' are exposed.

Photographs © Jeff Goldberg

A 1920s picture palace contrasts with the rough textures of the industrial-type space. Every surface inside the picture palace has been decorated in neo-Egyptian style.

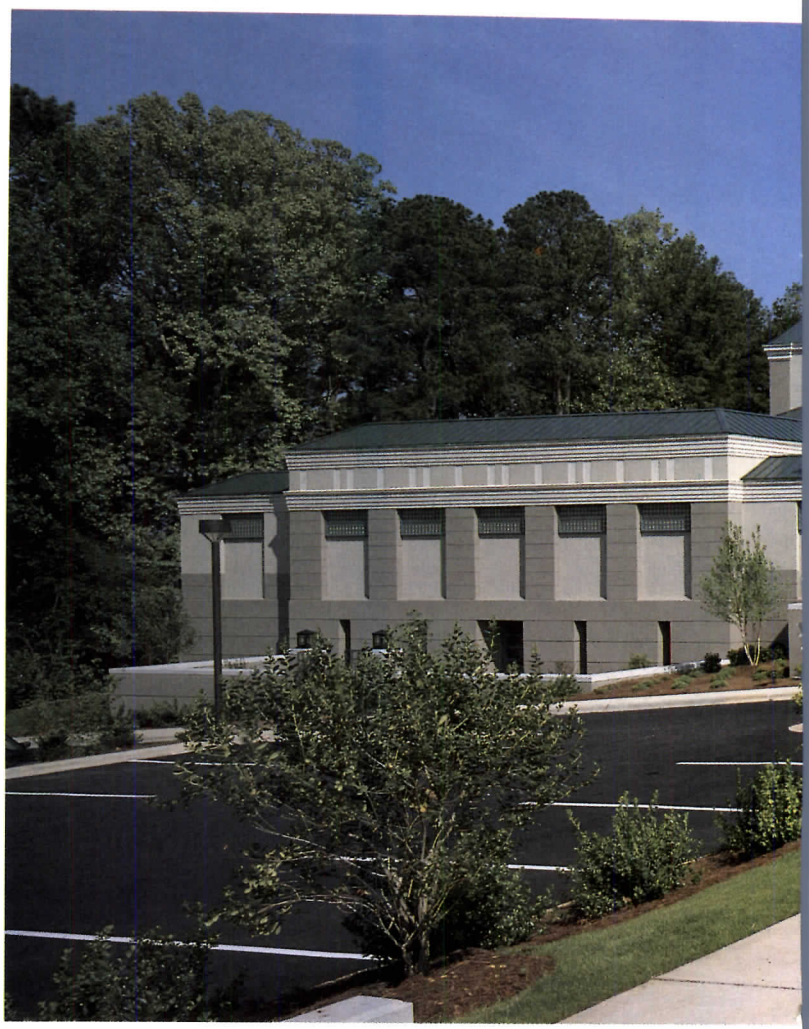
of all the museums in New York City. Also on this level is a small exhibit area that flanks the theater and provides a processional approach to the small screening room beyond. This exhibit area is quite narrow and therefore limited in the types and extents of the shows it can accommodate.

The second floor is one of the principal exhibition spaces, with half of its floor area devoted to the museum's permanent installations, which illustrate the history and production of movies and television. A simulated sound stage, with a double-height volume extending to the floor above, is the most prominent feature of the second-floor gallery. Administrative and service facilities also are on this level.

Highlighting the gallery space is a commissioned work by video artist Nam June Paik, titled "Get-away Car"; it has 80 monitors in the shape of an automobile—a visual pun on the moving image.

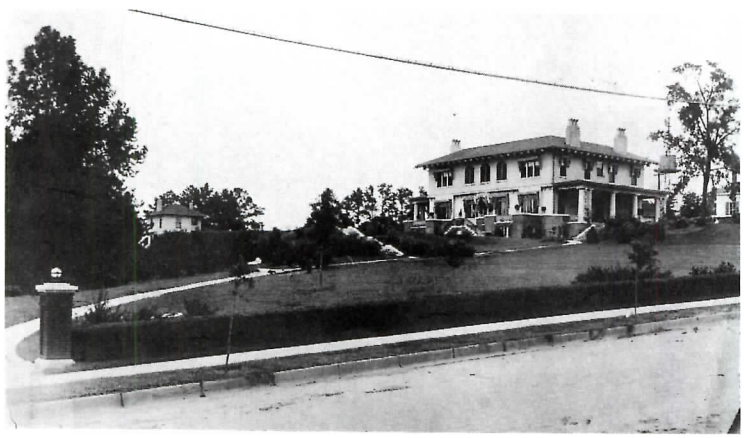
Another of the museum's visually exciting and fun installations is Tut's Fever, a permanent exhibit and screening room on the second level. It is an interpretation by two artists—Red Grooms and his wife Lysiane Luong—of a late-1920s picture palace. Every neo-Egyptian-inspired surface of the small theater, inside and out, has been designed and hand-painted by the artists, right down to slipcovers for folding chairs, foam statues, and a mummy. Museum curator Donald Albrecht, an architect himself, is delighted with the renovated building. After six years of sometimes frustrating work within the constraints of the building and the museum's needs for both screening and exhibit space, Albrecht says, "Gwathmey Siegel provided a wonderful environment to locate the picture palace and other exhibits." The architects left exposed two-story columns in the lobby to Tut's Fever to contrast old and new.

Work on the third floor was being completed this spring, and it will house classrooms as well as permanent and traveling exhibitions related to the technology of filmmaking. A column-free rooftop penthouse has been designed for additional galleries and a dining room. Reflecting the industrial nature of the museum, the new rooftop spaces will be housed in a barrel-vaulted, white metal structure whose curved form will contrast with the orthogonal building. □

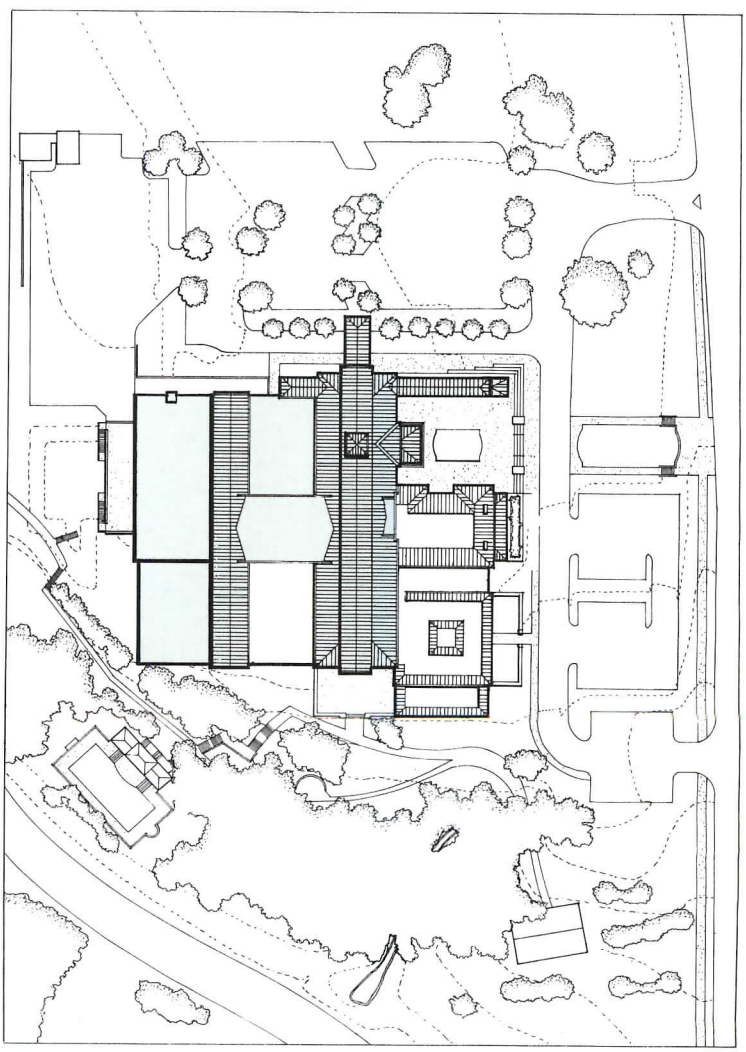


Museum Unified by a 'Hidden Temple'

The Columbus, Ga., Museum,
Ed Burdeshaw, AIA, David Cox, AIA.
By Robert A. Ivy Jr., AIA



Photographs © E. Alan McGee



Columbus, Ga., on the fall line of the Chattahoochee River, is the location of a secret temple on a hill 200 feet above the water. The temple colonnade lies within a new museum complex that houses the psyche and cultural history of its region. The Columbus Museum's inspiration is classical; it is a temple complex appropriate to a town with roots in Greek revival architecture.

A hilltop museum in six buildings already was standing on the site, housing a respected collection of American art and history. The building included a Mediterranean-style house and subsequent additions with large, low galleries and flexible space—circa 1962 and 1968.

A landmark on the site, the 1912 former home (named "Hill Haven" and designed by Atlanta architect A. Ten Eyck Brown) of a major benefactor, was a critical element in the project's direction. Its long porches, stucco exterior, and green tile roofs ultimately helped set the tone of the entire complex.

The interested community had agreed on certain goals for a new museum: it needed a major new building to hold the permanent collection, adequate to house major traveling exhibitions securely and well; it had expanded into a teaching institution, requiring studio and classroom space; staff had been spread among the buildings, so central offices were required; and new auditorium, gathering, and support spaces were required. To achieve those goals, $10 million was to be expended on the existing museum grounds.

The task of the architects, Ed Burdeshaw, AIA, of Columbus and consulting design architect David Cox, AIA, of KressCox Associates, of Washington, D.C., was to work a fractured puzzle figuring out how to glue together new and old buildings in which floor elevations differed, structural systems diverged, and materials, style, and scale varied strongly—all the while addressing complex local code questions and maintaining an overriding concern for an appropriate image for the new creation.

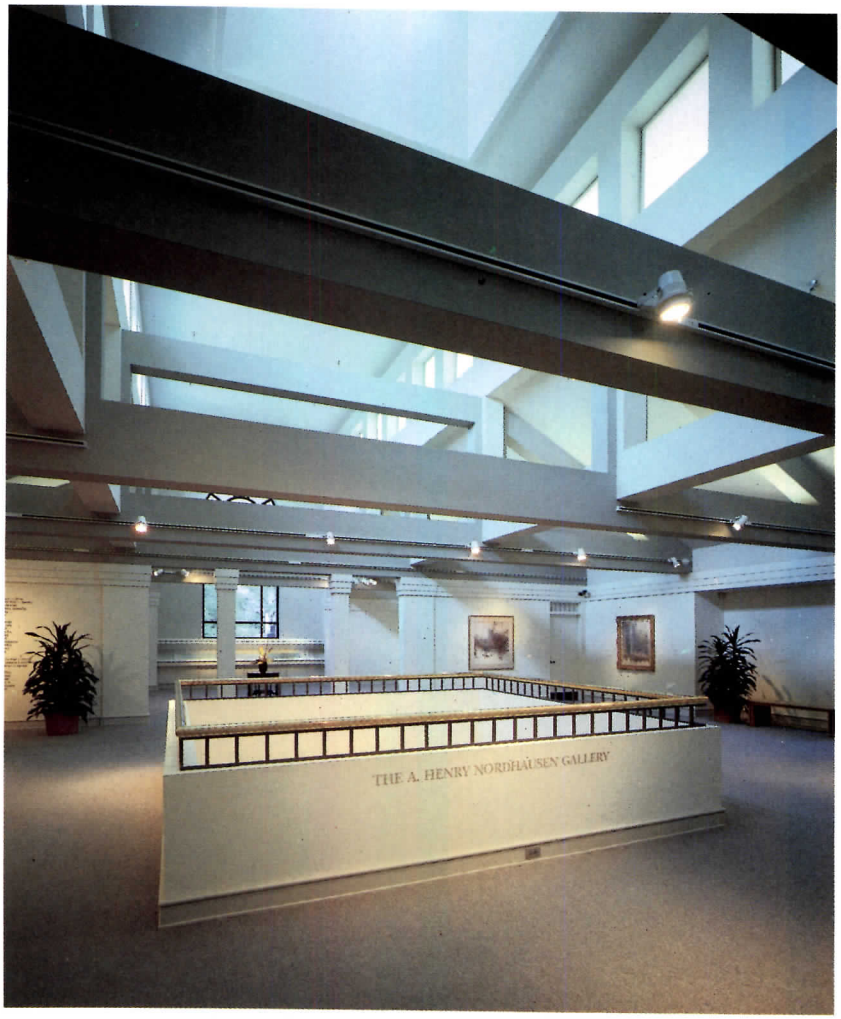
Far left, 'Hill Haven' before any additions. Above, the house now edges courtyard. Shaded area on site plan is new construction.

Unity came from within. At the heart of the Columbus Museum now lies a galleria, an arcaded central gathering space for varied social functions ("the temple within"). This is a sculpture and painting exhibition hall that links the three levels of the museum vertically, orients the visitor to the building visually, and speaks to the visitor spatially. A total of 96,000 square feet of space, 30,000 of which are devoted to galleries, spread from this galleria on three levels. At the lowest level, which corresponds with the basement level of the original house, are the 300-seat auditorium and primary support spaces, including studios, a teaching darkroom, and a hands-on exhibit, as well as administration and primary storage. At the second level are fine and decorative arts galleries. Upper levels consist of flexible new galleries, some of which are lighted by clerestory and cupola lights.

The galleria, a large, high rectangle containing an elegant elliptical arcade, acts as a spine backing up to the original buildings, its space and light drawing them into wholeness. The arcade, a colonnade of Tuscan columns above a strong base, terminates in large arches at each end. The abbreviated entablature carried by the columns acts as ingenious ductwork for mechanical systems as well as architectural device. At the entry, the arches hold stairs and landings for viewing the scene; at the opposite end, the archway opens to a Palladian window looking out to the magnolias and receding landscape of the city in the valley.

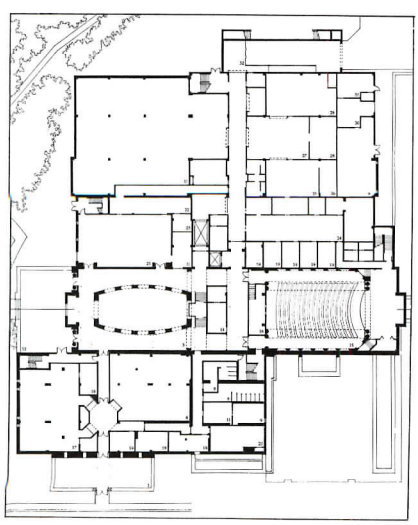
The ellipse recalls the Beaux-Arts concern with elegant line and line's ability to modify space, here controlled and in equilibrium, a neoclassical solution using a typically baroque form. The effect is that of a great stage setting.

Materials in the galleria are echoed throughout the project—simple, yet combined for maximum effect. Walls are either gypsumboard or synthetic stucco, layered from light-colored beige and white at the perimeter to dark gray for the rusticated base of the arcade. Columns above are white for emphasis; trusses floating at the clerestory level are light gray for definition in the sunlight that empties into the upper space.

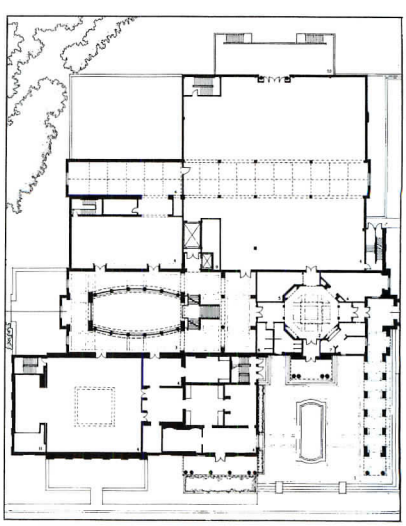


Photographs © E. Alan McGee

Left and above, typical galleries. Facing page, the galleria in a view over balustrade toward west window.



Lower level



Entry level

Floors (which vary in other galleries from carpet to parquet) are patterned in beige and dark gray precast terrazzo, providing a marblelike platform for the ensemble. The designer placed special emphasis on the balustrade, and although the materials are only stock bar steel and brass handrail their curving and recurving lines add grace to the heavier elements within the room.

Spatial homogeneity apparently was banished from the program, for new spaces vary from level to level. One primary new gallery for traveling exhibits is long and narrow, its tall, plain walls ideal foils for banners and textile hangings, while the more intimate rooms of Hill Haven remain low, appropriately scaled for the decorative arts, their plaster ceilings and elaborate millwork in concert with the work exhibited.

Entry is a controlled experience, proceeding from a low vestibule into the main entry below the cupola, a 52-foot-high octagonal space. The cupola marks the entrance to the museum from without, converses with its antebellum cousin across the street, and lights the entry within. The space is layered by receding walls and colors, hinting at experiences that lie beyond, its primary inward axial view intentionally blocked by the galleria stairway.

The exterior is unified through color and material. Like most classical compositions, the museum clearly has a base, rising from clay tiles on the courtyard surface, articulated by a darker gray stucco base surmounted by lighter beige stucco walls above. Green prefinished metal roofing complements the tile roof of Hill Haven. Rectangular stucco columns with darker bases, lighter shafts, and infill of painted metal grillwork are repeated as pilasters on the education wing, topped by a continuous horizontal band. The banding, another Hill Haven trait, draws the diverse pieces together horizontally.

Glazing, a clear insulated glass with ultraviolet film, is set in simple dark bronze aluminum frames, the repetition of square shapes forming a rhythmic line at the clerestory level. At major axial points, square, arched, or bullnose windows are enlarged to punctuate end walls as they provide views.

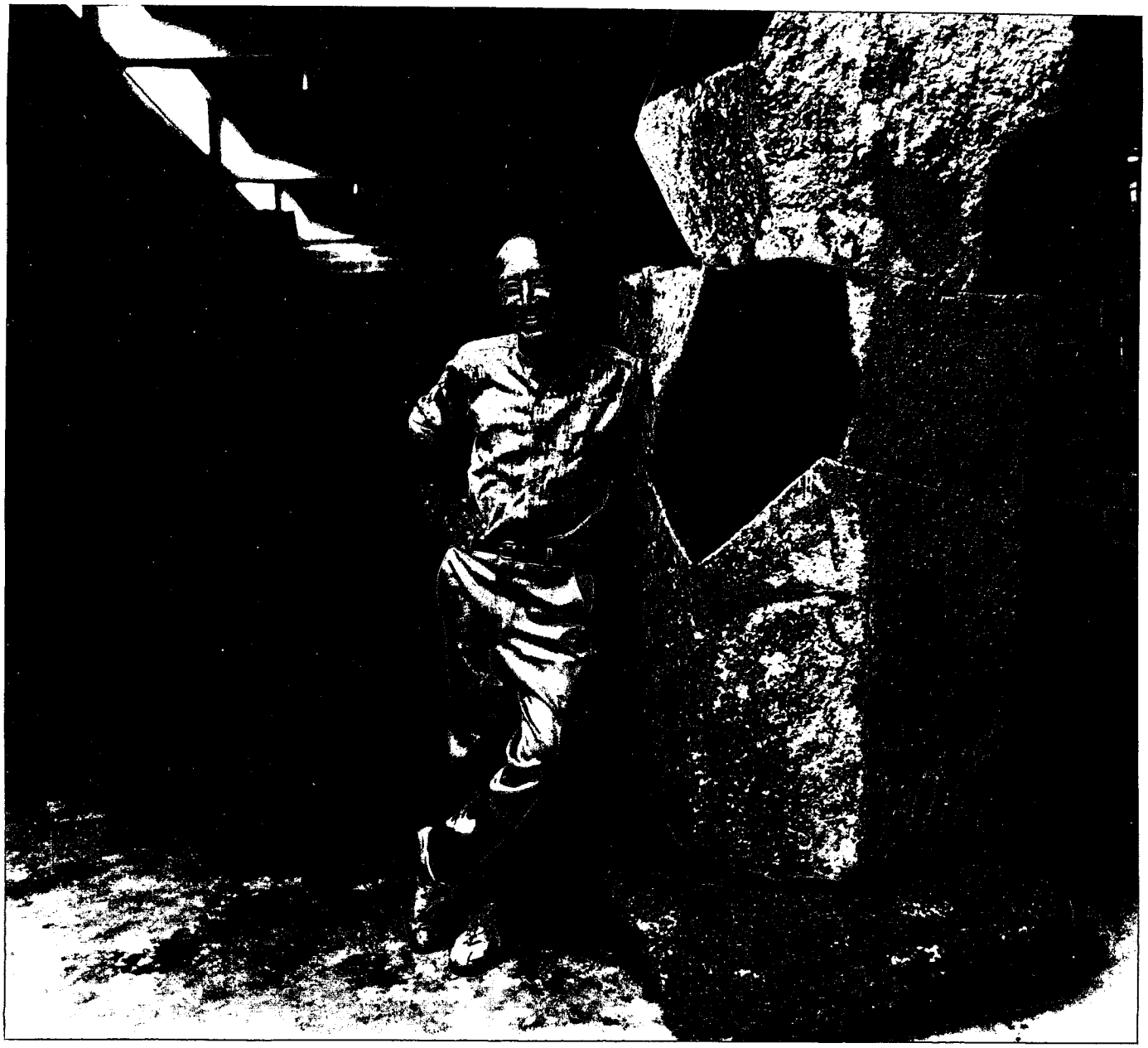
The original house, which occupies a position of honor on the exterior, sets the scale of the exterior and calls for the articulation of individual building forms. It stands adjacent to an open courtyard with plants and pool, extending from an entry porch of the new building to the street. Together with the subordinate teaching wing at its side and with the entry and galleries at its northern wing, the combination recalls a small Italian city—lively, linked, and well situated.

Connecting the individual pieces is the high line of the clerestory windows and roof, which runs parallel to the street. A porte cochere offers covered entry on the north side, gaining access to the octagonal entry hall, as does the outdoor arcade, a long, slim walkway that forms the northern boundary of the museum's outdoor courtyard. The outdoor arcade may be the building's weak link, since its intentionally airy second tier was filled in later for storage space, creating an unneccessarily top-heavy wall.

Other doorways on the primary elevation include those off the main courtyard into the entry hall (the building's true front door), as well as down the hillside through a small gate to the education wing. With so many ways in, there is some hierarchical confusion. Yet all roads lead to the strong entry space beneath the cupola, and the sequence is clear from there.

Parking for the museum has been stepped down the slope to save the gardens. Idyllic gardens originally laid out by the Olmsted firm surround the museum, filling an adjacent ravine with the splash of color from flowering trees and shrubs; a pool lies at the foot of the hill awaiting restoration. Further development of the property will entail the renewal of the gardens with walking trails and new planting and the addition of an exterior patio just off the galleria.

This is a contemporary essay in neoclassical design, more akin in spirit to John Russell Pope's *1941 National Gallery* of Art than to I.M. Pei's 1979 East Building. The architecture, by recalling the language of earlier museums, seems subservient to the purpose of the building, an invitation to contemplation. Yet it is not without power. □



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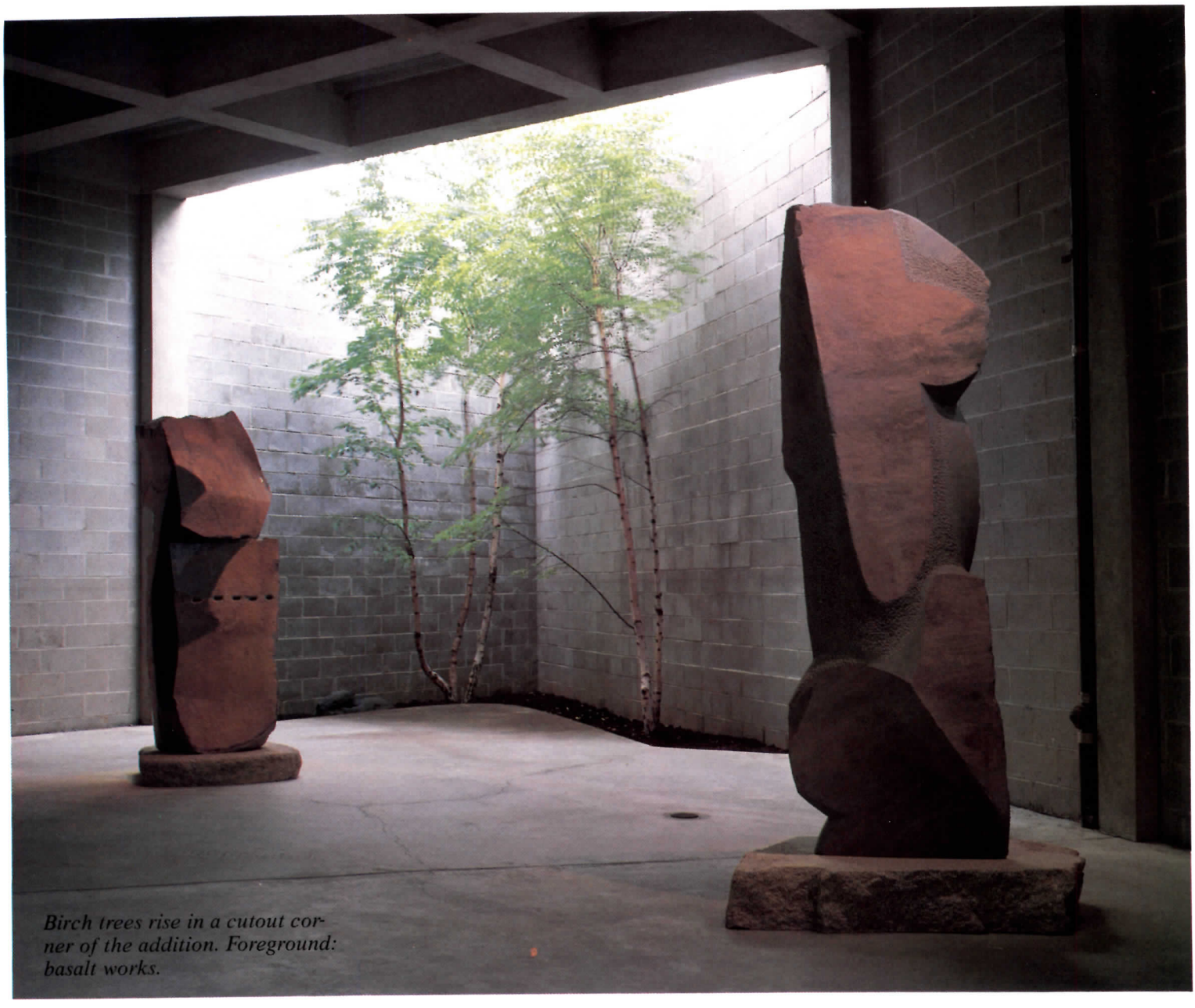
The Setting That Noguchi Created For His Sculpture

By Rosanna Liebman



Birch trees rise in a cutout corner of the addition. Foreground: basalt works.

© Michael McLaughlin

Isamu Noguchi chose for his studio a desolate Long Island City neighborhood of eerie broad avenues, warehouses, and machine shops across the East River from Manhattan. Here he set up shop in an abandoned photographic chemical plant and junkyard, which, in 1986, also became a museum devoted to Noguchi's work.

The desire to create such a museum was logistical, not megalomaniac. The larger metropolitan museums could not accept Noguchi's entire collection (even if they could, much of it would have been consigned to storage), and he balked at the prospect of another of his many run-ins with bureaucrats. Besides, he felt keeping his opus intact to be necessary to maintain the integrity of the works. He described the museum/garden, as "a metaphor for the world, and how an artist attempted to influence its becoming." This claim might be somewhat grandiose, but the museum does succeed as a metaphor for Noguchi: quick-witted, raw, and at the same time elegant, balanced, and contemplative.

From the street, the low-key museum is hardly distinguishable from its monochrome neighbors. Its triangular footprint conforms to the site, and the aggressively acute point of the building combined with its industrial fabric reminds one of contemporary Los Angeles architecture where rarified worlds are sheathed in unprepossessing garb.

Visitors enter a discreet doorway and, except for a catalogue they are invited to purchase, are on their own. Fourteen galleries (or "areas") are housed in the two-story old brick structure and cement block addition, while the garden fills out the triangle. Arranged (loosely) in reverse chronology, each area encapsulates an episode in Noguchi's 60-year career.

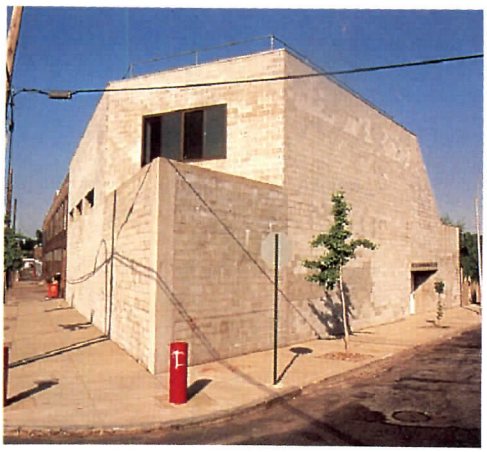
Though the areas contain mainly sculpture, one documents public works such as his Riverside Park proposals (the models have been cast in bronze) and his numerous landscape projects around the world (shown in photographs, although Noguchi includes in the catalogue a disclaimer for that medium).

One project, the 28-acre Bayfront Park in Miami, illustrates Noguchi's gift for gentle persuasion when it came to moving people, commissions, or boulders. The City of Miami asked him to do a sculpture. He looked at the decrepit site and told the officials they needed a new park. They agreed. He pushed: "But you cannot have a park with a building in it!" They tore down the library. An earth-berm bleacher, two amphitheaters, a light tower, and giant fountain now are nearing completion. Like Hart Plaza in Detroit (1972-79), where Noguchi eventually gained responsibility for the whole plaza in order to make it harmonize with his fountain, Miami's Bayfront Park, when completed, will be a massive piece of environmental art.

At his garden museum in Queens, Noguchi finally could exercise total control over a New York City environment, but the existing building on the site and the fact that the museum was developed additively precluded the homogeneity of a sculpted landscape. Rather, the Noguchi Museum is an artistic arrange-

Ms. Liebman is a writer and photographer in New York City.

Below left, the angular, pugnacious exterior. Below it, the garden with an old engraving plant as backdrop. Below, the Comtemplation Gallery with 'Childhood' (Aji granite, 1970), and 'Planet in Transit #1' (Swedish granite, 1968-72), and in corner, 'Core Composition' (basalt 1982).



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Rosanna G. Liebman

Rosanna G. Liebman

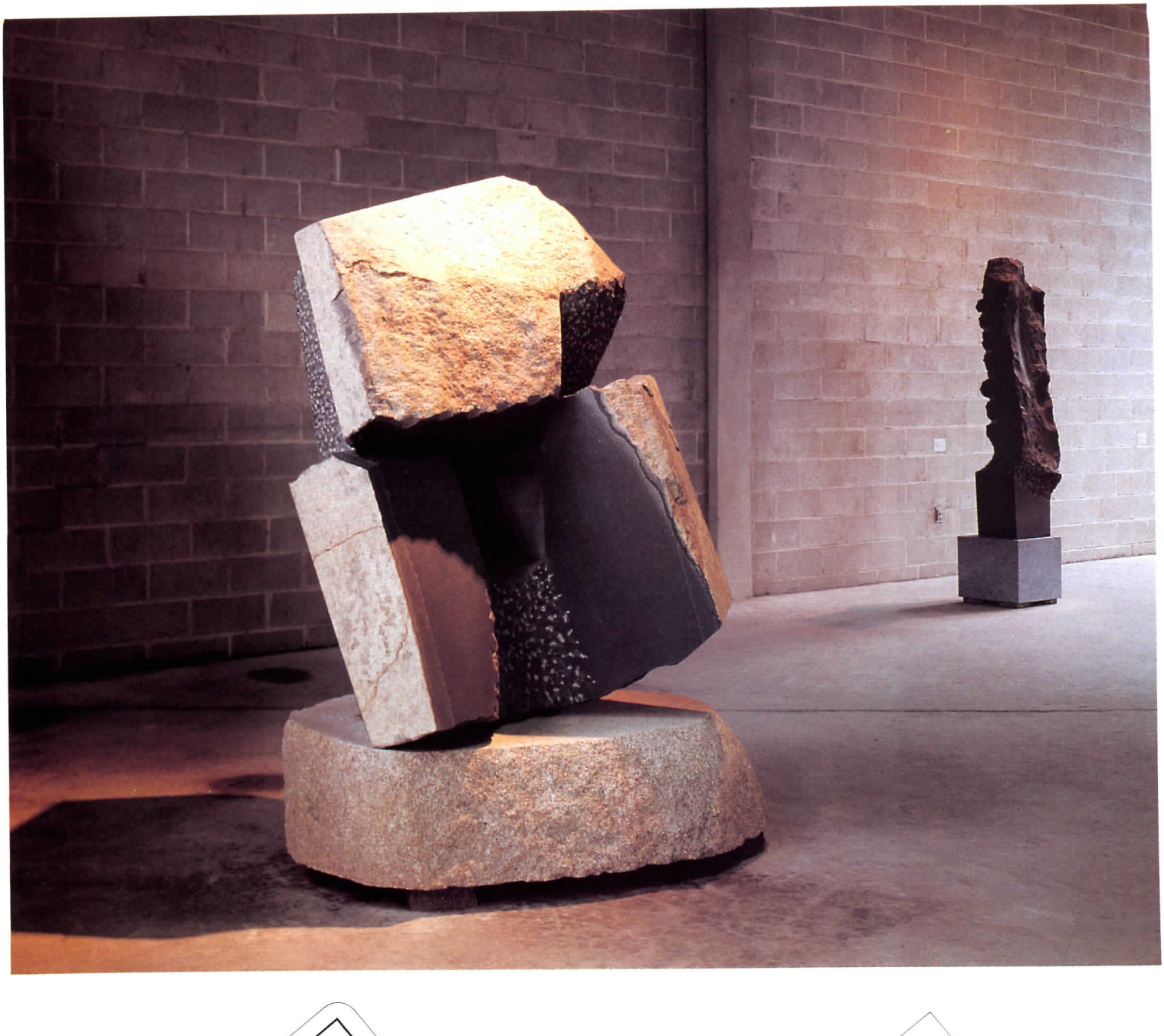
ment of artifacts. Area No. 1, built from scratch in the addition (with architect-collaborator Shoji Sadao), is the exception. The triangular corner of this first gallery is roofless, giving us to understand that the museum is subject to climatic whims, not simply for economic reasons but because its creator desired to dissolve the barrier between humanity and nature. When the sun shines, the stone monoliths bask in its warmth and visitors are drawn to the little birch tree in the corner. When it rains, the stones and cinder block are cold and people get wet. It is pure Noguchi: seductive but confrontational.

"It is said that stone is the affection of old men," he said, explaining his obsession with that medium in his later years. The younger Noguchi worked the entire surface of the stone, trying to achieve a polish in the marble and perhaps in himself. The older artist gravitated to unglamorous basalt, a volcanic and stubborn stone that resists the chisel. Having learned patience with age, Noguchi respected such a strong adversary. He sought not to conquer the stone, shaping it to his own design, but to have a "dialogue" with it, perhaps revealing its spirit and lending a little of his own. His cuts and stipples into the basalt only "interrupt" nature, for the gashes eventually will oxidize.

Like the cuts in the hulking basalts, Noguchi's museum interrupts its Long Island City context but does not deny it. Most visitors describe the museum as "serene." Compared with Manhattan, indeed it is. But this is no reliquary. The sculptures lend a hum of vitality and tension. Even in the contemplative garden where sleeping stones lie, the noise of trucks and airplanes disturbs the bird's song, and aluminum-sided factories and chain link fencing form a backdrop to the weeping apple trees. Noguchi made no effort to keep these local realities out; in fact, in a particularly calm gallery he cut a picture window opening to a view of midtown Manhattan to "recall to us another life."

What a pity it would have been if Noguchi's sculptures had ended up in a traditional museum. It is impossible to resist caressing the cool stone sculptures. Thank goodness there are no guards to keep one from doing so. Like his landscapes, playgrounds, and larger monuments, these pieces are accessible and participatory. Yet they are so artfully arranged and some are so still that one also wants to maintain a reverential distance. Shafts of sunlight gravitate precisely to certain works, as if Noguchi had planted them in spotlights as the sun ran its annual circuit. But he never would have stooped to such preciousness. "In an exercise in the placement of rocks, improvisation at its peak comes only once," he said.

Still, Noguchi seemed to consider his garden museum a work in progress. When asked about the definitive placement of the rocks, he replied, "I would say that this garden has to be improved. There are things that I think could be replaced with something better. I'll remain around here until it is perfect." He died Dec. 30, 1988, from complications arising from polishing marble. His tombstone (designed by Sadao), a small basalt cylinder partly polished and partly rough, completed the garden. Under it half of his ashes are buried. The rest are buried in his garden studio in Japan, fulfilling his quest to link West with East. □



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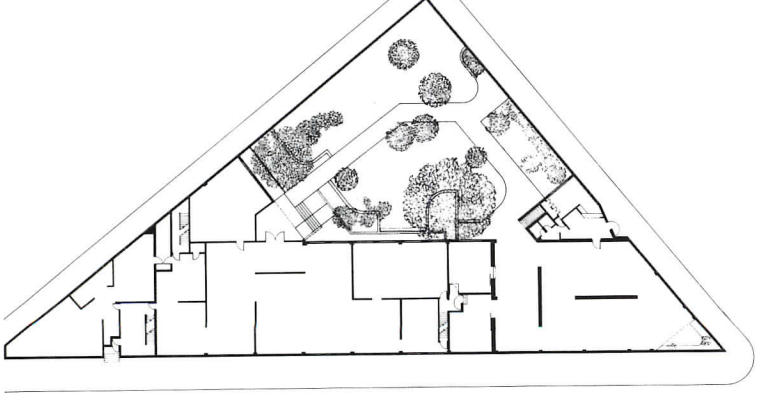
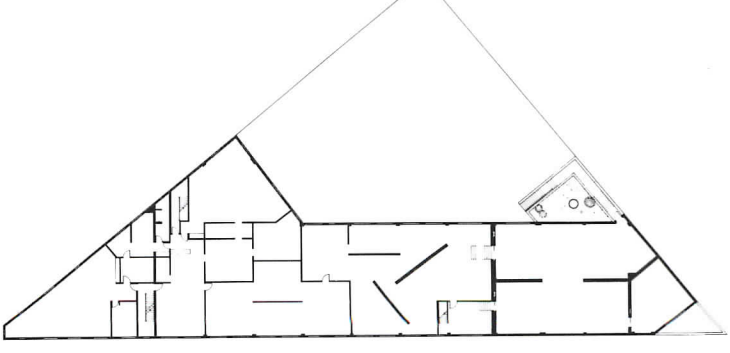


First floor



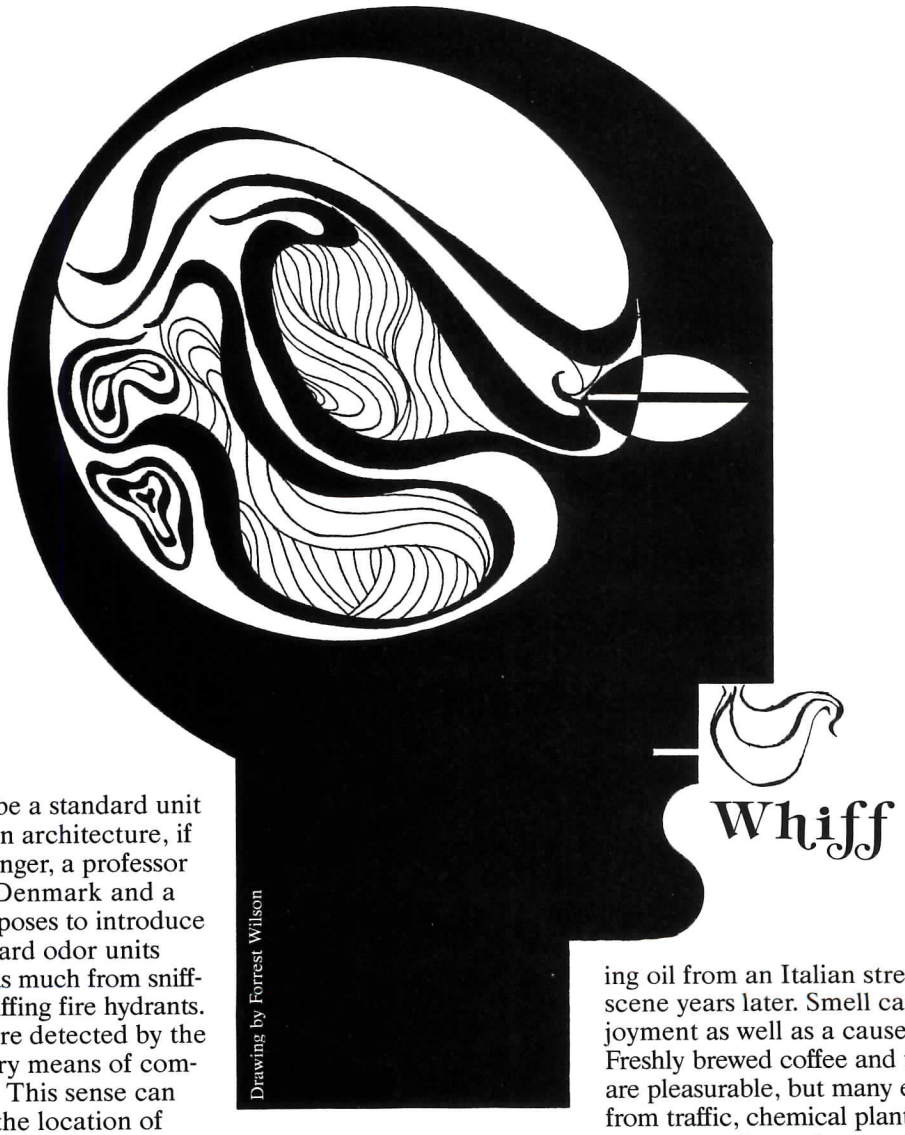
Second floor

Photo above, 'Woman' (basalt, 1983-85), and 'Age' (basalt, 1981).

Esplanade Condominium
Toronto, Canada
Owner: The Avro Group
Architect: Matsui-Baer-Vanstone Inc.

Beginning to Deal With Odor in Buildings

By Forrest Wilson



Drawing by Forrest Wilson

By the year 2000 there will be a standard unit of measurement for odor in architecture, if Ole Fanger has his way. Fanger, a professor at the Technical University of Denmark and a highly respected researcher, proposes to introduce the "olf" and "decipol" as standard odor units and contends that we can learn as much from sniffing buildings as dogs do from sniffing fire hydrants.

Chemical and natural odors are detected by the chemical sense and are a primary means of communication between organisms. This sense can differentiate individuals, aid in the location of food, and provide a means of marking territory. It encourages an appreciation of a sequence of odors rather than a sequence of spaces. Smell betrays the presence of enemies, can be used as a weapon (as skunks have discovered), and can lead a creature to its true love. The silk moth can find its mate at two or three miles distance, while we cannot locate ours three feet away in a crowded subway train.

Many places have characteristic odors, such as kitchens or amusement parks and fairgrounds with their areas of fried foods, candy, and popcorn. The smells of garlic, oregano, and cooking oil from an Italian street fair recall the scene years later. Smell can be a source of enjoyment as well as a cause for complaint. Freshly brewed coffee and the aroma of bread are pleasurable, but many environmental odors from traffic, chemical plants, and manufacture are extremely unpleasant.

The human nose is a remarkably sensitive detector, but unfortunately it is not totally reliable as a warning system. Many dangerous gases are odorless. Miners recognized this and took canaries with them into the mines. The birds reacted to the deadly odorless coal gas that could not be detected by the workers.

Architectural attention by means of separate ventilation systems is given to some odor-creating spaces in buildings, such as kitchens, conference rooms, bathrooms, and some manufacturing areas. Many building types, including hospitals, museums,

libraries, schools, and homes have distinctive smells. But little research is being conducted in this area even though we often remember the smell of a space much longer than we do its color, furniture, and pleasing or not-so-pleasing proportions. In some cultures smell is inseparable from a sense of place. Kevin Lynch tells of the Netsilik Eskimo, who describes home as "to be surrounded by the smell of one's own things."

Compared with visual, aural, and thermal research, odor investigations are primitive. This is surprising because the nose is an extraordinarily sensitive instrument—it identifies thousands of different odors. Human beings can detect concentrations of odor-producing substances so minute that chemists cannot measure them. Olfaction is an extraordinarily sensitive, if neglected, alarm system. People have known for centuries the air can carry poisons. Historian Jean Gimpel wrote that Queen Eleanor of England (the wife of Edward I) was driven from Nottingham Castle in 1257 by the fumes of sea coal burned in the industrial city below. Metalworkers often were killed by smelter fumes. Hatmakers were driven insane by the fumes of mercury used in making felt, and the phrase "mad as a hatter" has its origins in this sad fact.

Bad air was common in the workplaces of the ancient and medieval world, but the Industrial Revolution also poisoned the "ambient air," which the Environmental Protection Agency defines as "that portion of the atmosphere, external to buildings, to which the general public has access."

The Clean Air Act of 1970 was designed to clean up outside air pollution, but the danger is greater inside. A National Academy of Sciences (NAS) study published in 1981 shows we spend nine times more time indoors than out, so exposure is far greater. Also, there are indoor air pollution sources that typically do not occur in the outdoor air. These include tobacco smoke, trapped radioactive gases emanating from subsoil, formaldehyde emissions from particleboard, carpets, pesticides, cleaning fluids, and human metabolic gases and pathogenic organisms generated by coughing, sneezing, and flushing toilets.

There also are relatively new sources. Large office developments contain parking garages, access to transportation such as buses and subways, restaurants, health clubs, laundries, and recreational facilities. These spaces may add substantial amounts of combustion byproducts, including carbon monoxide, oxides of nitrogen, carbon dioxide, and diesel exhaust, to the indoor environment. There are thousands of chemical compounds in very small concentrations, difficult to detect with present chemical techniques of analysis. Some are above their thresholds of odor and irritation, and they contribute to the stuffiness of the air. Even if every single molecule were identified, the problem still would be to know the impact of the individual chemicals on human beings. Furthermore, we do not know how each is perceived in combination with thousands of others.

If chemists, physicists, hygienists, and engineers cannot find the chemical or physical reason the human nose finds air unacceptable, we can either solve the problem with caged canaries or refine our techniques and accept what the nose knows. The latter is what Fanger proposes to do. But how can we quantify the quality of indoor air when our sciences are inadequate? The answer, says Fanger, is to acknowledge that the human nose is the most sensitive instrument available, to "use man as the meter" (scentometer, perhaps?) "Outdoor air is provided to meet an individual's needs, and only the individual can judge whether these needs are met. The human being is the ultimate judge of the air quality they perceive," says Fanger.

"The nose knows," he continues. It is time we established a unit of measure for this most sensitive sensing device. He proposes two: the "olf" and "decipol." The olf quantifies the source strength of air pollution, and the decipol measures perceived air pollution. An olf (from the Latin *olfactus,* meaning olfactory sense) Fanger defines as the emission rate of air pollutants (bioeffluents) from a standard person who takes 0.7 baths a day in Fanger's calculations. Fanger does not describe how one person manages to take 0.7 baths a day. He does claim, however, that pollutant sources can be expressed by the number of such standard persons, or olfs, required to cause the same dissatisfaction as the actual person pollution source.

The olf is used as a relative unit of measurement, similar to the "clo," which is the numerical value given to clothing in thermal comfort computations. (Zero clo = no clothing and probable arrest on most beaches and city streets.)

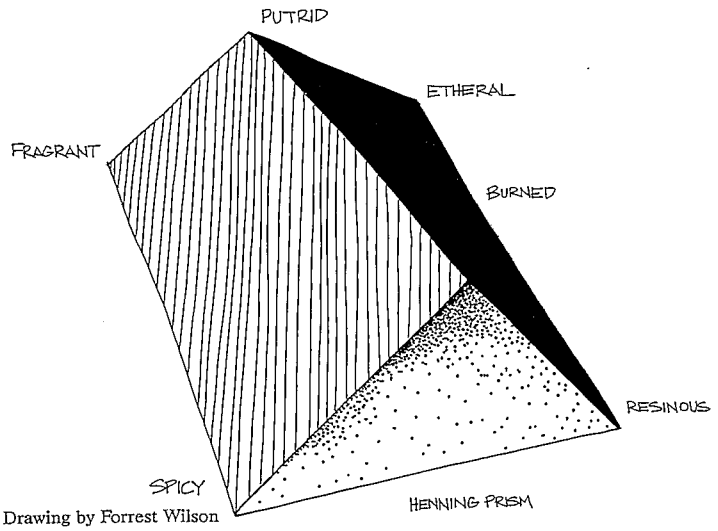
Human pollution was selected as a unit because it is well known and publicized, says Fanger. Perfumes, soaps, and candles are developed primarily to satisfy our desires for pleasant odors. The food industry has been at the forefront of using odors to enhance the appeal of their products, especially of chemically derived foods. Household manufacturers have followed suit with scented and perfumed products from detergent to toilet paper. Our sense of smell has received a good deal of marketing analysis. At Epcot Center near Disney World in Florida, where ingenious human-like robots enact historic scenes, illusion is enhanced with the smells of place. Smell guns are used to direct odors to those passing through the spaces.

The sense of smell is used by building diagnosticians in detecting building problems. Hugh Miller, FAIA, literally smells historic buildings and thus can tell the nature of their problems. "A musty odor indicates that moisture is approaching dangerous levels," he says. Pleasantine Drake of Diagnostics Canada, uses odors to evaluate airconditioning systems, and has successfully traced odors to locate mechanical malfunctions. Physicians use odor to diagnose illness: they smell bandages for infection and a baby's breath for diphtheria.

Human beings are veritable treasure houses of vapors and gases that include:

- metabolic intake of oxygen and output of carbon dioxide and water vapor;
- vaporizing of organic and inorganic substances from the hair, the skin and its glands, and apparel such as perfumes, cosmetics, cleansing agents, and cleansing solvents trapped in clothing;
- products of digestion and bacterial fermentation from the gastrointestinal tract;
- volatile products of bacterial growth arising from the mouths of people who practice poor oral hygiene;
- air contaminants from burning tobacco and from smoke exhaled from the lungs of smokers.

Fanger assumes this mixture of vapors will be partially diluted



Drawing by Forrest Wilson

in 0.7 baths per day. The remaining cocktail of gases constitutes Fanger's 0.1 decipol.

Considerable knowledge is available of how bioeffluents are perceived by people, as documented by the "even his best friends won't tell him" commercials for body-odor products. The human body is considered the primary pollution source in offices, assembly halls, and other nonindustrial buildings, according to Pettenkofer and Yalou in the ASHRAE *Journal* (Oct. '88, page 35), as well as by the underarm odor judges at Hill Top Research Inc. of Cincinnati. This is recognized by the fact that ventilation standards worldwide specify air changes per occupant.

The olf and decipol also correspond to analogous units for light and noise measurement. The lumen is a unit of luminous flux equal to the light emitted in a unit solid angle by a uniform point source of one candle intensity. For noise, the source strength is given in sound measured in decibels. The only power considered is at frequencies between 20 and 20,000 Hz, those detectable by the human ear. Lux and decibel measurements, however, do not express levels of annoyance. A given decibel may be caused by traffic noise or chamber music. The olf unit proposed by Fanger concentrates on annoyance and dissatisfaction independent of pollution source.

Originally, noise and light were measured using the human being as meter. Later, instruments were developed to duplicate the sensitivity of eye and ear and measure light and sound by wavelengths. At the moment, Fanger intends the olf and decipol to use the nose as meter, which means a panel of judges must be employed to arrive at an average. In the future, he expects a nose instrument will be developed. He hopes such a scientific meter will be as sensitive as the dope- and contraband-sniffing dogs employed by police and customs agents and as talented as a guinea pig, which can tell another guinea pig's sex, personality, friendliness, what it has eaten, and its emotional state from a drop of urine.

There is a certain legitimacy to Fanger's proposal, says William S. Cain, professor of environmental health and psychology at Yale University and fellow of the Pierce Foundation Laboratory in New Haven, Conn. Traditionally, ventilation rates were set by thermal and chemical comfort standards. Odor control is the driving force for ventilation, he says.

Annoying odors continue to play a dominant role in determining ventilation requirements, says Cain. The concerns of the past persist in the fear that smelly places are unhealthy. The legitimacy of those concerns, says Cain, depends on the source of odor. Residents may have no fear of a new carpet but may treat the odor of a dead rodent in the wall as grounds for temporarily vacating the premises. The health effect of the two threats may be quite the opposite of their impressions.

Fifty years ago at the Harvard school of public health, people sat in a chamber as others came by, smelled them, and made judgments about the odor of the chamber and about its ventilation.

Although the human nose is biased and not uniformly selective, there is little that it cannot detect. The nose can find one part of a chemical in a trillion, and it is a rare chemical of which the nose cannot register one-tenth part per million. It is a keen detector of contaminants.

The difficulty, says Cain, is in small amounts of adhesive, paint, fiberboard, and carpet, all emitting small amounts of odor. We do not know the total effect. This is being explored in Denmark as a possible source of building complaints, and the EPA is interested in this cocktail of common material odors present in low concentrations.

Scores of people are run through experiments to measure the inherent personal variability and objectivity of the experiment. They are exposed to a concentrated series of odors, from weak to strong, like a series of lights from dim to bright. They must identify the equivalent of, say, a 20-watt smell. Because the number of parts per million is known, the experiment can be repeated anywhere in the world. This is the process of matching intensities. The second step is measuring acceptability. The results, says Cain, show a relationship between intensity and acceptability, and there appears to be agreement in Western industrialized culture on that relationship. The target value of the ASHRAE standard is that 80 percent of the people be satisfied that the ventilation rate controls odors to an acceptable intensity.

The current occupants of a space are not its sole source of odors. Ventilation systems have histories of use and can grow biologically active materials that are absorbed into the walls of the system and played back into the system as a source. Hidden contaminants must be recognized, says Fanger. Since they will be unique they need a common equivalent, which is the amount of odor created by an occupant taking 0.7 baths a day. Fanger's olf is a standard unit like a meter stick that measures the human reaction to odor. The annoyance caused by odor is a function of its intensity. People object to body and tobacco odor equally at similar intensity, says Cain. Intensity is the objectionable factor. "We are not sure it is true for all contaminants, but for the extremes of normal occupancy, with body odor at one end and tobacco smoke at the other, we assume it to be true of odors between these two," he says.

The culture is changing. Major chemical changes have occurred in a great number of products introduced into buildings over the last decade, and we know smells can be deadly. People are less odor-tolerant today than they were 10 or 15 years ago, when it was not so socially acceptable to object to smoking. It is true that we now put more faith in the nose, for we know the nose knows. □

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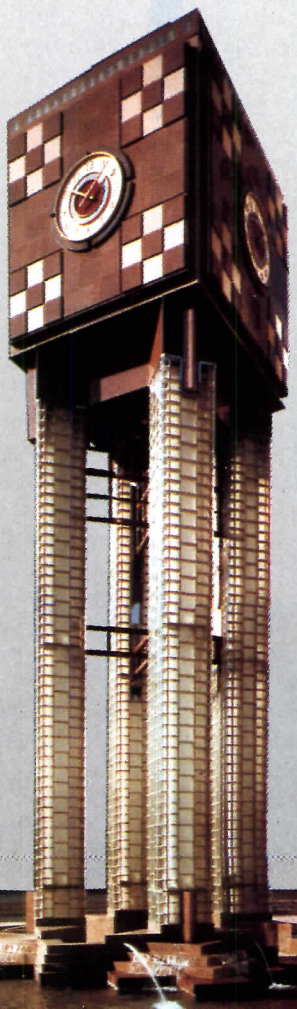

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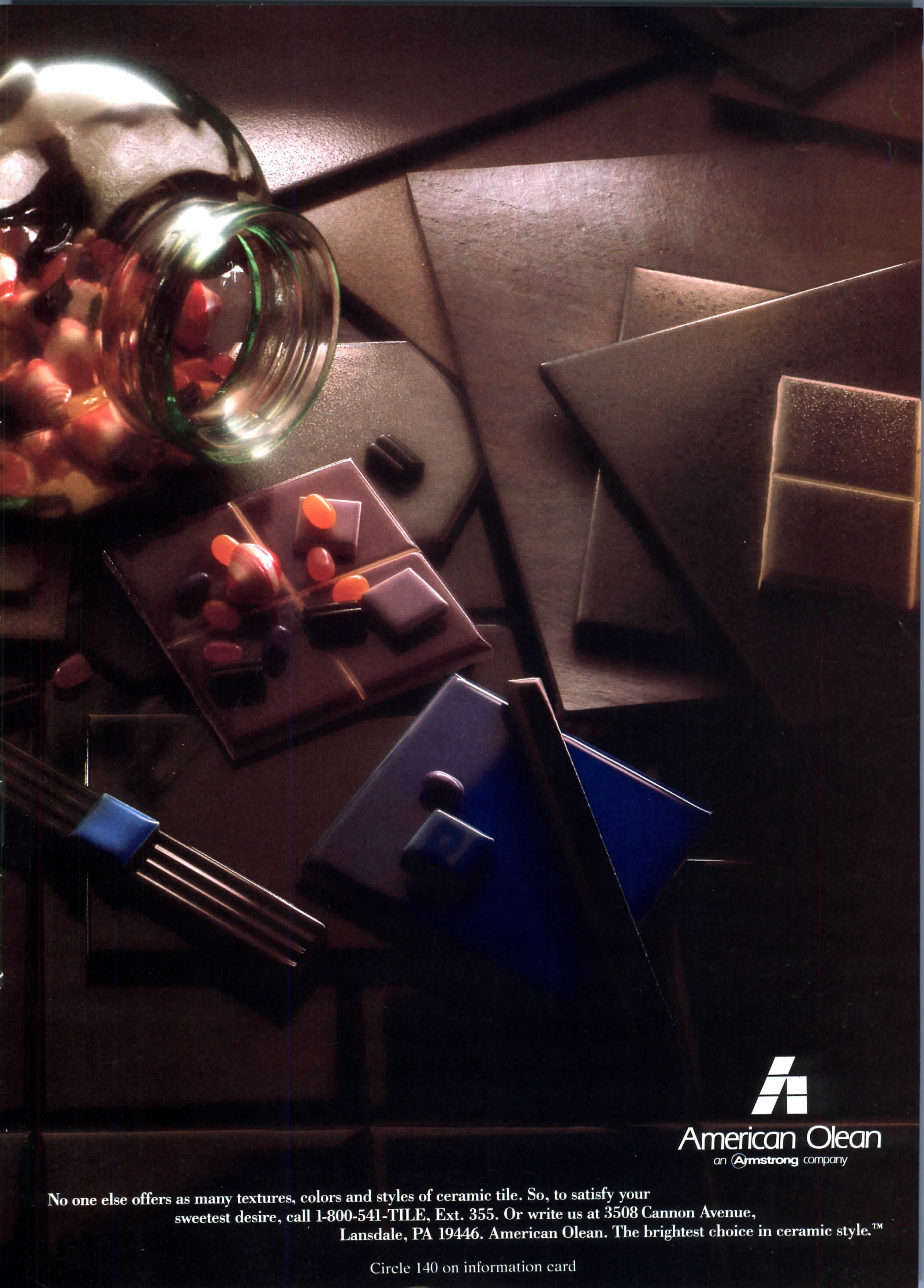

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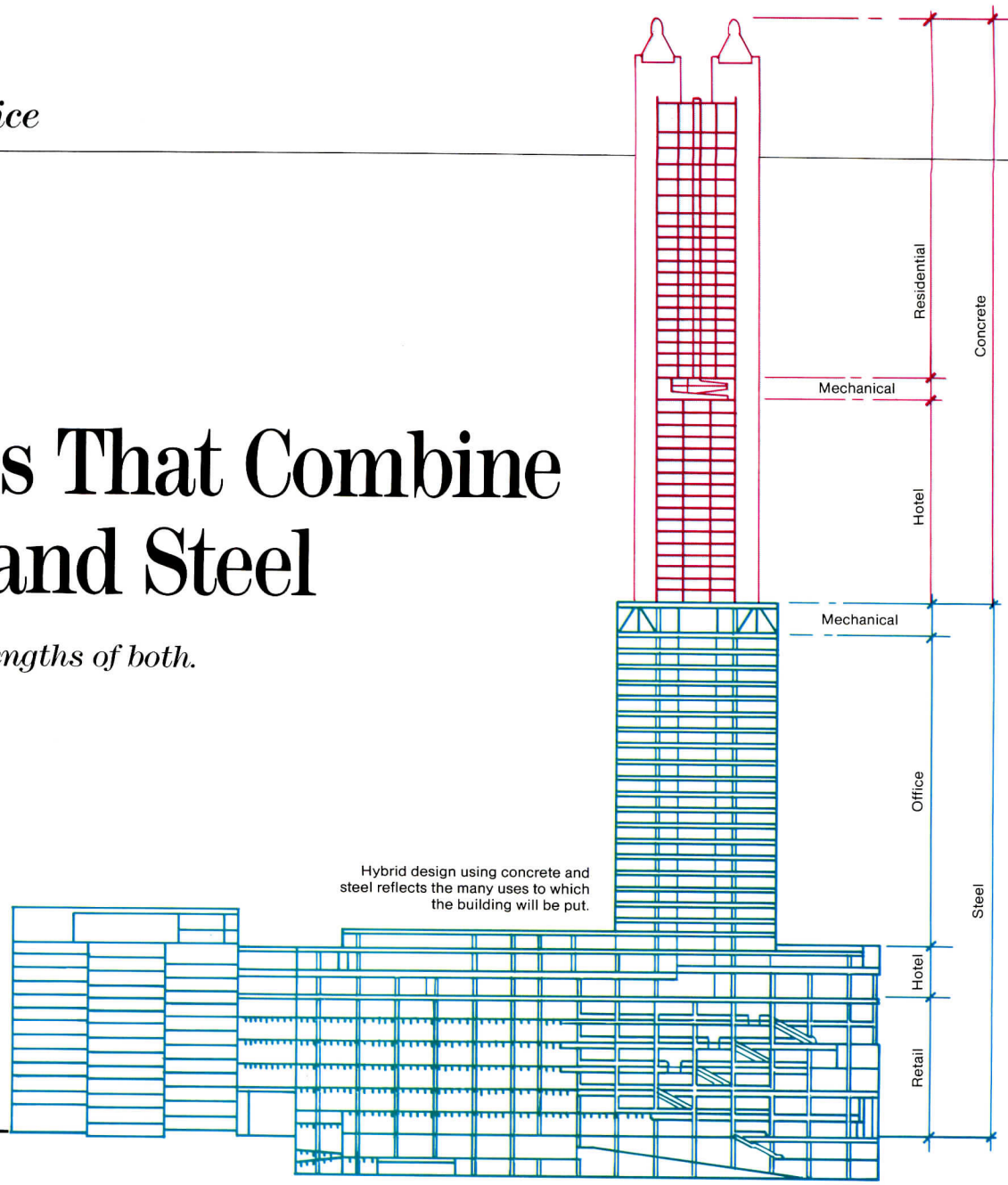
Structures That Combine Concrete and Steel

Hybrids exploit the strengths of both.
By Matthys P. Levy



Hybrid design using concrete and steel reflects the many uses to which the building will be put.

When I first entered the Jacques Baruch Gallery in the old 900 North Michigan building, I was transported to another time. Greeted by my old friend, the dapper Mr. Baruch, I was led into a two-story-high Gothic fantasy. There were fluted stone columns and spiral stone stairs leading to a balcony made for Juliet. It was a wonderland that had been built for the apartment house's original owner. Every detail, each exquisitely carved stone, was perfect. I was saddened when Jacques and Anne had to move their gallery to a nearby nondescript modern edifice."

—Matthys Levy

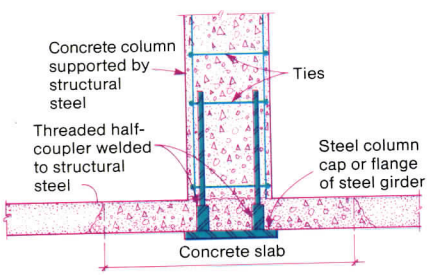
As late as September 1971, a news story in the New York *Construction News* announced that the new Olympic Tower facing St. Patrick's Cathedral in New York City was to be constructed entirely of reinforced concrete. By the time construction of the building actually started in the fall of the following year, the concept had been modified by redesign of the 21-story commercial base in steel, producing not only one of the first mixed-use towers in the country but an early hybrid structure as well. Not the result of disease or some weird mutation, a hybrid is merely the combining of two materials in a structure; in this case, steel and concrete.

One might argue that all structures are hybrids to some extent. After all, footings invariably are constructed of concrete, and piles, if they are needed, can be of wood, steel, or concrete, while superstructures are of either steel or concrete. But it is the mixture of materials in the superstructure, not the foundation, that earned Olympic Tower the classification of hybrid.

What led to the decision to mix structural materials in Olympic Tower and in the recently completed 900 North Michigan tower in Chicago by Kohn Petersen Fox? The two buildings share a common goal: to enliven an urban environment through a miscellany of occupancies. Olympic Tower is a 50-story building with a two-story retail base, 19-story office segment, and 27-story residential top (within a total of 900,000 square feet). The 900 North Michigan building is a 66-story tower with a six-story retail base and 19-story office segment, topped by a 16-story hotel and 18-story residential tower (within a total of 2.7 million square feet).

In both buildings, the structure was changed from steel to concrete above the last office floor. A major reason for this was the economy afforded by concrete construction in residential applications. The floor-to-floor height with flat slab construction can be held to under 10 feet, depending only upon the desired clear ceiling height and the concrete thickness, which is, in turn, dependent on the required column spacing. Also, flat slab concrete

Mr. Levy is a principal of Weidlinger Associates, an international structural and civil engineering research firm headquartered in New York City.



KPF's 900 Michigan Ave. building in Chicago, one of the newest composite structures. The section, left, shows flat slab construction for the top 30 residential floors. At the 30th floor, the load transfers to the steel frame of the offices, down to the seventh floor (retail), where the grid shifts again. The detail above shows the connection of concrete to steel.

construction allows shifting columns outside the rigid grid more common in steel construction; it therefore adapts to the more random column spacing needed for residential structures. Finally, no hung ceiling is required, since the slab is the ceiling; this results in further savings.

At Olympic Tower, steel girders, as much as seven to eight feet deep at the top of the office floors, allow transfer from the concrete columns above to the regular steel column grid below.

Apart from size, there are other major differences between the two buildings. Designed by SOM, Olympic Tower is a sheer monolith of dark bronze, a pure celebration of the International Style. With the cachet of the Onassis name, both as cosponsor and as early residential purchaser, the building attracted an international clientele and remains a prestigious address today.

The 900 North Michigan complex explores a contextual reference to the 1920s. With two setbacks on Michigan Avenue and a playful top with four lanterns, the building's warm masonry facade stands in contrast to the structurally powerful dark mass of the John Hancock Building diagonally across the avenue.

The competing requirements of the various uses in 900 North Michigan were resolved structurally by a variety of solutions, each unique to the requirements. At the top of the tower, the residential floors are flat concrete slabs with columns 15 to 20 feet on center. Between the 47th and 48th floors, concrete wall girders transfer the columns to a regular 30-foot grid in the north-south direction. At the 30th floor, the concrete structure is transferred to steel columns below, with steel girders transferring the hotel columns to the regularized 30-foot east-west grid. Finally, at the seventh floor, a last transfer converts all columns to the 30-foot grid of the retail space.

The stiffness of the tower to resist wind forces is obtained through a tube frame above the ninth floor, with perimeter columns 15 feet on center in the upper tower. Below the ninth floor, a braced frame with major diagonals down to the ground is placed on the four faces of a rectangle outlined by the plan of the tower above. This combination of a tube frame above a braced frame is ideally suited to the two occupancies, residential and open commercial. The same system was used on the Marriott Marquis Hotel in New York City.

Since the perimeter tube is called upon to do more work than the interior columns, having to resist both gravity and wind forces, the perimeter columns are generally less stressed under gravity forces alone. Therefore, to compensate for the anticipated differential shortening with the more highly stressed interior columns, the exterior columns are initially made shorter than the interior ones.

Apart from the advantage gained by using concrete construction for the residential portion of a tower, there is a disadvantage in continuing the concrete to the ground. Columns in such a concrete tower will result in dimensions of as much as five

New York's Marriott Marquis, a tube frame above a braced frame.

feet square. Such large columns significantly reduce the useful area and cannot be hidden in open floors such as those used for retail sales. Steel columns, even with fireproofing and cladding, measure half the size of concrete columns and are therefore more acceptable. Economic arguments, which undoubtedly played a large part in the choice of the concrete over a steel hybrid structure, also can be presented.

Restricted by a 549-foot, FAA-dictated height limit, the Southland Corp. of Dallas desired a headquarters with as many floors as possible. The recently completed Cityplace Tower, engineered by Weiskopf & Pickworth/Datum, squeezes 42 composite floors of 10-foot-10-inch story height within the FAA envelope. The tower is really two towers connected by bridges spanning over a central atrium. At every fifth floor, the two towers are fully joined by a floor structure, forming, in effect, a stacked series of five-story-high atriums. Each of the split towers is a complete tube of rigidly connected beams and columns, which are used to provide a wind-resisting system and stiffness for the simply connected interior steel framing. Using a steel frame for the articulated perimeter wall proved to be uneconomical, and a reinforced concrete frame was used instead. This results in yet another variation of a hybrid structure. The plastic property of concrete is utilized here to solve the problem of providing building stiffness for a highly articulated architectural facade while providing as an additional benefit the backup for the granite cladding. Consequently, all interior steel is designed only for gravity loads, allowing the use of simple shear connections for beams and avoiding the complication of moment connections and the necessary added steel weight. Embedded steel plates in the concrete frame are used to connect the beams to the perimeter wall.

The exterior wall of concrete columns and beams was constructed using a sophisticated jump form system. The form, which was attached to the side of the building on climbers, allowed one full floor to be poured every four days.

A problem this building has in common with the more usual hybrid structure using a slip-formed concrete core and steel framing outside the core (and with the piggyback structure discussed above) concerns differential shortening. Concrete columns (or walls) tend to shorten under load at a rate different from that of steel columns. In general, the strain in a steel column is greater than that in the concrete column, and the steel column therefore will shorten more. This effect is most noticeable in the upper stories of a tall tower and must be compensated for by deliberately lengthening the steel columns so that, under gravity loads, the steel and concrete columns will end up at the same level. Columns were lengthened by ⅛ inch for every two floors to counter this effect.

The Cityplace Tower had a further complication as a consequence of the split tower scheme. Each tower acts as a separate, although linked, cantilever under wind loads. This implies that the wall on one side of the atrium is in compression, resulting in potentially large differential deformations. Fortunately, the stiffness afforded by the concrete frame mitigates against this effect, and the actual deflections were well within allowable limits.

Core and perimeter wall hybrid structures can be contrasted in a number of ways. For instance, a concrete core is generally stable as well as self-supporting and therefore can be built totally independent of the steel framing that surrounds it. It is not unusual to see a slip-formed or jump-formed core rising well ahead of the steel construction (Erie County Bank, Cleveland Trust, Marriott Hotel). In contrast, a concrete perimeter wall needs the diaphragm action of floors to support it laterally and so cannot be poured more than a few floors ahead of the completion of the interior steel construction. A perimeter bracing system can provide lateral support for building structures up to the 60-story range, but a concrete core generally will not be sufficient as the only lateral force-resisting structure above 35 stories.

Common to all side-by-side concrete-steel hybrids is the potential problem caused by long-term creep and shrinkage of concrete. A concrete column or wall will, over time, shorten as a result of these effects. Since steel columns are not subject to long-term effects, differential shortening between the two must be accounted for in the design. Most often, this is accomplished by compensating for the length differences during construction.

The family of hybrid structures undoubtedly will grow in the future. Already we are witnessing light steel additions proposed above existing concrete buildings. As the pattern of renovation spreads, older inner city structures built for mills or manufacturing that have the capacity to accept added floors with little modification may be developed as hybrid structures.

Finally, a hybrid using a concrete superframe with light steel infill framing has been proposed in concept. The stiffness of the concrete frame provides this structure with its strength, permanence, and resistance to wind. The infill structure permits easy modification to satisfy our need for constant change. □

Controlling Sound Reflections

By Peter D'Antonio

The sound we hear in a room is a combination of the direct sound emitted by a source and the indirect reflections from the walls, ceiling, floor, windows, doors, and objects in the room. These indirect reflections arrive at a given point at discrete times, which are related to their travel paths. The amplitude, arrival time, temporal distribution, and directionality of indirect reflections determine how we perceive the actual sound source. Thus, control of room reflections is a central consideration in architectural acoustic design.

Room reflections can be controlled by the application of surface treatments that absorb, reflect, or diffuse the incident sound. Sound is attenuated by absorption, redirected by reflection, and uniformly distributed by diffusion. Figure 1 illustrates how sound is modified in space and time by these three acoustic surface treatments.

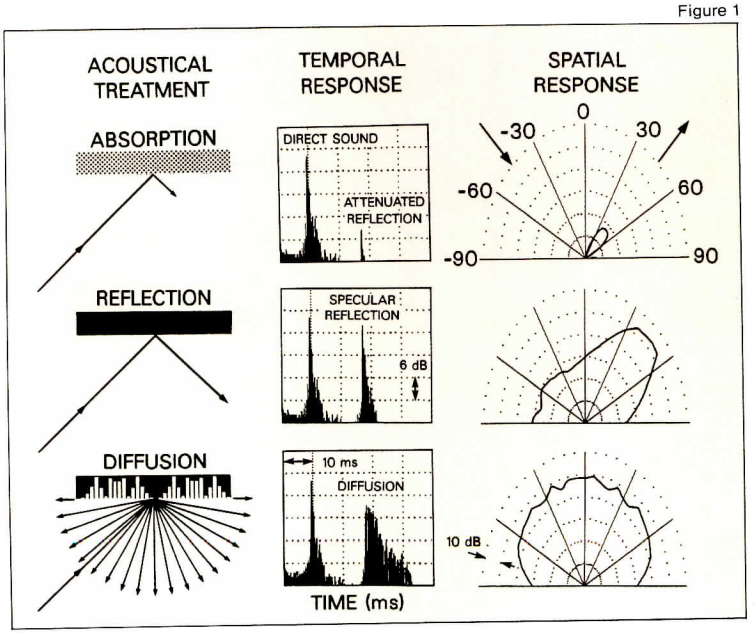
Absorption. Absorption is the most familiar sound-modifying treatment and the one architects most commonly specify. In fact, the term "acoustical material" has almost become synonymous with absorptive ceiling tile, fabric-covered glass fiber or rockwool, foam, bonded wood fibers, etc. Such a heavy reliance on absorption is unfortunate because absorption, while important, is not the only acoustic treatment, and for many applications it is the wrong ingredient.

The efficiency of an absorbing surface is rated by the absorption coefficient, which indicates the percentage of randomly incident sound that is absorbed. An ideal absorbing surface, determined according to ANSI/ASTM standards, has an absorption coefficient of 1.0 for random-incidence sound for all frequencies in the audible spectrum. While these random-incidence absorption coefficients are useful in statistical calculations of reverberation time, a frequency-dependent *directional* coefficient, which indicates the percentage of sound absorbed as a function of the angle of incidence and observation direction, is needed for reflection control. This is indicated in Figure 1 by the small outgoing sound arrow in the upper left diagram and the "attenuated reflection" in the temporal and spatial responses. While there exists an extensive library of random-incidence absorption coefficients, there is a serious void in published directional absorption coefficients.

Effective absorbing surfaces must operate over a wide range of frequencies at all angles of incidence. Practically all commercial porous absorptive treatments are effective above 500 Hz for random incidence. When using such materials, one also should verify the performance below 500 Hz to assure low-frequency absorption. Remember that low-frequency absorption efficiency increases as the depth of the air space behind the porous absorber is increased. If additional low-frequency absorption is required, damped diaphragmatic membrane absorbers, Helmholtz and slot resonators, etc., can be specified to augment porous absorbers.

Reflection. When flat or curved reflective surfaces, which are stiff and massive to prevent diaphragmatic absorption and transmission, are many times greater than the wavelength of the incident sound, interference effects cause the scattered sound to be redirected and reflected like light from a mirror. This mirror-like reflection usually is referred to as a specular reflection, where the angle of incidence equals the angle of reflection. This is illustrated in the middle row of Figure 1 by a longer reflected arrow than in the absorptive case, a "specular reflection" in the temporal response, which is comparable in level to the direct sound, and a spatial response that reveals that reflected sound is oriented in the specular direction (45 degrees).

Figure 1



Absorption, reflection, and diffusion control reflections of sound through different time sequences and spatial distributions.

The geometry of a room's reflective boundaries is important in determining the reverberant characteristics of a space. If a scattering surface is concave, as unfortunately is found in the rear of many churches, auditoriums, and recital halls, the sound actually can be intensified or focused at certain positions in the room. Large concave reflective surfaces should be avoided in architectural acoustic design. Convex surfaces, on the other hand, are beneficial because they distribute or disperse incident sound throughout a room.

Reflecting surfaces within a room also are needed to direct or project sound in a certain direction as well as toward other acoustic surfaces. To provide broad-bandwidth reflection control, reflecting surfaces need to be large and nondiaphragmatic. As the cross-sectional area of a reflecting surface becomes smaller, the minimum frequency at which specular reflection can occur is increased, thus causing the bandwidth of specularly reflected sound to decrease.

Diffusion. Diffusion promotes the uniform spatial distribution of continuous sound, increases uniformity in the growth and decay of transient sound, and improves the "liveness" (ratio of indirectly

Mr. D'Antonio, developer of the reflection-phase grating diffusor, is president of RPG Diffusor Systems Inc., of Largo, Md., an architectural acoustics research and development firm.

The control room of Tele-Image, Dallas, contains rear wall and ceiling diffusors for uniform listening throughout the room.

reflected sound to direct sound) in a room. In performing arts facilities, diffusion tends to enhance the natural qualities of speech and music for both performers and listeners.

A diffuse sound field exists in a room when the sound energy is uniform at all points in the room and there is a high concentration of sound waves propagating in all directions with equal probability. Diffusion of sound is increased by objects within the room, which scatter propagating sound waves, and by sound-diffusing surface irregularities, which scatter sound waves impinging on the room's boundaries. Ideal sound-diffusing surfaces neither absorb nor reflect sound, but rather scatter it in many directions instead of just the specular direction. When the directional distribution of scattered sound is uniform and doesn't depend on the direction of incident sound, the sound is totally diffuse. The range of frequencies over which a surface is totally diffuse and the temporal distribution of scattered sound also are critical.

An analogy to light is useful in explaining diffusion. The glare from an intense light source can be minimized by covering the light with frosted glass, which distributes the light arriving from all directions into many directions, thus minimizing the intensity in any one direction. In acoustics, we usually are concerned with back-scattering from a surface treatment as opposed to transmission, and so the concept of a frosted mirror is more appropriate.

Acoustic diffusion occurs when the sizes of the surface variations are comparable to the wavelength of the incident sound. There are many types of conventional diffusive surfaces. Imagine, if you will, the intricate interiors of a cathedral or "Old World" concert hall. These spaces usually are appointed with statuary, parapets, balustrades, coffered ceilings, loges, balconies, fluted columns, chandeliers, pilasters, and other forms of relief ornamentation. Curved surfaces, polycylindrical columns, and irregular geometrical shapes might be used as well.

Limited bandwidth diffusion also can be achieved from walls that do not have surface irregularity but instead have nonuniform impedance. This can be accomplished at high-to-medium frequencies by an irregular distribution of sound-absorbing surfaces and at low frequencies by diaphragmatic or resonating panels.

To evaluate sound-diffusing surfaces, one considers the uniformity of diffused sound throughout a space (its spatial response), the bandwidth (range of frequencies over which the spatial response is uniform), the randomness and density of any irregularly spaced frequency domain notches (the frequency response), and the density and breadth of the temporal response of those frequency domain notches.

Statuary, for example, scatters primarily high frequencies effectively over a limited angular range of scattering directions, with a limited temporal distribution. Thus, statuary presents a beautiful but limited diffusing surface, at substantial cost. To achieve beneficial results, then, individual scattering elements such as statuary must be constructively configured.

Curved surfaces with diameters greater than a half-wavelength provide good sound dispersion over a particular frequency range for normal incidence. Groups of cylindrical columns of varying diameters—customarily called polycylindrical columns—have been used as a way of extending the bandwidth. In practice, however, this is difficult to accomplish, and generally only a few sizes are used; this limits the bandwidth, results in frequency "coloration," and limits the density of the temporal response.

Monocylindrical and polycylindrical columns can be described as partially diffusive because their spatial response depends on the angle of incidence. At glancing incidence, monocylinders tend to scatter sound back in the incident direction and polycylinders tend toward specularity. A graph of the frequency response of partially diffusive surfaces is characterized by regularly spaced "comb filter" notches as opposed to the dense distribution of irregularly spaced frequency notches characteristic of totally diffuse reflections.

Despite the usefulness of all these forms of partially diffuse relief ornamentation, experimental measurements reveal limitations in either the uniformity of the spatial response, the degree of independence from the direction of incident sound, the diffusion bandwidth, the temporal density, or the frequency response. Intricate and esthetic sound-diffusing surfaces, furthermore, are no longer the norm in performing arts facilities and auditoriums. Due to rising building costs and increased seating requirements, flat plaster, concrete, drywall, and cinder block surfaces have become all too commonplace. The result is poor acoustics and an ineffective venue. This presumed economy often leads to expensive acoustic renovation and/or expensive special-purpose sound systems that are called upon to provide an electronic solution for an acoustic problem.

It is reasonable, therefore, to wonder whether there is an optimum diffusive surface with predictable and calculable results. The answer is yes—the reflection phase grating (RPG). The secret behind its unique properties lies in number theory, the paradigm of pure mathematics. The RPG is the acoustic analog of the optical diffraction grating, which has played a central role in optics for more than 100 years. A diffusive surface treatment of this type was not used in architectural acoustics prior to the discovery by Manfred R. Schroeder linking number theory with diffusion and the development of the RPG diffusor system.

The one-dimensional RPG, pictured above left, is a modular computer-designed phase grating, consisting of a periodic grouping of an array of wells of equal width but varying depths and separated by thin dividers. The depths are related to

View through a custom optical plexiglass diffusor into the control room of the Blue Jay Studios in Carlisle, Mass.

quadratic-residue number-theory sequences discovered by Karl Friederich Gauss in the 18th century. (The proprietary name for diffusors of this design is QRD.) The quadratic-residue sequences are based on prime numbers. We can use the prime number 7 as an example. The sequence values are the remainders, or "residues," after the integers 1 through 7 are first squared and then divided by 7. For the prime number 7, the sequence values are 1, 4, 2, 2, 4, 1, 0. For example, to determine the fifth element in the sequence, take the square 5, which is 25, divide by 7, and determine the remainder—7 goes into 25 three times with a remainder of 4. The fifth sequence value, then, is 4.

These sequences are periodic; this, in our example, results in the eighth sequence value being the same as the first. Thus, for integers larger than 7, the sequence simply repeats. As the prime number increases, the diffusion increases but the ratio of the prime to the highest sequence value approaches unity, therefore reducing low-frequency efficiency. Recently, optimized QRD sequences have been devised that maximize low-frequency efficiency for a given depth for any prime. The actual well depths are determined by multiplying the sequence values by the longest wavelength for which the diffusor is designed to scatter efficiently and dividing by 2 the odd prime chosen.

The minimum frequency of the diffusive bandwidth for a QRD is directly proportional to the maximum well depth, and the upper frequency is directly proportional to the number of wells, N, and inversely proportional to the well width, w. To realize the periodic nature of these sequences in practice and to afford ease of installation, the QRDs are constructed in standard modular 2x2-foot, 2x4-foot, and 4x4-foot repeat units and contiguously clustered as a wallpaper pattern. The uniformity of spatial diffusion is directly proportional to the length of a repeat unit, Nw. Thus, a good broad-bandwidth, wide-angle diffusor requires a large period, with a large number of deep and narrow wells.

The schematic in the bottom row of Figure 1 illustrates how incoming sound is uniformly backscattered into many directions. The temporal response illustrates how the depth variations of the QRD provide attenuated dense diffuse reflections over an appreciable time period compared with the direct sound, and the spatial response illustrates the wide-angle scattering pattern or polar distribution. To demonstrate the broad range of frequencies for which the QRD is effective and the independence of the angle of incidence, Figure 1 shows a comparison of the octave-averaged spatial response between a commercial QRD and a flat specular panel of equal area for various octave-band center frequencies at zero-degree and 45-degree angles of incidence. It is apparent that the QRD provides uniform spatial diffusion over a broad range of frequencies for normal (zero-degree) and glancing (45-degree) angles of incidence, in contrast to the flat panel, which behaves specularly. Our research has indicated that a practical fabrication limit consists of a diffusor with 43 wells (N=43), one inch in width with a maximum depth of 16 inches.

These diffusors span over five musical octaves and form the basis of a new generation of recording and broadcasting studios. Beneficial psychoacoustic designs that couple specular and diffusive surfaces also have been developed with diffusors exhibiting even smaller bandwidths and lower costs.

Sound waves, like other waves, including light, can cancel (destructive interference) or reinforce (constructive interference) each other. The resulting interference is determined by the relative phase of the interfering waves, that is, the relationship between the crest of one wave with respect to another. When two sound waves of equal amplitude and frequency interfere, we get cancellation if one wave lags another by $\lambda/2, 3\lambda/2, \lambda/2$, etc., and reinforcement when the phase difference is $0, \lambda, 2\lambda$, etc. Thus in wave interference, it is not the path length difference that determines the interference pattern, but the path length difference divided by the wavelength or residue. The reason number theory is so applicable to sound diffusion is that the residues of modular arithmetic can be used to model the way sound waves interfere. As noted above, in modular arithmetic what is important is not the quotient itself but the remainder after dividing by the modulus, which is an odd prime number.

Thus, if we could determine a way to introduce surface irregularity in a predictable way to modify the phases of the scattered waves appropriately, we could control the way this scattered sound is distributed. When sound is reflected from a flat surface many times its wavelength, the scattered energy is directed primarily in the specular direction, because the wavelets in nonspecular directions are cancelled due to destructive interference. When a surface is configured to have wells or troughs whose depths are determined by a quadratic residue sequence, these depths provide appropriate phase shifts to allow constructive interference to occur in all of the diffraction directions. Thus, the sound that was concentrated in only one specular direction is now uniformly distributed in many directions.

Effective architectural acoustic designs require an appropriate combination of absorptive, reflective, and diffusive surfaces. The specific mix depends on the type of environment desired and whether the objective is noise control, where the goal is to remove or contain unwanted sounds, or sound control, where the goal is to optimize the room acoustics to enhance the perception of music or speech. In noise control applications such as offices, computer rooms, machinery rooms, natatoriums, gymnasiums, etc., absorption is the most effective ingredient. In sound control applications, such as performing arts facilities, auditoriums, lecture halls, and worship spaces, diffusion and reflection are of primary importance and absorption plays a minor role. In critical listening spaces, such as recording/broadcast studios, A/V presentation rooms, conference/teleconference rooms, and listening rooms, absorption, reflection, and diffusion are equally important.

One should understand the distinction between statistical and strategic application of acoustic materials. Statistical application is reserved principally for absorptive materials to introduce a sufficient number of sabins to lower the reverberation time in a room (one sabin is equivalent to the absorption by one square foot of a perfect absorber). This means covering a certain percentage of interior surfaces with absorptive material. When reflection control is desired, as in minimizing a troublesome echo that is corrupting speech intelligibility and sound quality, strategic application of absorptive, reflective, and diffusive surfaces is warranted. Therefore, in reflection control we have to address the question of where, as well as how much. Sound-modifying surfaces are most effectively placed at the specular reflection positions and the amount of surface area treated should be comparable to the longest wavelength of interest.

The uses of absorption and reflection are fairly straightforward, but there is some confusion about diffusion. Diffusive surfaces are equally important in large and small rooms, to manipulate both early (less than 0.10 second) and late (greater than 0.10 second) reflections. In sufficiently large rooms with appropriate dimensional ratios, the reflective boundary surfaces are capable of generating a diffuse reverberant sound field. In problematic cases where the reverberant field contains intense isolated specular reflections that corrupt intelligibility and sound quality, diffusors can be used to disperse these reflections without significant absorption. Diffusion also is effective in controlling early reflections, in some applications traditionally reserved for absorption, especially when there is a desire simultaneously to maintain the natural ambience of the space.

In large rooms, diffusive surfaces can be used: on flat or focusing reflective rear walls and balcony fronts to disperse intense isolated reflections, which cause intelligibility loss and confusion; in acoustic shells to provide beneficial early diffuse ensemble reflections for performing musicians, enabling them to hear themselves as well as other musicians; on lower side walls to provide diffuse lateral reflections, which increase the sense of spaciousness and envelopment for the audience; on low ceilings to reduce the energy of binaurally similar reflections and distribute this energy laterally; as hanging ceiling clouds to introduce early diffuse reflections in high-ceiling rooms; and in combination with specular surfaces to improve sound coverage by uniform spatial distribution of backscattered sound. Thus diffusive surfaces can be used as a corrective measure in renovation or as an integral design ingredient.

In small rooms the temporal distribution of reflected sound is sparse due to the limited number of travel paths and so prohibits the formation of a diffuse sound field. Since the walls are relatively close, strong primary reflections, which are comparable in intensity to the direct sound, dominate the early reflection pattern. As in large rooms, diffusive surfaces are used for nonabsorptive reflection control of primary as well as late reflections to generate a dense diffuse sound field. Much progress has been made in the last five years in developing designs incorporating absorptive, reflective, and diffusive surfaces that create the psychoacoustical impression of a large space in a physically small room.

Since the QRD has filled a void, it is quickly finding application in all critical listening and performing environments. The RPG was developed initially at Underground Sound Recording Studio in Largo, Md., to improve the acoustics of recording control rooms and to implement a design approach called LEDE, introduced by Don Davis of Synergetic Audio Concepts. The first commercial application of the RPG was at the Oak Ridge Boys' studio in 1984 by Todrank & Associates, Nashville, Tenn.

One of the early pioneers in the use of the RPG diffusor system in the recording and broadcast industry is Russell E. Berger, vice president of the acoustic consulting firm The Joiner-Rose Group of Dallas. "Of the three ingredients from which we can choose, absorption is the most overused and diffusion the least understood," Berger says. "Diffusion often can provide the desired effects of absorption without extracting all the life and air out of a space. An optimum method to provide ambience and control reflections is the use of RPGs." □

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Processes for Delivering Projects to Clients

By Peter Piven, FAIA

The project process is the most important aspect of a firm's design technology. How a firm delivers projects to its clients and the process the firm puts in place to execute projects affect every area of its practice—products, personnel, marketing, finances, etc. There are several aspects to the process: team organization; project schedule and deliverables; staff roles and responsibilities; and individual accountability for decisions.

There is no "right" way to organize and schedule projects, nor is there one "right" way to assign responsibility or accountability. Rather, a wide variety of opportunities allow consideration and application of many variables, including project location and scope, project schedule and compensation, and staff ability and availability.

The trick is to consider each project situation as unique within the context of a process that is flexible enough to be applied differently to different project situations. What is important is to determine individual solutions for individual project situations, within a project *process* that is consistent for the firm as a whole and consistent with its goals.

A prototype process

Step 1. Identify the firm's project delivery unit—individual, project team, studio, department, or combination. Each firm will have established its preferred method of organizing personnel to deliver projects to clients. Figure 1 indicates six common project organization structures. Each accomplishes the design, managerial, and technological aspects of achieving projects in different ways that accord with the firm owners' preferences. In each, the involvement of the partner in charge can vary depending on the client, the project, and the size and capability of the firm.

In a principal-led team, the principal maintains overall authority for project implementation. Little essential responsibility or authority is delegated to key staff members below the principal level; rather, the principal retains responsibility for actively running the project on a day-to-day basis. In the following project structures, essential project responsibilities are delegated to key people, usually below the principal level, with the principal generally retaining overall project supervisory responsibility.

An architect-led team places authority in the hands of one person who has overall project responsibility and is expected to make both design and management decisions.

A designer-led team structure places prime responsibility and authority in the hands of a designer, who has a subordinate manager or subsumes those management functions.

In a manager-led team, prime project responsibility and authority are placed in the hands of a manager, who usually has a subordinate designer as a part of the project team.

A co-equal designer and manager team has managerial and design responsibilities assigned to two persons (a project manager and a project designer, for example) who have equal authority but different responsibilities.

Manager-led departments, which concentrate on specific aspects of the work, such as design and production, often are established by firms seeking to maximize design and technical efficiency. A project manager (or partner in charge) represents the client's and the firm's overall interests and shepherds the project through the firm's system. Often responsibilities are shared, with the manager responsible for the program and schedule and department heads responsible for design and technical quality.

Pitfalls do exist within each prototypical project structure. Principals who elect to retain day-to-day project responsibility automatically limit their own availability to assume other important responsibilities in the firm; they also limit the number (and perhaps size and complexity) of projects the firm is capable of accepting. And the growth potential of younger professionals in the firm is limited because there are no supervisory project positions into which younger professionals can grow.

Firms that choose to organize projects in architect-led teams often do so to increase the principal's span of control while keeping a generalist (sometimes the principal's alter ego) at the project helm. As the workload grows, these project architects—sometimes called project directors or architects in charge—can find themselves more and more deluged with managerial and administrative tasks and less and less involved in the actual design and technological development of projects—which was probably the reason they and the firm elected such an organization in the first place.

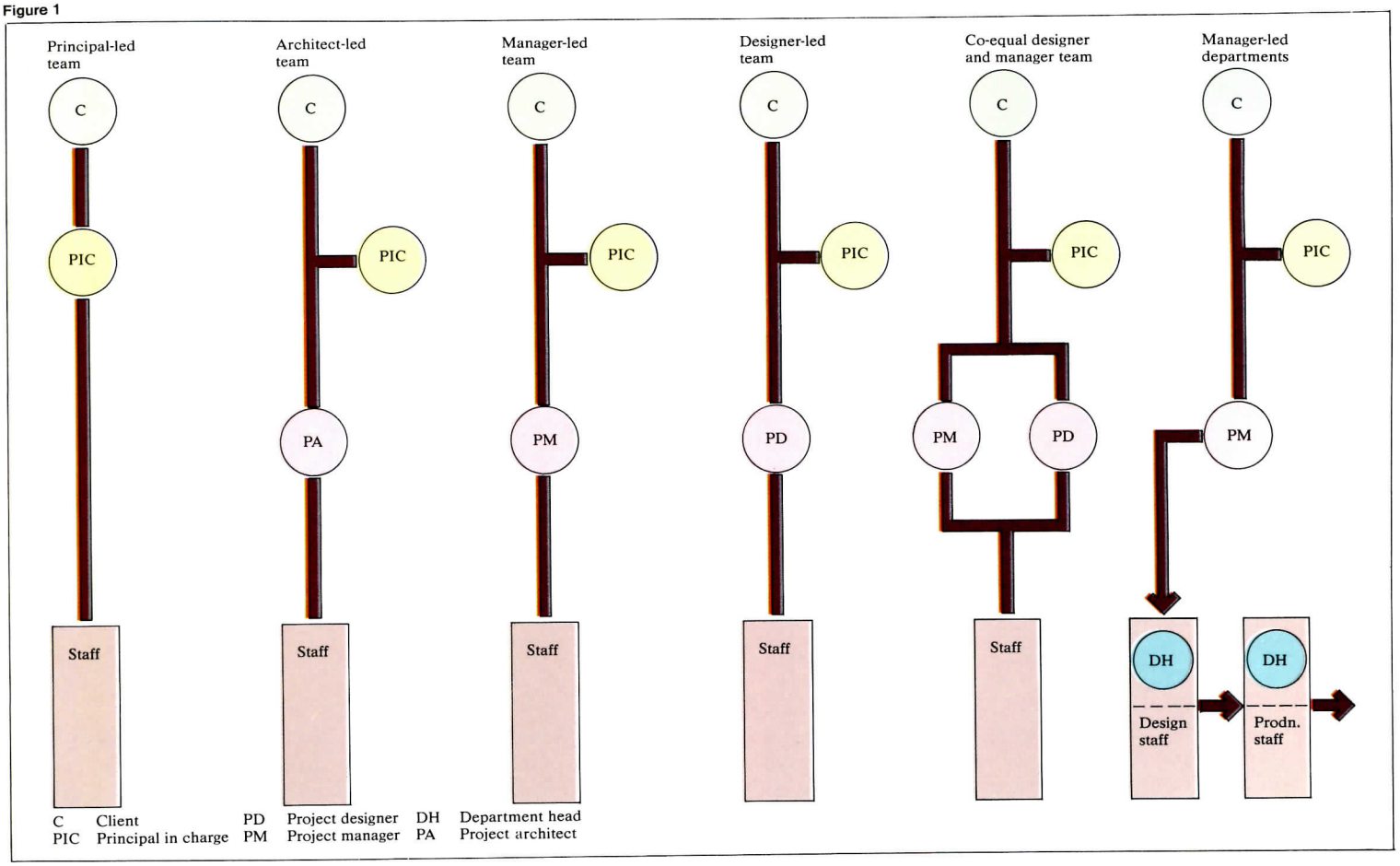
Firms interested in the primacy of design often will want a designer to lead the team. A dilemma then arises. The designers may find themselves unwilling, and sometimes unable, to deal with expanding managerial and technical project needs. On the other hand, if they accommodate and assimilate those responsibilities, they are less available to address design issues on the initial project to which they were assigned or on others that come along.

Emphasis on their own and clients' management needs (such as budgets, schedules, and approval procedures) leads to manager-led teams. The danger here is in managers who fail to recognize and/or are unable to represent the level of design and achievement desired by the firm. It also helps immensely for the manager to have not only basic architectural experience and cognitive managerial skills (planning, scheduling, budgeting) but also the interpersonal skills so important to effective management—communication, negotiation, delegation, and team-building.

The co-equal designer and manager team would appear to solve all the problems. However, it requires projects and orga-

Mr. Piven is a principal consultant of the Coxe Group, a Philadelphia consulting group specializing exclusively in the management of professional design firms. He is a co-author of Success Strategies for Design Professionals *(McGraw-Hill, 1987).*

Figure 1



nization sufficiently large to accommodate double-heading at the top, clearly defined extents and limits of responsibility, and a solid working relationship.

Departments achieve efficiency by focusing personal effort and energy on narrower tasks, often sacrificing broader understanding and continuity of decision making. Also, the apparent conflict between the project manager's responsibility for the "what" (program) and the "when" (schedule) and the department head's responsibility for the "who" (staff) and the "how" (design and technical procedures and quality) must be understood clearly.

Each firm must choose an organizational structure that meets its needs. Strong idea firms ordinarily will be most effective with single-point leadership—an architect or designer with responsibility for all aspects of the project. Strong service firms will be most effective using departments.

Step 2. Prepare a project process diagram (see Figure 2) showing the percentage of time expended by role and by phase. Identify the deliverables provided and indicate the level of project profitability. From its historical project data, the firm will be able to identify the amount and percentage of time spent on particular projects, on "typical" projects, and on all projects taken together. Going further, the firm will be able to identify how that time was expended on a task-by-task basis in each phase.

From this information, it will be possible to prepare a pro forma project process diagram, which then can be adjusted on a project-by-project basis to reflect the conditions of a particular project.

For example, one firm's experience shows that it expends 10 percent of total project time in schematic design. It allocates 40 percent of that time to a project manager, 40 percent to a project designer, and 20 percent to an assistant designer or drafter.

	Phases						
	Predesign	*Schematic Design*	*Design Development*	*Construction Documents*	*Bid Negotiation*	*Construction*	Post-construction
Percent of Total	%	%	%	%	%	%	%
Deliverables							
Roles							
Principal in Charge	%	%	%	%	%	%	%
Project Manager	%	%	%	%	%	%	%
Project Designer	%	%	%	%	%	%	%
Job Captain	%	%	%	%	%	%	%
Specification Writer	%	%	%	%	%	%	%
Construction Admin.	%	%	%	%	%	%	%
Staff	%	%	%	%	%	%	%
Admin./Clerical	%	%	%	%	%	%	%
	100%	100%	100%	100%	100%	100%	100%

Figure 2

It usually delivers a schematic design package of a site plan, ground floor plan, typical floor plan (if any), sketch elevations, and a three-dimensional representation of some kind.

In comparing the firm's usual experience to a new project, it became clear that the review and approval requirements of the new project likely would require an unusually high level of managerial effort to successfully shepherd the project through to completion and acceptance by the owner. At the same time, the project was deemed to require at least twice as much design effort as the firm's norm. In this case, early identification of these problems enabled the firm to both schedule and prepare interim presentations to serve multiple purposes, and to isolate certain aspects of the (agency) review process as additional services.

Figure 3

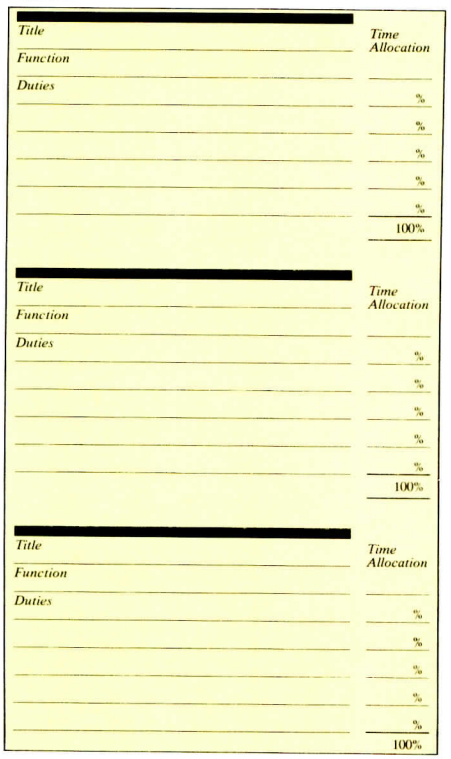


Figure 4

● Primary Responsibility ◐ Secondary Responsibility ○ Contribution/Participation	Responsibility							
	PIC	*PM*	*PD*	*JC*	*Dept Head*	*Spec Writer*	*CA*	*Other*
Fee Determination								
Contract Negotiation								
Consultant Selection								
Staff Identification								
Client Need Determination								
Personnel Assignments								
Program Preparation								
Conceptual Design								
Schematic Design								
Design Documentation								
Technical Decisions								
Document Format & Organization								
Specifications								
Quality Assurance								
Construction Changes								
Monitoring Team Progress								
Invoice Preparation								
Accounts Receivable Collection								
Other								

Step 3. Define the various functions and duties each project person performs and the percentage of that person's time to be expended in that role. Generally, people in a firm, especially those at higher levels, do more than one type of task. A partner or a principal might have responsibilities in management and administration, project management or design, marketing or public relations, personnel management, and a host of other areas. A project manager might have responsibilities for particular projects and exercise project quality assurance/quality control responsibilities and certain staff coordination and assignment responsibilities as well.

Using the project role descriptions form (see Figure 3), list the various responsibilities executed by each person and the percentage of time to be expended in each aspect of his or her role. This will create an array of each (and therefore every) person's productive time, leading to identification not only of cognitive planning but also of total staffing availability and utilization.

For example, John Doe, a partner in the firm, might spend 30 percent of his time marketing, 50 percent with clients as partner in charge, and 10 percent on paid time off (vacation, holiday, sick leave, etc.) Jane Smith, a staff-level project manager, might spend 74 percent of her time on active project management, 5 percent on marketing assistance, 8 percent on firmwide quality assurance matters, 3 percent on professional activities, and 10 percent on paid time off categories. The application of Jane Smith's available time to a particular new project might reveal that the project would receive sufficient managerial attention only if she could be assigned to the project full-time. Unfortunately, Ms. Smith has other projects that require her attention. For this project, the firm will need to consider alternative solutions, perhaps extending the project schedule, requiring overtime effort, or temporarily extending Mr. Doe's responsibilities.

Step 4. Assign ultimate responsibility for decision making (see Figure 4). Unless it is absolutely clear where and how the firm wants decisions to be made, they will be made ad hoc, according to status rather than responsibility, by default, or perhaps not at all. Also, regardless of the specific project delivery system and structure put in place by the firm, the system and structure will vary with the people assigned to the project. No two people will act precisely the same way in the same situation; each will perform pursuant to particular individual experiences and personalities. A rigid, unalterable system applied uniformly is doomed to failure, as no two people will be able to fulfill the requirements of the system in the same way. It is preferable to be flexible, modifying and manipulating the system to reflect the individual capabilities of the people responsible for implementing it.

One way is to have those key project people negotiate essential responsibilities among themselves. Not only will all responsibilities be accounted for but individual responsibilities will be clearer, more readily accepted, more likely to be performed, and more likely to be performed well.

For example, for the project mentioned above, the project manager may be unusually adept at keeping on top of collections, even though it is the firm's usual policy to place that responsibility with the partner in charge. If the project manager and the partner in charge can negotiate the responsibility for collections on this project, the firm may benefit not only by more timely collections but also by having the task performed at a lower level.

The effective result is a process that establishes project-specific decisions based on the firm's own goals, history, procedures, and personnel; project delivery unit organization and structure; project schedule and deliverables; personnel roles, responsibilities, and time allocations; and individual and collective accountability for decisions.

The process and forms encourage individual project planning based on particular project needs. There is no need to replicate specifics from project to project. Rather, once the firm has established its overall goals and project goals and has selected a project structure based on those goals, projects can be planned and then monitored according to their unique characteristics and those of the firm's key people. □

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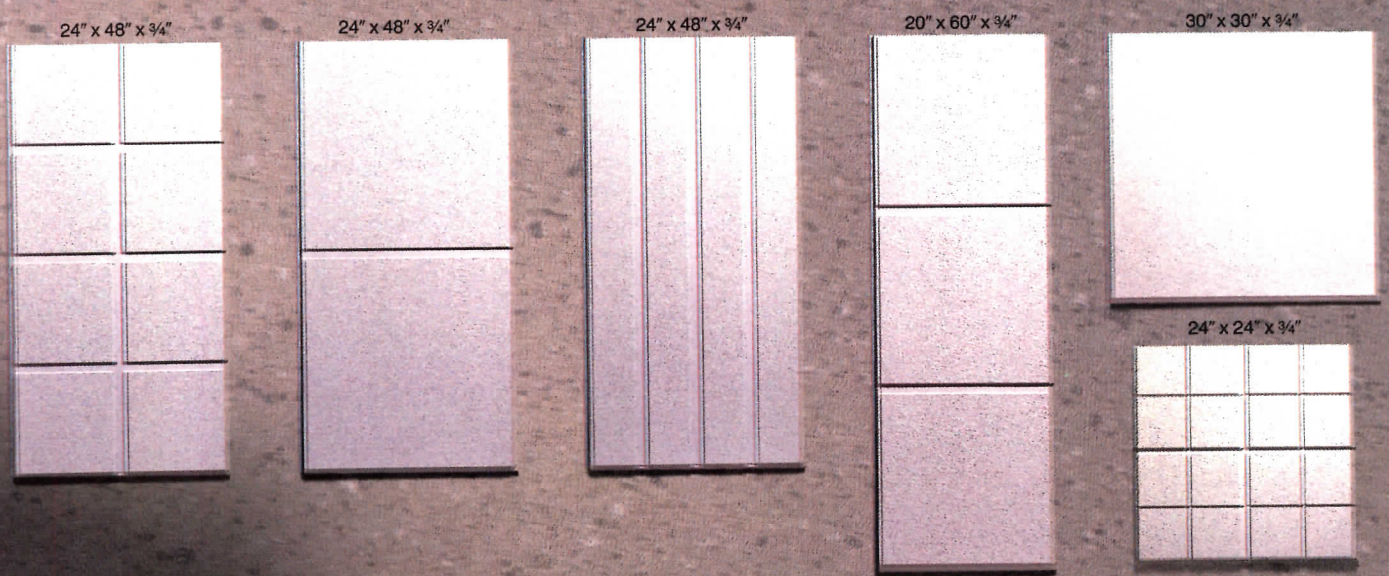

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Computerizing Behavioral Design

In a small Texas practice. By Clovis Heimsath, FAIA, and Ben Heimsath

Let's start with the premise that has been a guiding principle for our firm since its inception in 1963: human behavior is somewhat predictable, and that predictability can be used as a design element to create livable architecture more closely suited to its users. This isn't to say humans are predictable in the way an automaton might be, but people are creatures of habit. We feel intensely that architects too often have disregarded the user, and the public record of design miscalculations backs up our feelings. Behavioral architecture seeks to enhance choice, not control it.

Over the past 25 years, the works of Robert Summer, Edward T. Hall, Christopher Alexander, and many others have given form to and have bolstered the usefulness of behavioral studies. But we have encountered a problem in using this philosophy in our day-to-day practice, partly because it tends to conflict with primary goals of nonarchitect members of the building team. For example, trying to argue a behavioral point of view armed only with plans and elevations can be frustrating because many clients simply don't understand them. Hand-drawn perspective renderings are more effective because they present information in three dimensions, but they are time-consuming and generally considered to be displays of subjectivity.

Over the past several years, we have incorporated into our practice three-dimensional CADD graphics, a tool with the speed, clarity, and perceived objectivity to carry the day with users and clients both. Combining behavioral architecture with 3D CADD yields a design strategy we have just begun to pursue, which we call "user graphics."

Our eight-person, family-owned firm delved into personal computers for word processing about six years ago. Then we discovered 3D wire-frame programs that have become integral to our practice. Three-dimensional design comes together in the same way we conceive of space. It allows you to put down a plan, place yourself, and then actually construct the lines as you see it in perspective. We really are quite emphatic that 3D is much more than a presentation tool for the client. Taking three-dimensional graphics from the static state of renderings to time-dependent activity analysis, the concept we call user graphics, is now our goal.

To date, design decisions have concentrated on the fixed dimensions of buildings, not on the variable dimensions of time and movement of people and objects. When you look at people and objects, movement and time, you must forgo precision and rely instead on probability. User graphics helps to quantify what until now has been an intuitive, qualitative process. Although its potential is unlimited—and the need is immediate—the concept still is in only the most rudimentary stages of development.

A security evaluation of an embassy building we performed for the U.S. State Department is an example of the value of visually simulating behavior within a building. In this example, we have identified five user groups: foreign service officers (FSOs—Americans working in the embassy), foreign service nationals (FSNs—non-Americans working in the embassy), Marine guards, visitors who are American (travelers abroad, expatriates, and visiting dignitaries), and visitors who are not American (immigration applicants, visa applicants, office visitors, visiting dignitaries, and U.S. beneficiaries).

An early task is to differentiate the service users from the served users and establish the needs, concerns, and patterns of each. Individuals with a similar reason for being in a building have similar expectations. For example, within the embassy compound, the distinction between Americans and non-Americans is necessary only for issues of specific area access. American visitors are indistinguishable from non-American visitors, and, for most worker categories, the FSN and FSO work as a team. (There certainly are more complex service/served relationships within these five primary distinctions. For instance, the FSN may be in a served role for his or her boss, the FSO. But to understand the user dynamics and expectations, the primary distinction is the critical one.)

The next step is to define "user episodes." This involves following each prototypical user through a defined series of typical events (episodes). This allows us to see the building in terms of people, rather than as a brick and mortar series of voids and solids.

On entering the embassy, a user may go through as many as five distinct episodes: (1) determining place image, (2) confirming place, (3) transition, (4) acknowledgement, and (5) interaction. If the visitor is to be escorted, he or she must add two steps after acknowledgement: (4b) wait and (4c) be escorted. In leaving, the visitor must go through the steps in reverse order.

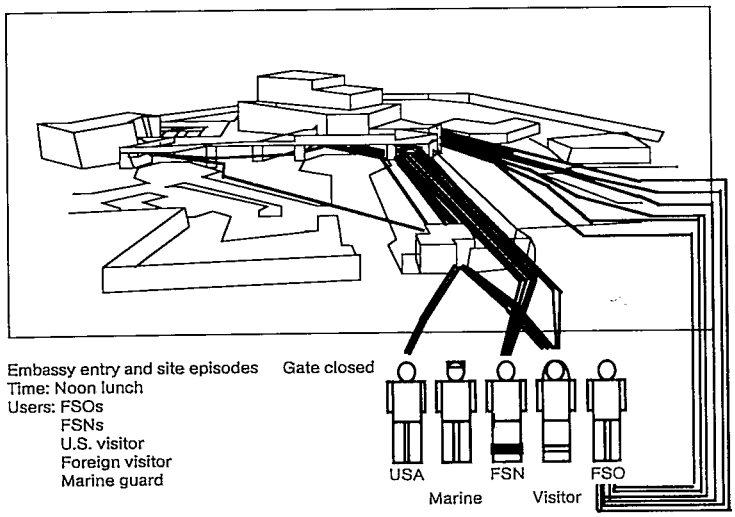
For example, the visitor arrives at the embassy at the main gate, passes through a security check, proceeds down an open walk to the chancery (confirming place), enters the lobby (transition), checks with the receptionist and the Marine guard (acknowledgement), then enters the consular area (interaction).

In a similar way, and perhaps at the same time, the Marine guard moves through a series of episodes in reporting for duty. He will leave the barracks, cross the service lane, enter the chancery through the service entrance, check with his duty officer, and report to his guard post. We can define these episodes, place them in the embassy compound, and with some accuracy determine the time of the events.

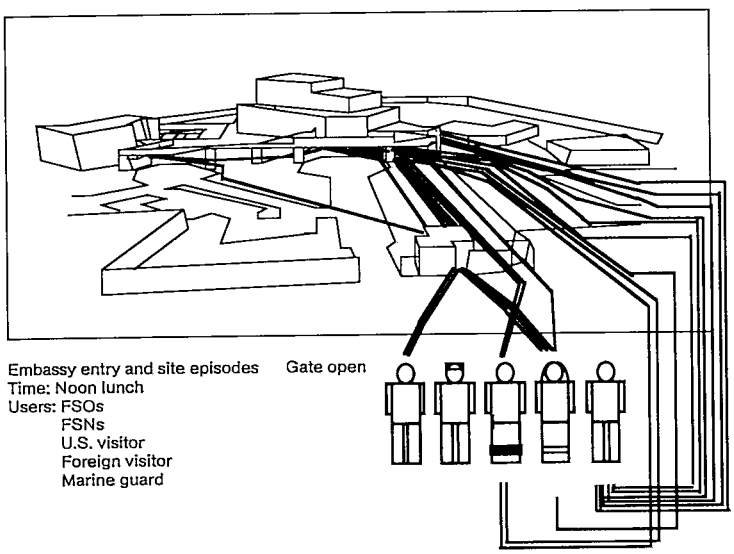
We linked together episodes for each user. The collection of repetitive episodes is the user sequence. When user sequences occur over predictable intervals, the event is a user pattern. User patterns allow for definitive statements about the normal life of a building. Once they are determined, patterns can be represented graphically.

Clovis Heimsath is a principal of Clovis Heimsath Architects in Austin, Tex., and author of Behavioral Architecture: Toward an Accountable Design Process *(McGraw-Hill, 1977). Ben Heimsath, his son, is a recent graduate of the Harvard graduate school of design and now practices in the firm.*

Opposite page, a 'user graphics' analysis of a U.S. embassy design. The top two drawings show simultaneous entry sequences (gate open and closed) for the five categories of users. Drawing at bottom left indicates ambiguity and cross-circulation patterns in the lobby; bottom right, the redesigned lobby.



Embassy entry and site episodes Gate closed
Time: Noon lunch
Users: FSOs
FSNs
U.S. visitor
Foreign visitor
Marine guard



Embassy entry and site episodes Gate open
Time: Noon lunch
Users: FSOs
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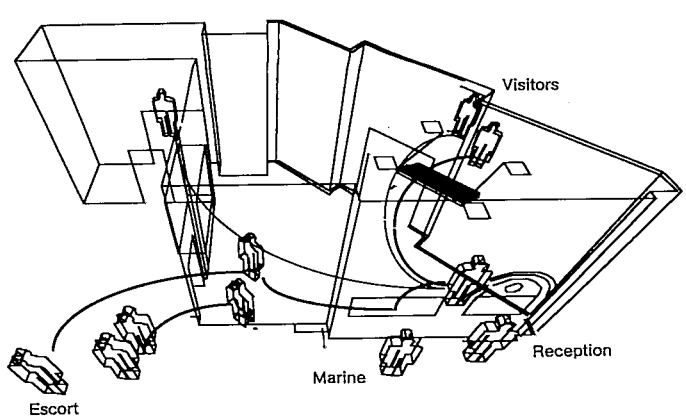
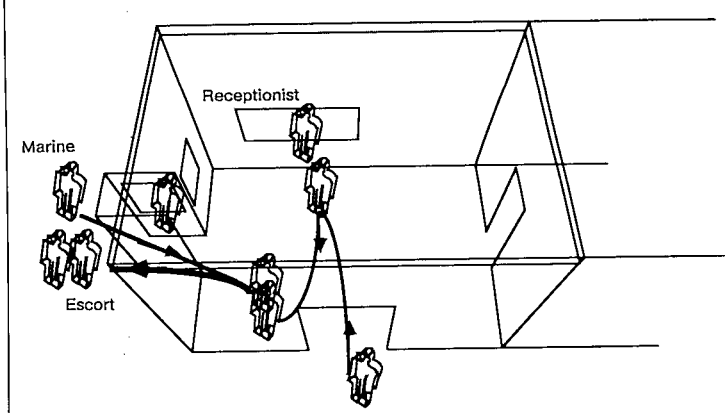
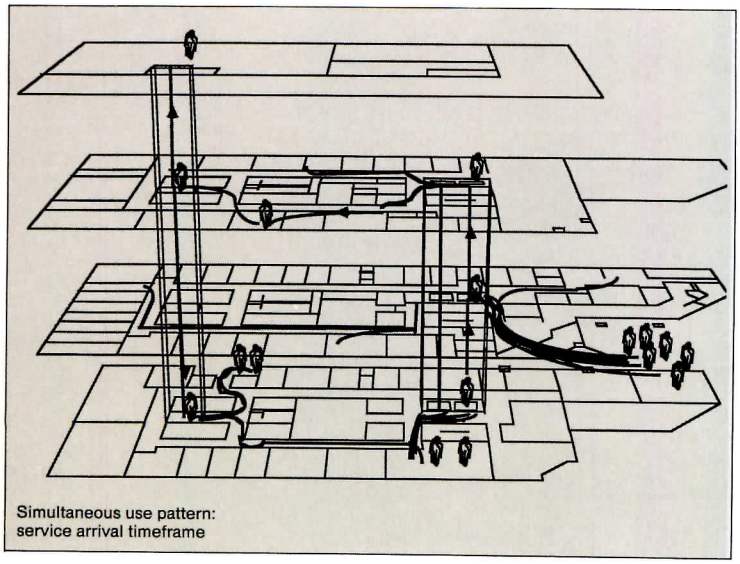
U.S. visitor
Foreign visitor
Marine guard



Existing lobby



Alternative user/building fit improves escort security



Using 3D graphics, simultaneous use patterns also can map out the vertical travel paths of the various building users.

Patterns contain elements of time. It may take 15 minutes for a visitor to enter, clear the security points, walk to the chancery, and enter the consular area. This pattern may be allowed only during certain times of day. With the time element, we know who is doing what in a given area of the building at a given time, and, more importantly, how those patterns interact.

Evaluation of "simultaneous use"—the many user patterns that occur in a building at the same time—makes the building come alive and points up time frames that might not otherwise be considered (after-hours maintenance, for example, or off-duty staff still within the embassy complex). Conventional work hours take up only a third of the entire day. As one specific case, the activities of the Marine guards, who live at the embassy, must be designated between work and leisure patterns.

It is the visual presentation of user patterns, shown simultaneously courtesy of the 3D wire-frame program, that drives home the importance of plotting movement patterns. The example shown is an ambiguous lobby design, which permits undesirable cross patterns of circulation. The space is serviced by three service personnel: a receptionist at the far left, a Marine guard next to the receptionist, and a disbursement officer at the far point of the entry lobby. Upon entry, a served user checks in with the receptionist, is acknowledged by the Marine guard, and then either moves to the right of the room to enter the consular section or waits to be escorted to other areas of the embassy.

The ambiguity begins with the placement of the receptionist, who conventionally is directly on line with the entrance. The various users entering the lobby have significantly different needs. The ambiguities concern the movements of different kinds of users. A visa applicant will check in with the receptionist and cross the lobby to the right. Those using other parts of the lobby will wait to be escorted. If the Marine guard is placed to check on those passing into the main part of the chancery, the user diagram shows that he cannot see the door from his vantage point. And those passing through the entry do not cross to right and left except at oblique angles.

An alternate, rectangular lobby designed to clear up these ambiguities places the receptionist directly ahead of the entering user. Note that in this configuration the hall is opened up to the entry to the left for clear circulation. This in turn makes it possible to place the Marine at a corner window, giving him real supervision of the entry access.

This exercise was repeated with other circulation areas of the embassy, including the vertical patterns as shown. Once user patterns are established, we define user criteria. We state all criteria in performance terms rather than prescriptive terms. While it is a goal that passages be both adequate and appropriate, it is not proposed that minimum widths of hallways be specified. Instead, we present user formats in visual form to demonstrate the adequacy and appropriateness of the passage.

Development of user graphics

The next step for user graphics is to commit to expert-system software the information on movement that we already have. Applying the laws of probability, computer scientists can take complicated movement patterns of various objects and people and establish the probability of where they will go under what circumstances. To establish probabilities such as these will require extensive research and observation, in which postoccupancy feedback plays an integral part.

The resulting tool will be the antithesis of the traditional behavioral matrix. Matrices are frozen, and they lead to conclusions of minimal error. User graphics, through artificial intelligence, purports that if you're going to simulate the brain you've got to have fuzzy logic that gives you a series of options rather than a precise path to a solution. The user graphics approach employs the speed of computers to simulate these many nuances and to generate options of maximum flexibility. Also, it is fortuitous that behavioral patterns are influenced by a number of repetitive items—motivations and expectations of the individual, physical constraints, positive and negative symbols, and house rules—and computers are particularly good with repetitive items.

With the computer, you can make sense of conceptually difficult considerations, such as double tracking (parallel courses for individuals so they are separate from each other during daily activities—doctors from waiting patients, and judges from the public, for example), service/served episodes, and multiple-use patterns, which have to be considered simultaneously before you can plan building function. All of these concepts then will bring the next level of use dynamics to the fore.

Our immediate goal in the integral process of developing user graphics is refinement of a commercial service or product focusing on user graphics. We are putting together a new company within our architecture firm that will focus on user graphics development. It includes a physicist/programmer who has worked at the University of Texas. Architects as creators need evaluative tools to solve long-standing fundamental problems of user/building fit. User graphics is not a substitute for architectural expertise, but a tool for expanding problem-solving abilities.

One of our computer consultants even did us one better on possible computer pursuits. He wants to work with the dynamics of an individual group, devise an expert system to simulate the group interactions in three dimensions independent of a building, and then bring those activity patterns together with the proposed building design. Our initial reaction was that he is proposing visual chaos similar to that with which the deconstructivists are so fascinated. He said, "Couldn't you design the behavior first and then have that generate the building?" Whatever the outcome, here clearly is one person who appreciates the new mind-set of CADD. □

Fly Ash as a Concrete Admixture

Mexican fly ash?! Is it delivered in a plain brown paper wrapper?" I asked the contractor. "No," he answered, "but it's the reason why the concrete didn't come up to strength." He explained that for the past few months suppliers had been mixing fly ash in their concrete to save money. As a result, the concrete wasn't coming up to strength when it should. "It'll come up eventually, it's the nature of fly ash. But it has nothing to do with where it came from," he assured me.

Fly ash is one of many concrete admixtures introduced to enhance properties that concrete possesses naturally. In some cases, admixtures are used when they are not really necessary—the same results can be achieved through the selection of proper materials and good workmanship. Of course there are exceptions, and when used properly concrete admixtures can cause standard concrete mixtures to perform more effectively. Admixtures serve well in emergency situations and may reduce the cost of construction. Two of the most commonly used admixtures are fly ash and air-entraining agents.

Properties of fly ash

Fly ash is a pozzolana, a siliceous or aluminosiliceous material. A by-product of coal-fired electrical power plants, fly ash, like other pozzolanas, displays no cementitious qualities until it is finely ground and exposed to water. Fly ash particles are microscopic spheres—some solid, some hollow, and some that are spheres within spheres. The spheres contain silica, alumina, iron, and calcium, as well as trace elements of magnesium, sulfur, sodium, potassium, and carbon.

ASTM C 618 Class F and Class C standards set limits on the amounts of calcium and carbon allowed in admixtures for concrete. Class F admixtures can contain no more than 10 percent calcium and carbon, but usually the carbon content is less than 5 percent. The calcium content in Class C admixtures can be as high as 30 percent, and carbon content should be only 2 percent. Class C admixtures, with their higher calcium oxide content, are classified as having both pozzolanic and cementitious properties, meaning they hydrate and harden very quickly when exposed to water.

Both for economic and environmental reasons, use of fly ash admixtures recently has led to extensive testing on its short- and long-term effects on fresh and cured concrete. With other properties such as slump and strength being equal, tests have revealed that fly ash additives or the substitution of fly ash for portland cement alters the properties of concrete in significant ways. For instance, concrete handling and workability generally is improved with the addition of fly ash. Also, ease of finishing is improved or at the very least unimpaired. The addition of fly ash will reduce bleeding and segregation, particularly in concrete with aggregates insufficient in fines. And fly ash admixtures reduce the heat built up by hydration, and so they are particularly useful in massive pours.

On the other hand, fly ash often retards setting and lengthens curing times. Comparative tests show fly ash admixtures can delay initial set from 10 minutes to an hour, and final set over two hours. Depending on the proportion of fly ash added, the concrete may need an extra 30 to 90 days to come up to the 28-day strength requirement. Class C fly ash, unlike Class F, often develops strength earlier. Fly ash normally is the same color as cement, but it can turn the concrete bluish gray, dark gray, or tan when used in large quantities. The color and quantity of fly ash should be controlled carefully, particularly if the concrete is exposed or decorative.

When faced with potentially reactive mix materials or contact with reactive materials in the environment, fly ash can help impart an ability to resist expansive cracking and spalling of cured concrete. Foundations and on-grade slabs are particularly prone to this kind of deterioration. In addition, concrete that will be exposed to seawater or external sources of sulfate found in groundwater or soil can be protected to some extent by the addition of fly ash in the mixture. As a rule, Class F fly ash has a greater effect on sulfate resistance. Class F fly ash also is very effective in preventing reaction between cement alkalies and reactive silica in aggregate. (Fly ash won't prevent alkali-carbonate reactions, however, caused by a number of dolomitic limestones.)

Fly ash also affects concrete carbonation, which can occur if airborne carbon dioxide penetrates the concrete and reacts with the calcium hydroxide to form calcium carbonate. This carbonation not only increases shrinkage during drying (thus increasing the chances of cracking) but also lowers the alkalinity of the concrete (high levels of alkalinity help protect steel reinforcing from corrosion). The combination of fly ash and a short moist-curing time can increase the likelihood of carbonation. On the other hand, fly ash combined with a long moist-curing time will actually decrease carbonation. Fly ash added to the concrete mix will reduce chloride ion penetration, thus reducing the possibility of corrosion.

All things being equal, concrete containing fly ash generally provides the same resistance to freeze-thaw cycles as concretes using only portland cement as a binder. Proportionally larger amounts of entrained air is needed when fly ash is part of the mix. The amount depends on the purity, the lack of organic material, alkali content, and fines present in the fly ash. Generally, ASTM Class C fly ash tends to require less entrained air, and little is lost during mixing. A Foam Index test should be performed if there is some doubt as to the amount of air entrainment necessary for a particular fly ash.

Air entraining

Air-entrained materials are the most commonly used concrete admixtures today. First introduced in the 1930s, most air-entrained materials today consist of wood resin, sulfonated hydrocarbons, or fatty and resinous acids. By purposely introducing microscopic bubbles, air entraining improves the durability of concrete

exposed to cycles of freeze and thaw, as well as its resistance to scaling caused by deicers. Like fly ash, air entraining improves the general workability of the concrete and reduces the amount of segregation and bleeding.

Air entraining does have its drawbacks. Compressive strength and flexural strength both are reduced 2 to 6 percent for each percent of air added. (The exception is that lean or harsh mixtures of concrete actually may gain compressive strength.) Also, the modulus of elasticity will decrease per percentage of entrained air.

Entraining materials can be either combined with the cement clinker during manufacture to produce air-entrained cement or introduced into the concrete during mixing. Both methods release into the concrete mixture an agent that increases the absorption of bubbles by lowering the surface tension of the mixing water. Air-entrained agents are hydrophobic—their tough, water-repelling film keeps water out of the bubbles and is strong enough to contain and stabilize the bubbles without letting them combine. The agent's fine aggregate particles also help hold the bubbles in place. Additional stability is provided by the negative electrical charge introduced by the air-entraining agent. Thus, the negatively charged bubbles are naturally attracted to the positively charged cement grains. (Positively charged admixtures also are available.) The entrained bubbles act like microscopic relief valves, dissipating hydraulic and osmotic pressures that build up during freezing. When wet concrete begins to freeze, the expanding ice produces pressures within the minute cracks and pores of the cement and aggregate. As the pressures exceed the tensile strength of the concrete, the pores and cracks dilate and rupture. Air-entrained concrete provides millions of empty cells into which the freezing water and ice can migrate, thus relieving the pressure. The air in the bubbles is displaced temporarily by the greater pressure of the ice. When the ice thaws, most of the water returns to the cracks and pores due to capillary action and air pressure in the bubbles.

The effectiveness of air-entrained concrete in relieving freeze/thaw pressures largely depends on the size and spacing of the bubbles. ASTM C 457 describes how to evaluate air entrainment in set concrete. Pre-installation tests can evaluate air entrainment based on the amount of air volume in the concrete mix. When passed through a No. 4 sieve, the mortar portion of the concrete should contain 9 percent (plus or minus 1 percent) air volume. This standard for durability must be adjusted to account for the coarseness of the aggregate and the anticipated severity of the freeze/thaw cycles.

Air-entrained concrete also is recommended if the concrete is expected to come in contact with salts and deicers. The bubbles that allow room for the ice to expand also relieve pressure by providing space for expanding salt crystals. Concrete made with air-entrained cement will meet the needs of most standard jobs, but if the air entrainment proves insufficient, or when the peculiarities of the job require additional entrained air, the concrete mixture can be adjusted with an admixture. Variations in aggregate size and proportion, temperature, slump, and mixing time all affect the volume of entrained air. Clear and accurate specifications from the architect as well as careful batching and mixing of ingredients at the plant have the most significant effect on the volume of entrained air in the concrete.

An added benefit of air entraining is improved workability, especially in lean concrete mixes where the cement content is low. In some cases, the water and sand content also can be reduced. Despite these general improvements, air-entrained concrete can be overworked; normal finishing techniques won't affect the concrete, but premature or overfinishing can decrease the amount of bubbles in the surface layer of the concrete.

Handling also is important for air-entrained mixtures. Internal vibration is the most commonly accepted method for consolidating freshly poured concrete. As little as 15 seconds of vibration can reduce the air content. If the vibrator isn't handled by knowledgeable workers, the entrained air content can be greatly reduced. Transporting also can affect the air content. Normally, a 1 to 2 percent loss is expected during transport to the job site, but this amount can vary with temperature, concrete contents, slump, and distance and haul time. If the concrete is handled using standard methods, including discharge chute, bucket, wheelbarrow, or shovel, the air at the job site will remain constant. The exceptions are pumping and long conveyor belts, where up to 2½ percent overall air content can be expected to be lost. This is true particularly of high air-content mixtures.

The resistance of air-entrained concrete to freeze/thaw, salt, and deicer deterioration will be increased greatly if the concrete is allowed to air dry after the initial moisture cure. Air drying removes the water from the concrete, reducing excess internal pressure created by freeze/thaw cycles or adding chemicals such as deicers or salts. Of course this means scheduling the pour to give the concrete time to air dry before freezing weather restricts the process.

Additional admixtures should be evaluated for their effects on the air-entrained mix. Superplasticizers, depending on their chemical formulation, can increase or reduce the air content and increase the bubbles' size and spacing. This usually doesn't effect the freeze/thaw durability, but it should be carefully monitored. Set retarders can either increase or decrease the amount and spacing of bubbles, depending on when they are added to the mix. Water-reducing agents will increase efficiency of air-entrained admixtures, thus reducing the amount of entraining agent required.

When added in solution form, calcium chloride can be used in cold weather to accelerate curing; this will also slightly increase the air content. But if calcium chloride comes in direct contact with the air-entraining agent, the chemical reaction will make the agent less effective. Other curing agents used to harden concrete usually have little effect on air-entraining agents. These are only two of the many admixtures commonly used. In the future we hope to cover some of the other admixtures, such as accelerating admixtures, retarding agents, and superplasticizers.

—Timothy B. McDonald

The author thanks the Portland Cement Association for its help with this article.

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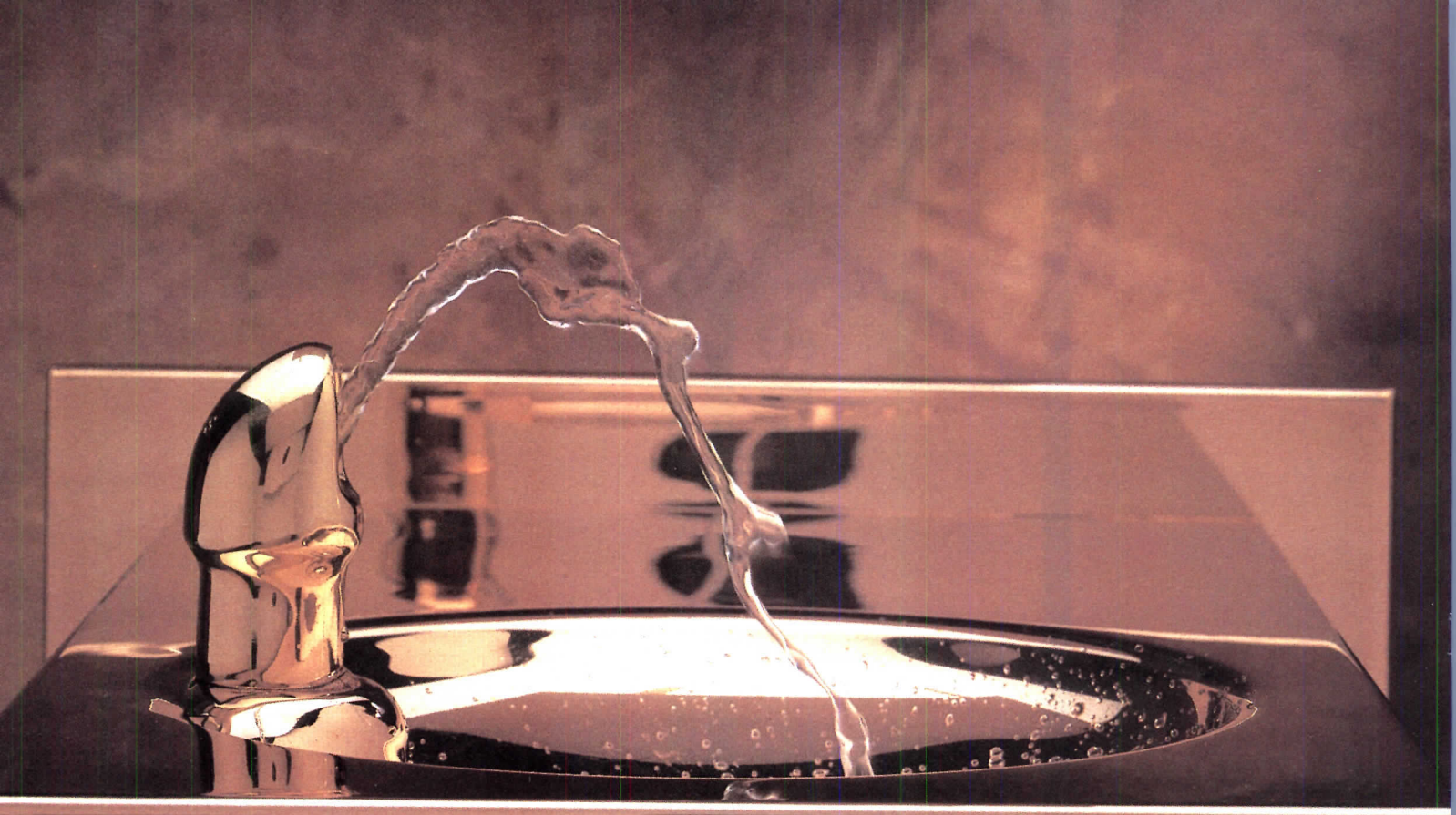

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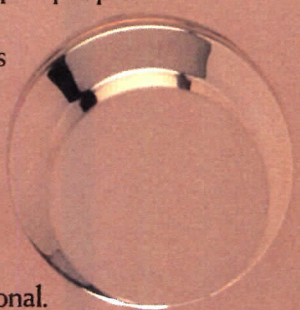

Haws

$H_2Ohhhhhhh.$

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PRODUCTS

Perforated Metal Ceilings
Metal ceilings from Forms + Surfaces and Armstrong World Industries, right, feature perforated designs in 24x24-inch panels in anodized or painted aluminum, with tegular edges. Ceilings are available with or without infill panels, and perforations come in either circles or squares.
Forms + Surfaces
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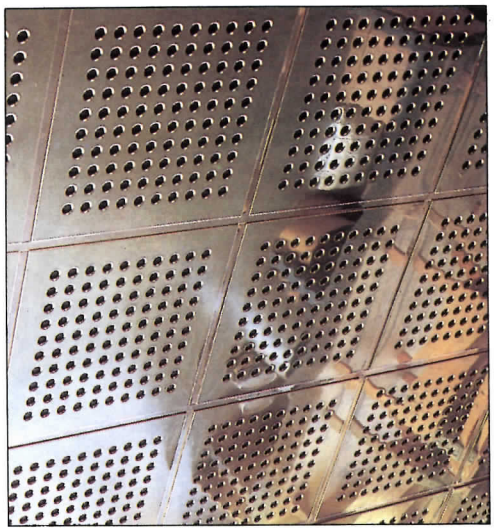


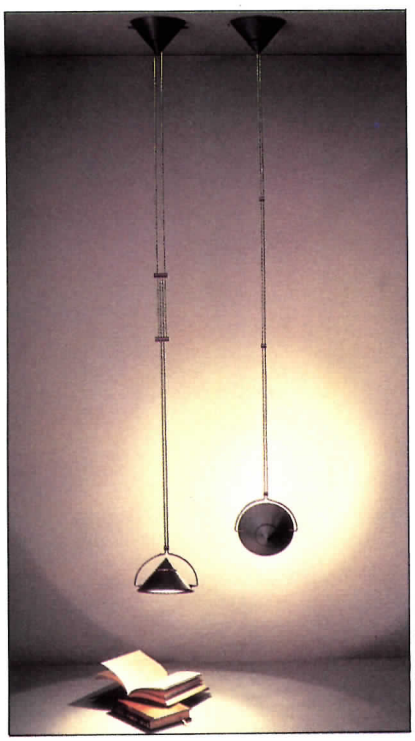
Updated Junction System
Zerone, a tridimensional junction used mainly for display systems, below, is an updated development of the original Zero system designed by architects De Pas, D'Urbino, and Lomazzi, for Quattrocchio, Zero division. The structural systems can be used for exteriors as well as interiors and provide a variety of uses for stands and pavillions.
Quattrocchio, Zero div., U.S. Corp.
Circle 404 on information card

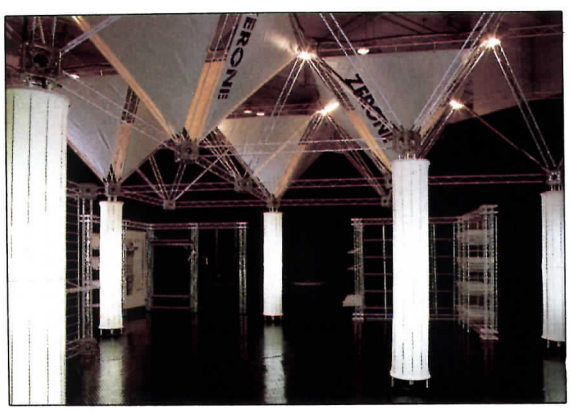
New Line of Metal Office Furniture
The Places line of freestanding metal furniture from Haworth, above, features a polyurethane work surface edge treatment that will allow edge trims to match or complementarily contrast with the laminate surface.

The steel furniture accommodates electrical support and storage needs through the use of wire management channels, grommets, work surface-height duplex receptacles, adjustable keyboard pads, and overhead storage and shelving units that mount on the top of a desk or credenza.

The line includes single or double pedestal desks and desks without pedestals with full or ¾-length modesty panels. Desktops come in a laminate, wood-trimmed laminate, or veneer surface.
Haworth Inc.
Circle 401 on information card

Products *is written by Amy Gray Light*





Suspension Lamp
This low-voltage halogen fixture, left, is designed by F.A. Porsche for Artemide litech. The transformer is fully enclosed in the ceiling canopy, and the height is adjustable from 36 to 72 inches. A fully rotating, adjustable diffuser comes in a die-cast aluminum with a gray lacquer finish.
Artemide litech Inc.
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Using Corian for Far More Than Just Countertops

The United States Postal Service's Branch Station E in the State of Illinois Center government building in Chicago, designed by the Chicago firm Loebl, Schlossman & Hackl, creates a strong identity within the building by means of flowing curvilinear walls and countertops of Du Pont Co. Corian, and an undulating metallic linear ceiling that moves upward in a variety of angles to form a geometric wave.

The counters and casework align horizontally and vertically to link the space and to act as an organizing device throughout the area. The sweeping, curvilinear counters create a rhythmic sequence and suggest a flowing circulation path to guide users through the area.

A modular Corian system designed for all reveals of the fascia, soffit, counters, and casework to parallel the mullions of the window wall was bent, molded, and attached to the surfaces and custom millwork. Because of Corian's properties regarding durability and maintenance, the use of white throughout the space was possible, even in such a high-traffic area. The white background accents the U.S. Postal Service's red and blue palette.

The process of bending and molding the Corian panels to attach to the curved surfaces involved the use of 30-inch panels that had to be precisely placed and aligned. A variety of lighting effects was used, with emphasis placed on the areas of the writing surfaces and the curvilinear teller counter.

Fluorescent lighting fixtures are recessed into acoustic baffles in the metal slat ceiling. A nonslip granite flooring not only relates to the entire building as a continuation of the central atrium floor but also is directional throughout the space.

An L-shaped lock box facility, shown above, also contains stamp machines, writing tables, display spaces, and security cameras connected to the building's system. Located on the lower concourse of the building's circular atrium, this space uses materials and finishes identical to those of the postal facility.

Du Pont Company
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Products continued on page 137

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Sound Diffusion System
When controlling unwanted noise is the design goal, absorptive surfaces are the materials of choice. But when the goal is to control sound—make voices or music clearer and more intelligible, for instance—diffusion becomes the key to the solution (see page 109). Once accomplished by strategic placement of columns, statuary, baffles, and acoustic clouds (convex reflecting disks of various sizes), sound diffusion has made a technological leap forward with the recent development of reflection phase grating (RPG), which uniformly distributes into many directions sound arriving from any direction for a broad range of frequencies.

In large rooms, diffusive surfaces can be used on flat or focusing reflective rear walls and balcony fronts to disperse intense isolated reflections; on lower side walls to provide diffuse lateral reflections, which increase the sense of spaciousness and envelopment for an audience; on low ceilings to reduce the energy of binaurally similar reflections and distribute the energy laterally; as hanging ceiling clouds to introduce early diffuse reflections in high-ceiling rooms; in acoustic shells to enable musicians to hear themselves as well as other musicians; and in other applications either as a corrective measure in renovation or as an integral design ingredient.

RPG was developed initially at Underground Sound Recording Studio, Largo, Md., (photo above) to improve the acoustics of recording control rooms and to implement a particular design approach introduced by Don Davis of Synergetic Audio Concepts, called LEDE. The first commercial application of RPG was at the Oak Ridge Boys studio in 1984, by Todrank & Associates, Nashville. In the five years since then, hundreds of state-of-the-art facilities all around the world have been designed using the RPG diffuser system and RFZ (reflection-free zone) designs, which optimize the psychoacoustic perception of music.

Corporate facilities increasingly need sophisticated acoustic design in boardrooms, teleconference rooms, and A/V rooms, which require more than traditional absorptive wall coverings. Another growing application of the RPG diffuser system is in schools, including classrooms, lecture halls, auditoriums, rehearsal spaces, performing facilities, and acoustic shells. Recently the RPG system has been used in the critical listening rooms of A/V manufacturers, dealer showrooms, and residential listening rooms.

The RPG diffuser system consists of the QRD diffuser, a broad-bandwidth, wide-angle sound diffuser; the company's "Abffusor," a broad-bandwidth sound absorber; and the "Triffusor," a rotatable variable acoustics module with absorbing, reflecting, and diffusing sides. "Diffusers" and "Abffusors" are available in 2x2-foot, 2x4-foot, and 4x4-foot modules, which are compatible with standard wall and ceiling

mounting systems. "Triffusors" are four-foot-high, equilateral triangle prisms with two-foot sides. Units are available in standard and custom finishes to complement any decor.
RPG Diffuser Systems Inc.
Circle 405 on information card

All-Glass Fiber Window System
A window system by InLine International is made of glass fiber and has a welded frame and sash. The windows are available in six styles, all of which will be custom built, although the company plans to market standard sizes.

The system complements InLine's glass fiber patio door. Because of the glass fiber, the windows are designed so that they do not need reinforcement materials, and there are no sash sag or sticking problems, which can be found in wood windows. The InLine glass fiber window system will not twist, warp, rust, or corrode. The windows are paintable and can be ordered in white, beige, or brown, with a variety of glass options including standard clear glass, tinted glass, Low-E, Low-E with argon, and Heat Mirror glass. All glass is double-strength insulated and comes in standard ⅞-inch through 1⅛-inch thicknesses.

A casement style opens out to a 90-degree angle for cleaning panes from inside. Other styles include casement bays and bows, fixed light styles, awnings, and hoppers. The windows are covered by a 10-year limited warranty.
InLine International
Circle 406 on information card

CREDITS

Herman Miller Office Pavilion, Boston (page 50). *Architect: Jung Brannen Associates, Boston.* Mechanical engineer: LeMessurier Consultants. Structural engineer: Don DiLeo. Electrical engineer: LeMessurier Consultants. Contractor: Construction Planning and Management Inc. Audiovisual: Herman Miller. Graphic design: Herman Miller. Lighting: Fantasee Lighting. Artists: Blossom Mako & Decorative Finishes. Signage: P.M. Designs.
Credits continued on page 139

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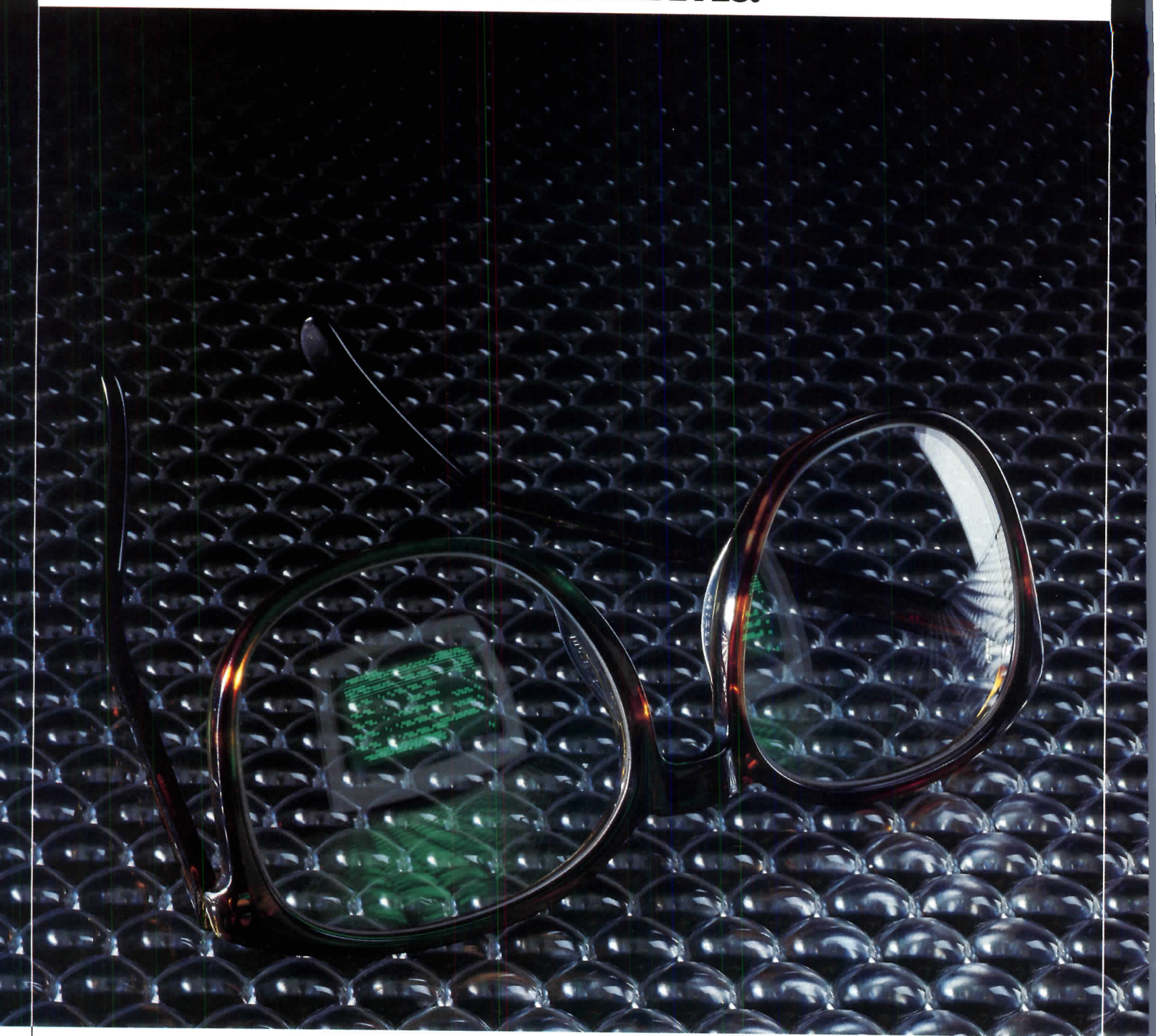

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Herman Miller Office Pavilion, Washington, D.C. (page 54). *Architect: Studios, Washington, D.C.* Design team: Gene Rae, Bruce Danzer, Steve Dunn, Michael Bell. Developer: Kaempfer Co. Structural engineer: James Madison Cutts. Mechanical engineer: G.H.T. Ltd. General contractor: OMNI Construction.

Propaganda Films, Hollywood, Calif. (page 56). *Architect: Franklin D. Israel Design Associates, Beverly Hills, Calif.* Principal in charge: Franklin D. Israel. Project architect: H. Seth Rosenthal. Project team: Mitchell De Jarnett, Christopher Duncan. Interior furnishing and finishes: Paul Fortune. Structural engineer: Davis/Fejes Design. Electrical engineer: Silver Engineers. Mechanical engineer: Hartich. General contractor: Iverson Construction. Lighting: Saul Goldin.

Thomas Twining Photography Studio, Minneapolis (page 60). *Architect: Pfister Architects, Minneapolis.* Principal in charge: Peter J. Pfister, AIA. Project designer: Sixto J. Beltrandy. General contractor: Hammering Hanks Construction. Interior design: Pfister Architects. Furnishings: Metropolis Furnishings.

Park Avenue Apartment, New York City (page 62). *Architect: David Hannaford Mitchell, AIA, New York City.* Assistant Heidi Blau. General contractor: Gulli Construction Co. Cabinetmaker: Lee Taylor.

New American Home, Roswell, Ga. (page 64). *Architect: Charles W. Moore, Architects, Austin, Tex.* Project director: Arthur W. Andersson. Interior design: Bauer-Moore Interior Design Group. Builder: John Wieland.

Ambulatory Surgical Building II, Brigham and Women's Hospital, Boston (page 68). *Architect: Kaplan McLaughlin Diaz, San Francisco.* Design team: Mitchell Green, Herbert McLaughlin, AIA, Bruce Nepp, AIA, Kenneth Schwarz. Collaborating architect and interior design: Tsoi/Kobus & Associates. Design team: Mark Hall, Richard Kobus, Gertrude Levy, Heidi Richards. Structural engineer: Weidlinger Associates. Mechanical and electrical engineer: Shooshanian Engineering Associates. Landscape architect: William Pressley & Associates. General contractor: George B.H. Macomber Co.

Columbus Museum, Columbus, Ga. (page 80). *Architect: Hecht, Burdeshaw & Johnson, Columbus, Ga.* Partner in charge: Edward C. Burdeshaw, AIA. Project manager: Raymond Carrion, AIA. Design architect: KressCox Associates. Partner in charge: David Cox, AIA. Mechanical and electrical engineer: Adams, Shadrick, Davis. Structural engineer: Paul A. Darden. Landscape architects: Eberly & Associates, Julia Orme Martin. General contractor: Williams Construction Co. □

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