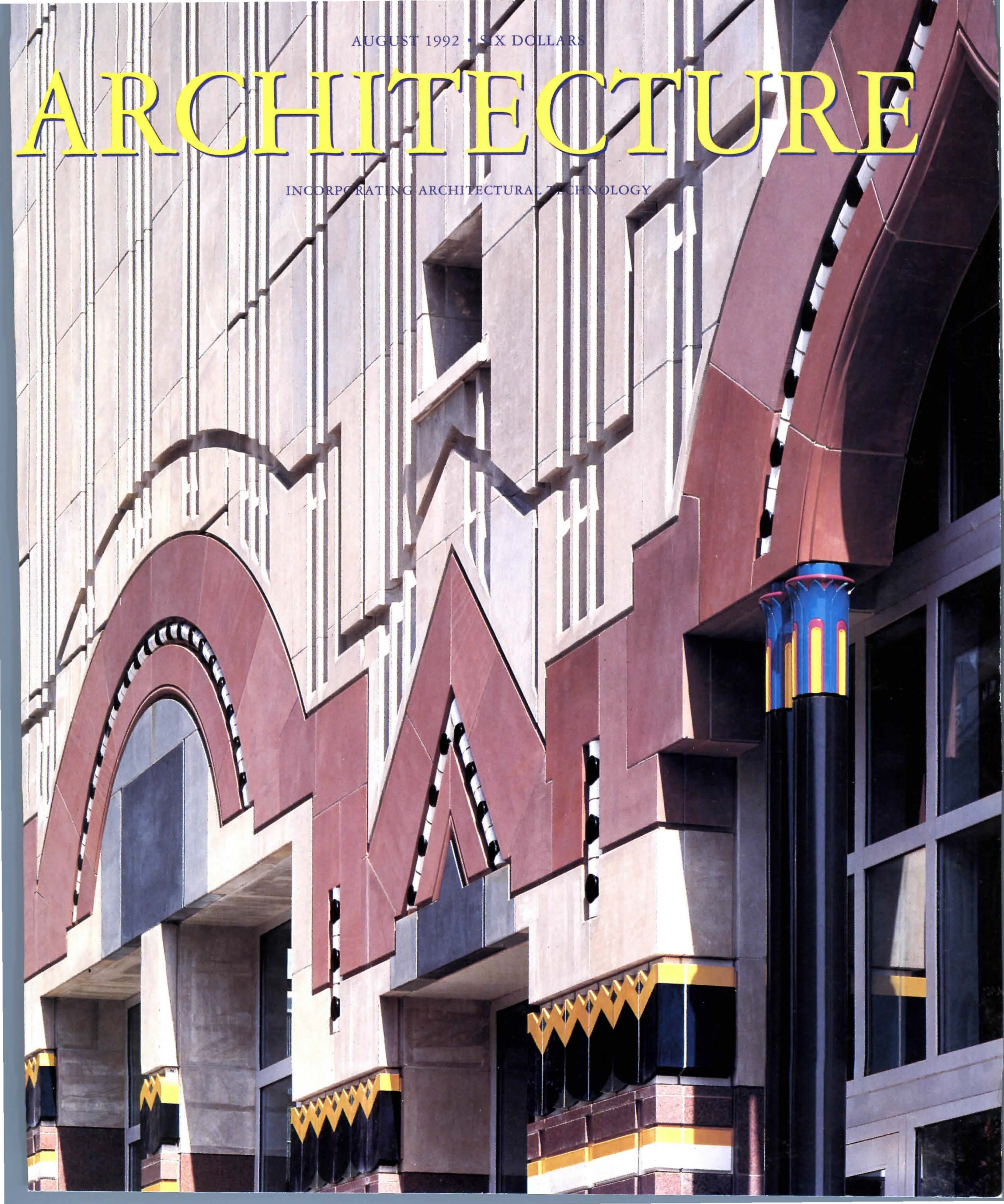
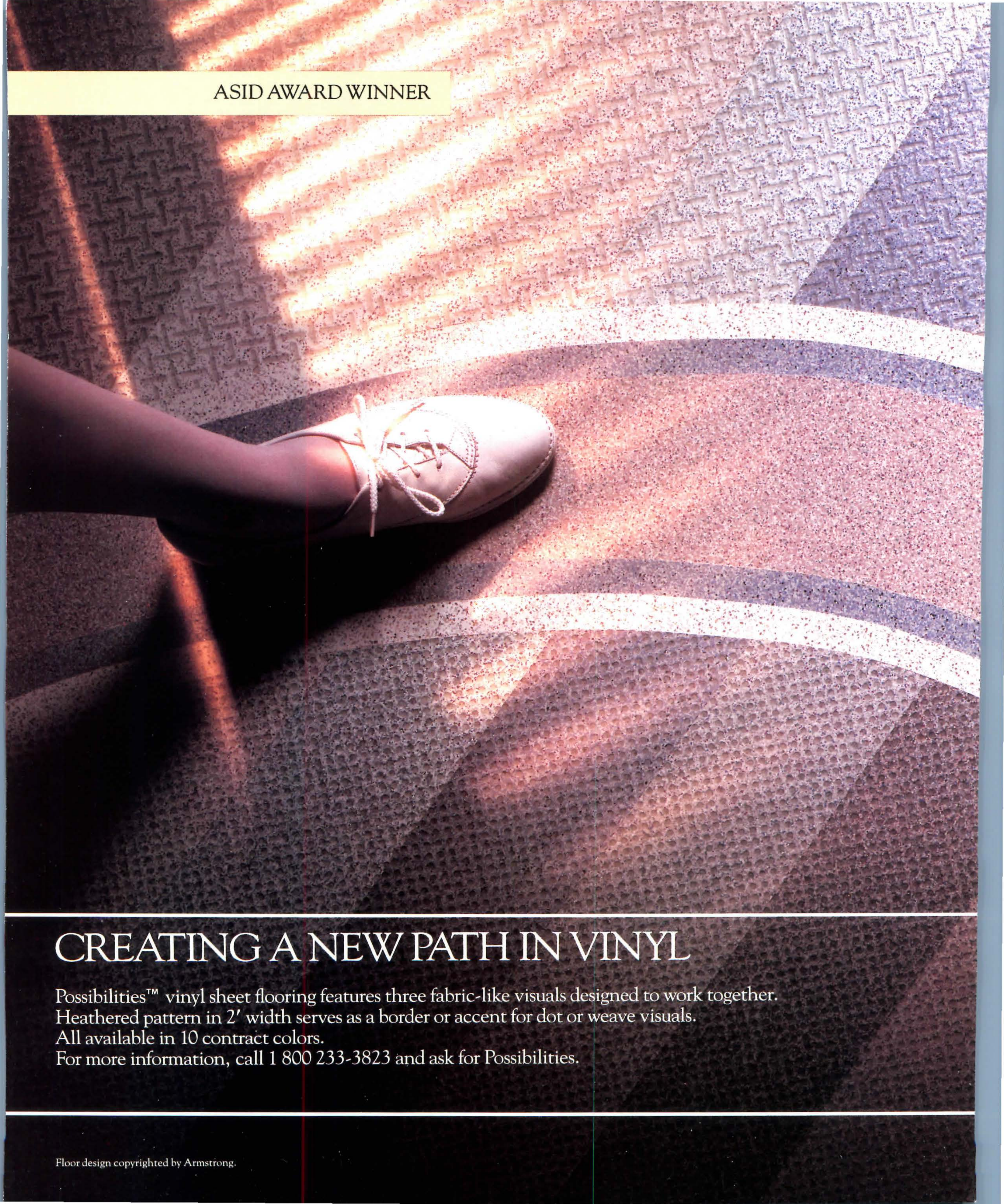
AUGUST 1992 • SIX DOLLARS

ARCHITECTURE

INCORPORATING ARCHITECTURAL TECHNOLOGY





Wright Revival

THIS YEAR MARKS THE 125TH ANNIVERSARY OF FRANK LLOYD WRIGHT'S BIRTH. To celebrate the master's birthday, tours of his buildings, exhibitions and conferences devoted to his work, and other Wright-related events are being held from coast to coast. Most visible among these is the reopening of the Solomon R. Guggenheim Museum in New York (pages 34-41), now expanded and restored. This month and next, Wright's Taliesin complex in Spring Green, Wisconsin, will be open to the public for the first time. And for those seeking a permanent piece of the Wright legacy, reproductions of 105 decorative designs by Wright, including furniture, fabrics, and art glass, are now available from four American companies (right).

The Wrightian celebration underscores the architect's unwavering popularity among members of the profession and public alike. Architects responding to an AIA survey last year, for example, voted Wright the greatest American architect of all time and Fallingwater the best work of American architecture. Wright's continuing appeal is not only rooted in his genius for total environments, but in the timeless principles underpinning his designs. In fact, it is remarkable to consider how relevant Wright's ideas are to practice today.

Environmental sensitivity: Embracing nature in his buildings, through site integration and symbolic imagery, Wright was an early champion of "green" architecture.

Multiculturalism: Wright looked not only to Western Europe for inspiration, but to the architecture of Japan and Mexico. With the increasing racial and ethnic diversity of the U.S., this pluralistic approach is even more valuable today.

Material honesty: Wright believed in revealing the qualities inherent in various building materials to achieve sensuous, human-scaled forms, a design approach that is currently gaining ground among young architects.

New technology: Throughout his long career, Wright embraced state-of-the-art building technologies, including reinforced concrete, radiant floor heating, and earthquake-proof structures.

Affordable housing: With his Usonian houses, Wright demonstrated that distinctive architecture could be available to the average American at a modest price, a model that is greatly needed in today's market.

Reproductions of Wright-designed furnishings (above) are available from Atelier International, Schumacher, Tiffany & Company, and Oakbrook Esser Studios.

Low density urbanism: Wright upheld the Jeffersonian ideal of decentralized urban development. His vision for Broadacre City presages the current boom in edge cities across the country.

While such ideals indicate that Wright might have been right at home practicing today, America's most famous architect was also its most iconoclastic. Wright always countered the status quo of his day. Never content to repeat his past successes, he experimented with radical designs late into his career. Fallingwater, the Guggenheim Museum, and the Johnson Administration Building, for example, were all designed after the architect turned 65. This continuing search for innovation may be Wright's greatest legacy. ■

—DEBORAH K. DIETSCH

There Are 174
In AutoCAD

3. Phenomenal 3D rendering. Capabilities that used to come only with AutoShade® are now built into AutoCAD® Release 12. And hidden line removal is up to 100 times faster.

4. AutoCAD SQL Extension (ASE) allows you to access data in standard database management systems via SQL. ASE provides commands for manipulating external nongraphic data and linking it to graphic entities in AutoCAD drawings.

5. Region Modeler creates intelligent 2D models. Allows you to quickly create 2D shapes with holes and complex boundaries. Automatically finds area, perimeter and inertial properties of a region.

6. Automatic timed save at user-selected intervals.

7. Now you can use PostScript® typefaces in AutoCAD drawings.

8. You can also import PostScript files into AutoCAD, and plot them.

9. New boundary polygon command surrounds an area with a closed polyline automatically.

10. New Fence or Polygon window crossing selection feature speeds selection of entities in dense and complex areas of drawings.

11. No Main Menu! You now enter directly into the AutoCAD drawing editor, where you can perform standard file handling and configuration operations, as well as work on your drawing.

12. Dramatically improved entity selection speed in large drawings.

13. Nested entity dimensioning. Entities within blocks or external references are now easily dimensioned.

14. Locked layers feature prevents accidental modification of drawing data.

15. PostScript output feature lets you enhance AutoCAD drawings by using PostScript-compatible imaging programs.

16. Release 12 and Release 11 drawings are forward and backward compatible.

17. Support for 255 individual pen widths for laser and electrostatic plotters.

18. You can plot without leaving the drawing editor. (And without losing the UNDO file.)

19. Now you can import TIFF, GIF and PCX raster images into your drawing.

20. GripEdit feature allows interactive editing of selected entities without running a command.

21. PickFirst feature lets you select entities prior to executing a command.

22. Improved external references. You can attach, reload or bind Xref files while the "master" is being edited.

23. Enhanced hatching. Automatically hatch bounded areas with a single pick.

24. New continuous polyline linetypes facilitate contour mapping and other applications.

25. Programmable dialog boxes can be customized for your particular working environment or by third-party application developers.

26. AutoCAD's new integrated calculator performs calculations based on existing geometry and includes extensive algebraic and geometric functions.

27. New ALIGN command lets you move and rotate entities in 2D or 3D.

28. 3D ROTATE command rotates entities about an arbitrary 3D axis.

29. 3D MIRROR command mirrors entities on an arbitrary 3D plane.

30. CHANGE command enhancements simplify entity property modifications, such as elevation, color, layer, linetype and thickness.

31. Advanced, multipoint tablet calibration allows compensation for map projections or stretched drawings.

32. Platform-independent menus and dialog boxes that follow operating system standards. So AutoCAD works like other programs on your computer.

33. An improved graphical interface makes the power of AutoCAD more accessible to everyone.

34. Cascading pull-down menus that put more power at your fingertips.

35. Pop-up menus at the cursor location for often-used items.

36. Screen menu is automatically updated to reflect the currently running command.

37. Shift and Control key combinations allow you to invoke more commands with your mouse and digitizer buttons.

38. Single mouse click-and-release action for selecting pull-down menus.

39. Automatic Drawing Conversion. Full support for any drawing created by any version of AutoCAD.

40. Enhanced CONFIG comman allows for configuring AutoCAD from the drawing editor.

41. New dialog boxes give you control of dimension variables and styles

42. Dimension dragging feature provides visual feedback while creating dimensions.

43. RECTANGLE command no allows you to create a rectangle wit just two screen picks.

44. Enhanced Write Block com mand helps developers maintai "smart" drawings (entity handles).

45. Enhanced command transpar ency lets more commands be use inside other commands.

46. Transparent "Object Filters" dia log box allows more flexible definitio of selection sets.

47. ZOOM Window is now th default.

48. DXFIX utility reads R12 DXF files and translates them into R10 file

49. New COMPILE command com piles shape files, font files and Type PostScript fonts.

50. Now you can fill closed pol lines with PostScript patterns for e tremely high-quality output.

51. Network users can view a plot AutoCAD drawings without usi server authorization.

52. Database-specific drivers li AutoCAD and external nongraph databases, such as dBase,® Parado Oracle® and others.

53. Create New Drawing comma now allows you to start with an unnam

New Features
Release 12.

rawing or specify a prototype drawing.

54. OPEN command presents
)pen File" dialog box to simplify load-
g of existing drawings.

55. SAVE AS command now changes
e current drawing name to new name
ecified.

56. END and QUIT commands
ompt you for a file name when
iting an unnamed drawing, to pre-
nt you from losing data.

57. Several AutoLISP® enhance-
nts, including much faster loading of
P routines.

58. A wide range of new and en-
nced system variables, especially
ated for the power user.

59. DD Modify command allows for
eractive editing of entity parameters.

60. New Units Control dialog box
ws all units, angles and direction
ues on-screen as well as precision
tings.

61. New special context-sensitive
p dialog boxes allow you to browse
ugh available help files.

62. New View Control dialog box
ws selecting with a pick instead of
ing in view name.

63. You can plot AutoCAD drawings
it map files in PCF, TIFF, TGA and
formats. You can even automati-
y FAX your drawings to a subcon-
tor or client.

4. 24-bit, true color rendering is
ported by appropriate hardware.

65. PostScript files can be brought in as outlines or fully rendered images.

66. Modify Entity dialog box enables you to edit an entity's properties directly.

67. Mirrored blocks can now be exploded.

68. List and load standard AutoCAD SHX fonts as well as Adobe Type 1 PostScript fonts from dialog box.

But Either One Of These Alone Makes It Worth The Price.

1. Something every AutoCAD® user has been waiting for: new technology that virtually eliminates regens. A new built-in 32-bit display list permits pans and zooms without regens. So you can spend your time editing your drawing, instead of waiting for regens.

2. The plot quickens. Now you get WYSIWYG plot preview, on-the-fly plot device selection and the ability to save plot configurations.

69. New option allows a box to be drawn around dimension text automatically.

70. Insert a text string before or after dimension text automatically.

71. Configuring for ADI® drivers has never been easier, with the new feature that displays all drivers in the appropriate menu when configuring AutoCAD.

72. HP LaserJet legal-size paper output is now supported by a new, improved device driver.

73. ADS applications can now be compiled by inexpensive "real mode" compilers; no need for costly development tools.

74. AutoLISP and ADS can now be used to drive the PLOT command.

75. Linetype scaling adjusts to view scale in Paper Space.

76–174. Unfortunately, we're out of space. But you get the idea. Release 12 is the most significant enhancement of AutoCAD ever. Its improved performance will pay off for every AutoCAD user. So the cost of an upgrade can pay for itself in a couple of weeks.

If you're still not convinced, call your Authorized AutoCAD Dealer. Your dealer can give you an even more complete list of the new features. And tell you what you need to do to upgrade. If you need more information or the number of your nearest dealer, call **1-800-964-6432, ext. 780.** Outside the U.S. and Canada fax 415-491-8303.

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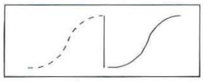
Management Learning Curve

I commend your informative article on Total Quality Management (May 1992, pages 103-106). Peter Sholtes, a quality consultant and author of The Team Handbook, observes that the learning curve for TQM looks like this:

The dotted line is a preliminary state followed by a moment of recognition where the false starts and blind alleys are clarified and the real learning begins. My experience is that the architectural profession and the construction industry are approaching this moment of recognition. Your article is a just-in-time delivery of essential information.



Robert S. Barnett, AIA
The Hillier Group
Princeton, New Jersey

Dispute Protection

Your article on Alternative Dispute Resolution (June 1992, pages 99-101) was refreshing and well-informed, particularly when read in conjunction with your roundtable discussion on alternative project delivery systems in the May issue (pages 87-91).

Our firm has dealt with construction/architecture litigation support services, and many of the disputes we have witnessed over the years have been caused by the "low bids, unrealistic owner expectations, stereotypes of architects as dreamers and contractors as liars, and the assumption that specs and construction drawings are imperfect," as stated in the article. But the evolution of architectural practice away from an administrative focus over the last several decades has been the foundation of just as many of the cases we have handled.

Although ADR is a commendable and less costly tool than the quagmire of the courts, the solution, I believe, is to elevate construction administration to an integral and equal role in the entire building-delivery process. Architects should learn dispute prevention rather than ADR or litigation.

Bruce Wade, AIA
Wade & Associates
Laguna Beach, California

Thanks for encouraging the involvement of architects as mediators, arbitrators, and "standing neutrals" on-site in your article on ADR. Today's competitive climate and client demands for increased services dictates that disputes be resolved quickly and effectively with minimum expenditure of nonproductive time.

I must however, take exception to the statement that "common problems include low bids...and the assumption that specs and construction drawings are imperfect." Indeed, architects should be educating their clients that perfect documentation is not possible, and that the cost of approaching perfection is prohibitive. Failure to understand this basic concept often leads to escalating claims, entrenchment of the parties, and, ultimately, the litigation that we all must avoid. Consumers of architectural services deserve to be continually educated by architects regarding reasonable standards for performance.

Lee Schwager, AIA
D/C Support Services, Inc.
San Francisco, California

Proof Positive

Our firm has provided construction management as part of our architectural service since 1980 and has experienced every problem noted in "New Directions in Project Delivery." Except for very unusual circumstances, design-bid-build is a lousy way to complete a project. We believe wholeheartedly that construction management by the project design architect is the best system by far to achieve design excellence, quality construction at the lowest cost, and increased income for the architect.

Robert C. Mutchler
Mutchler Bartram Wild
Fargo, North Dakota

Corrections

Richard C. Coleman, AIA, is the architect of Overland Park Farmers Market Canopy (June 1992, page 85).

George Cott photographed the State Regional Services Center (June 1992, 52-56).

Flack + Kurtz Lighting Design Group consulted on the Goldman Sachs Headquarters (June 1992, pages 108-109).

August 15: Registration deadline for an AIDS housing design competition cosponsored by the City of Boston Public Facilities Department and the Boston Society of Architects. Contact: Timothy Smith, (617) 635-0331.

August 21: Deadline for completed entry forms for the AIA/San Francisco Interior Architecture Awards. Contact (415) 362-7397.

August 31: Deadline for submitting to the Chicago Athenaeum International Exhibit on Black Architects. Contact: Carolyn Davis, (312) 266-0269.

September 1: Registration begins for the City of Rancho Cucamonga, California, Affordable Housing Design Competition. Contact: Lynda Thompson, (714) 989-1851.

September 23-24: Capital Design Week at The Washington Design Center in Washington, D.C. Contact: (202) 554-5053.

September 29: "Taliesin Legacy: The Independent Work of Frank Lloyd Wright's Apprentices," at the New York Institute of Technology, Old Westbury, New York. Contact: Stephen Judge, (516) 487-7822.

October 1: Registration deadline for the O. Jack Mitchell Design Competition for the Heart of Hermann Park, Houston, Texas, sponsored by the Rice Design Alliance. Contact: (713) RDA-1992.

October 13: Submission deadline for the Boston Society of Architects' honor awards program for Massachusetts design. Contact: (617) 951-1433, extension 221.

October 15-17: "Design America Now: At Home and Abroad." Designer's Saturday at the IDCNY and throughout New York City. Contact: (718) 937-7474.

October 19-21: 1992 National AEC Expo, featuring automation, management, and reprographic systems at the Moscone Convention Center in San Francisco. Contact: Susan Werlinich, (609) 987-9400.

October 20-22: Third Annual International Conference on Intelligent Buildings in Washington D.C. Contact: (202) 457-1988.

October 24-25: "Disaster Prevention, Response, & Recovery: Principles & Procedures for Protecting and Preserving Historic/Cultural Properties"; symposium at MIT. Contact: Susan E. Schur, (617) 227-8581.

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NEWS

AIA Convention Report • Guggenheim Museum Expands

RICHARD BRYANT/ARCAID

B. BRAUN FACTORY, MELSUNGEN, GERMANY, BY JAMES STIRLING, MICHAEL WILFORD & ASSOCIATES (1992)

James Stirling Remembered

British architect James Stirling, winner of the 1981 Pritzker Prize, died in London on June 26 at age 66. The following tribute is written by London-based photographer Richard Bryant, who has documented Stirling and Wilford's architecture over the past seven years.

I FIRST MET JAMES STIRLING IN 1968 WHILE visiting the Cambridge History Library with a group of fellow architectural students. This chance meeting led to a memorable guided tour into a new world of spatial impressions. At that time, I had no idea that I would become an architectural photographer, let alone that James Stirling and I would form a professional relationship that would endure until our final meeting this past April to photograph his last completed project, a medical equipment factory in Melsungen, Germany.

I photographed my first Stirling building, the Neue Staatsgalerie in Stuttgart, in 1985. I am not sure whether this project was the highlight of the Stirling and Wilford partnership, but it certainly was one of my most memorable assignments as an architectural photographer. The building's richness of form and space and its ingenious circulation routes not only excited me, but inspired great pride and pleasure among the museum's staff and visitors.

For an architectural photographer, the work of Jim Stirling was pure paradise: color, form, and texture in abundance, as well as a rigorous attention to detail. My work at his buildings would last for several days if not a week or two, enabling me to become much more familiar with the qualities of the architecture than most visitors. His buildings were never influenced by the fashions of the day, but always looked to the future in new stylistic directions.

While blessed with the gift of inspiring people with his architecture, Stirling never acted as the prima donna, but ran his practice with refreshingly informal accessibility. Affable and unpretentious, with a quiet sense of humor, Stirling reacted to praise or criticism with amused detachment. While giving a short address at the opening of his new factory in Germany, he did not dwell on his own involvement, but instead chose to share credit with Walter Nageli, his German partner on the project.

To me, Stirling was the perfect client, always eager to discuss the photography, but leaving the ultimate creative decisions up to me. He almost always ended our meetings by saying, "Well, you do whatever you want." In one instance, I found him walking around a site with a camera of his own, happily snapping pictures while allowing me to make my own creative decisions on which shots would show the project in its best light. He was a pleasure to work with.

I have had the good fortune to photograph many exciting projects and to work with many different architects all over the world. Few projects have the power of space and form that I found in so many of Stirling's buildings. I found that I became more emotionally involved with Jim Stirling's projects than almost any others. The thought that I will not experience that excitement again is very sad. —RICHARD BRYANT

AIA Elects New Officers

AIA UPDATE AT ITS JUNE CONVENTION in Boston, the AIA elected L. William Chapin II of Rochester, New York, to become the Institute's president in 1994. His tenure starts this December, when he begins a year as first vice president. Chapin, who heads L. William Chapin II, Architect, his own three-person firm, chaired the Institute's commission on the public as an AIA vice president from 1990 to 1991. He represented the New York region on the AIA board of directors between 1988-1990, and he has also served as a regent and secretary-treasurer of the American Architectural Foundation. Susan Maxman, current first vice president, will succeed W. Cecil Steward as AIA president in December. Additional officers elected during the June event include three national vice presidents: Cynthia Weese of Chicago, Illinois; Francis A. Guffey II of Charleston, West Virginia; and Chester A. Widom of Santa Monica, California. Michael E. Bolinger of Baltimore, Maryland, will continue his two-year term as treasurer. Betsey Olenick Dougherty of Newport Beach, California, was elected to a two-year term as secretary.

OSCAR & ASSOCIATES

1993 AIA officers are (left to right, from rear): Cynthia Weese, Francis A. Guffey II, and Chester A. Widom, national vice presidents; Michael E. Bolinger, treasurer; Betsey Olenick Dougherty, *secretary; James P. Cramer, executive* vice president; L. William Chapin II, first vice president and 1994 president; Susan A. Maxman, president.

DETAILS

The **National Park Service** has withdrawn its plans to demolish 12 historic buildings on Ellis Island for a $140 million hotel and conference center. **Norman Foster and Partners** of London was selected over **James Ingo Freed**, **Antoine Predock**, and **Christian De Portzamparc** to renovate and expand the Joslyn Art Museum in Omaha, Nebraska. **Venturi, Scott Brown and Associates**, in collaboration with **Anderson/Schwartz Architects**, won a competition to design a 350,000-square-foot civic building in Toulouse, France. **Nix Mann Viehman Architects** and **Niles Bolton Associates** were selected to design a $78.5 million dormitory complex on the Georgia Tech campus in Atlanta that will house 4,000 athletes during the 1996 Olympic Games. **Rebecca L. Binder** has been selected to design a 15,000-square-foot administrative office building for the University of California, Irvine. **Craig Ellwood**, renowned for his California case-study houses, died on May 30 at age 70. The Japan Art Association has awarded **Frank O. Gehry** one of five 1992 Japanese Praemium Imperiale awards for his lifetime achievement in the arts. **Centerbrook Architects** won the Competition for Excellence in State Parks Architecture held by Connecticut's Departments of Environmental Protection and Public Works. **Weiss/Manfredi Architects** won a national competition for the design of a new American green to be built in Olympia Fields, Illinois. The New York firm **Hardy Holzman Pfeiffer Associates** was selected to design a $90 million renovation and expansion of the Cleveland Public Library. The Museum of Science & Industry in Tampa, Florida, has unveiled a scheme by **Antoine Predock** in association with **Robbins, Bell & Kuehlem Architects** for a 110,000-square-foot expansion (below) that will house a theater, library, and exhibition space.

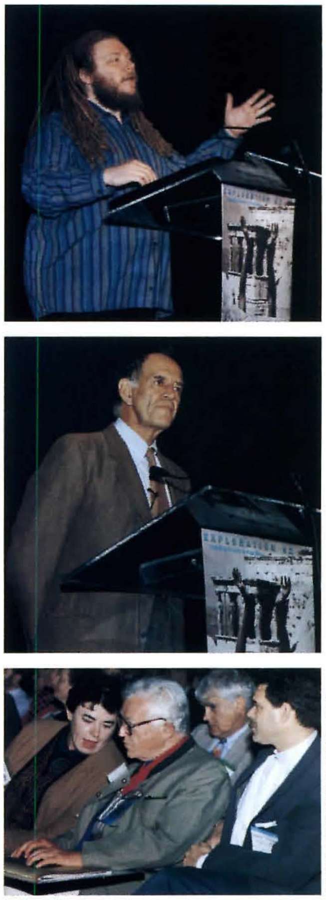

ROBERT RECK

MUSEUM OF SCIENCE & INDUSTRY, TAMPA
ANTOINE PREDOCK ARCHITECT

AIA Convention Advocates Social Responsibility

AIA UPDATE THIS YEAR'S AIA CONVENTION, held June 19-22 in Boston, eradicated any lingering perceptions that the self-absorbed "star" architect will thrive in the 1990s. The event, entitled "Engaging Society in Vital Ways," urged architects to adopt an environmentally sensitive and socially minded outlook as a way of surviving economic hard times.

During one of the more lively meetings, architectural historian Vincent Scully and architects Joseph Esherick, John F. Hartray, Susan Maxman, and Denise Scott Brown bemoaned the message conveyed by Howard Roark, the architect-hero in Ayn Rand's 1943 novel, *The Fountainhead*. Panelists noted how much Roark's quest to build the ultimate skyscraper presaged, and perhaps fueled, the rise of Modernism in the United States. Now faced with economic recession, decaying cities, and environmental destruction, the profession is in the midst of a backlash against the Roarkian values of the 1980s. Over the four days of the convention, seminars and discussions highlighted the environment, health facility design, and urban revitalization, giving rise to a new professional image of the "responsible" architect.


PHOTOS BY OSCAR & ASSOCIATES

Convention theme speakers included Jaron Lanier (top), who founded the computer technology known as virtual reality, Mexican architect Ricardo Legorreta (center), and 1992 AIA Gold Medalist Benjamin C. Thompson (above), seated with partner Jane Thompson.

In a Saturday session on energy-conscious architecture, Jeffrey Cook of Cook & Associates in Scottsdale, Arizona, asserted that architects must begin to incorporate recycling into building design, while being attuned to high-performance glass and insulation materials. During a panel on sustainable design, architects discussed global conservation as a way of sparking economic growth. "Health and economic recovery go hand in hand with ecological progress," noted Judith Chafee, professor of architecture at the University of Arizona, Tucson.

Prompted by a coalition of architects who have been lobbying the Institute since March, the AIA also put urban aid at the top of its agenda. On the second day of the proceedings, AIA board member Ronald Altoon urged architects to commit themselves to healing cities in the aftermath of the Los Angeles riots. Just prior to the convention, the AIA board of directors pledged $50,000 and technical support to the Los Angeles chapter to help rebuild riot-torn areas. Addressing the overdevelopment of Mexico City, Mexican architect Ricardo Legorreta lamented society's lapse of esthetic values in its pursuit of technology and comfort. "What have we done in the 20th century to improve living?" he challenged listeners, adding that over the past few decades, architects have been creating better buildings for fewer people.

While this year's event fell short of offering satiating opportunities to work-hungry professionals, an AIA survey released at the convention suggests that the economic outlook for architects is brightening. Of 300 firm principals across the country, 44 percent reported that business opportunities for local architecture firms have increased since the beginning of the year, while more than half of the participants believe the recession has passed its lowest point. "The current recession has dealt America's architects punishing body blows," noted AIA President W. Cecil Steward. "Yet from coast to coast, you adapt, you innovate, you endure. The resiliency of this profession is nothing short of miraculous." —KAREN SALMON

Guggenheim Expands at Home and Abroad

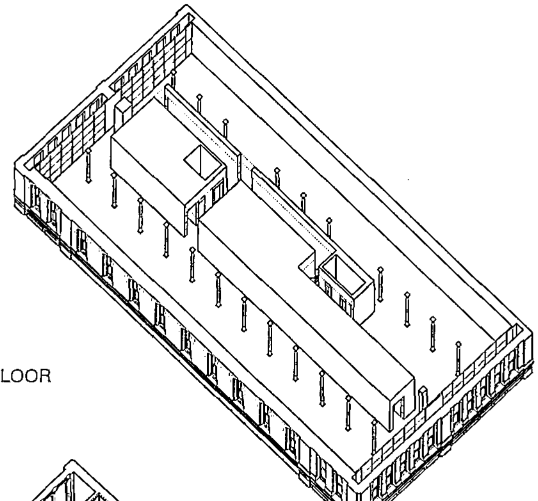
THOMAS KRENS, WHO HEADS THE SOLOMON R. GUGGENHEIM FOUNDATION, is well on his way to becoming the Michael Eisner of the art world. Despite the current recession, the Guggenheim director has commissioned big-name architecture firms to expand the museum's facilities on both sides of the Atlantic. Prior to the opening of the new Gwathmey Siegel-designed annex adjoining Frank Lloyd Wright's spiral landmark on 5th Avenue (pages 34-41), as little as 3 percent of the museum's collection was permanently on view in New York City. Along with the uptown annex, the first evidence of Krens's expansionist policy is the Guggenheim Museum SoHo, an historic commercial-loft building newly renovated by Japanese architect Arata Isosaki (left). A 256,000-square-foot museum in Bilbao, Spain, is being designed by Frank Gehry (bottom), and a 105,300-square-foot, subterranean facility in Salzburg, Austria (below right), designed by Hans Hollein, is under consideration.

The SoHo museum, which opened in June, is housed within an 1882 brick and cast-iron shell. With linear galleries around a central service core on the second level, Isozaki increased the museum's New York exhibition space by 60 percent. Gehry's scheme, adjacent to a river that cuts through downtown Bilbao, stacks orthogonal galleries within the architect's trademark organic forms, organized around a four-story atrium. Construction will begin in late 1993.

The gem of the three venues, should the Guggenheim push forward with its plans, will be Hollein's underground structure in Salzburg. Selected through an international competition sponsored by the city, the scheme focuses on a dramatic, central atrium that acts as a circulation core, and an enfilade of galleries. In this project, Krens believes he finally may have a museum in which architecture plays a subordinate role to the art it displays. ■

—K.S.


GUGGENHEIM MUSEUM SOHO, ARATA ISOZAKI, ARCHITECT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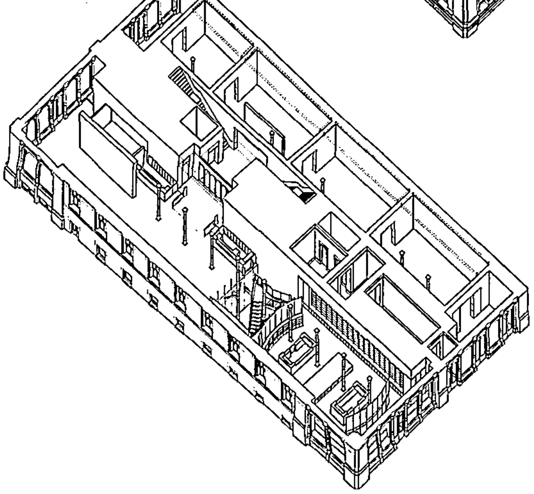
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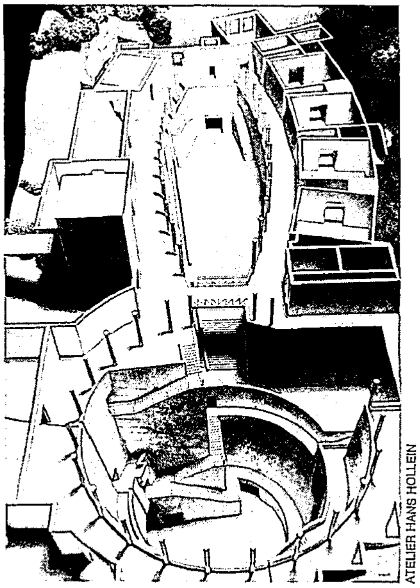
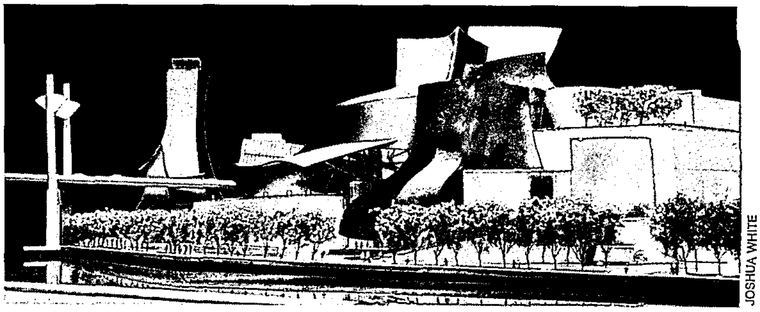
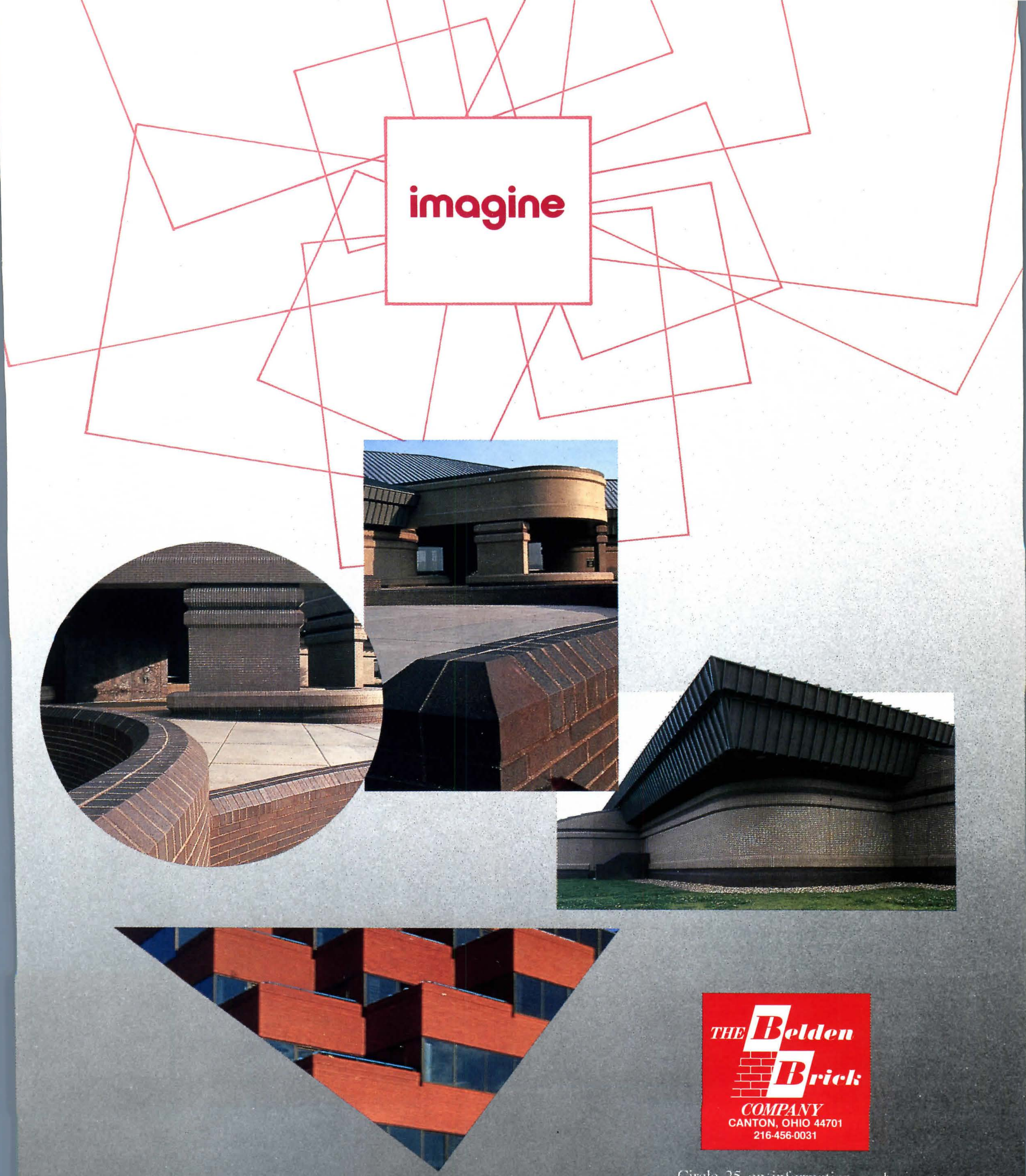

ATELIER HANS HOLLEIN

GUGGENHEIM MUSEUM, SALZBURG AUSTRIA, HANS HOLLEIN, ARCHITECT

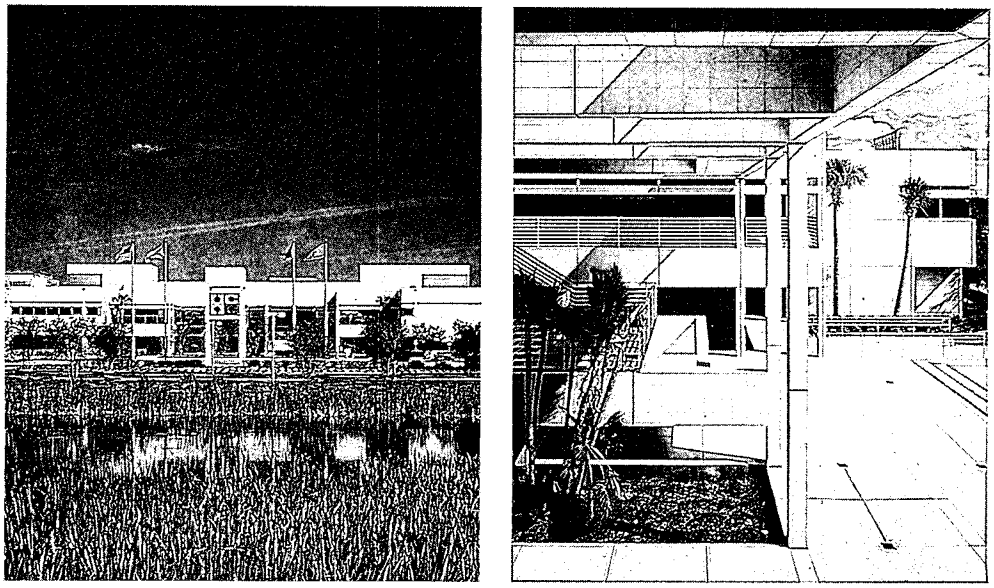

JOSHUA WHITE

GUGGENHEIM MUSEUM, BILBAO, SPAIN, FRANK O. GEHRY & ASSOCIATES


imagine

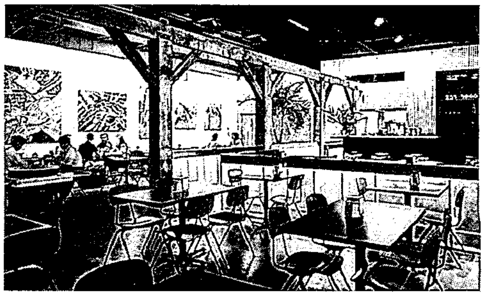
Citizens and Architects Honor Florida Buildings

TO HELP ITS MEMBERS UNDERSTAND THE public role of architecture, Tampa Bay AIA invited separate juries of architects and citizens to judge this year's awards submissions. While the two groups agreed on the merits of three projects—a restaurant, an office building, and an academic facility—they selected entirely different buildings for first place. The jury of architects, comprising Eugene E. Aubry, Andrea Clark Brown, and Roney Mateu, gave its highest award to the Brandon Learning Center by Ranon & Partners, a porcelain-tile-clad community college in Hillsborough County. The public jury, which consisted of Tampa councilwoman Linda Saul-Sena, photographer Brad Cooper, psychologist Joyce Parr, and museum curator Christoph Gerozissis, also cited two high schools by Ranon & Partners, but its top honors went to a Mediterranean Revival house renovation by the Jan Abell Kenneth Garcia Partnership. A project that drew praise from both groups, the State Regional Services Center by Rowe Rados Hammer Russell Architects (ARCHITECTURE, June 1992, pages 52-57), was lauded for its sensitively designed courtyard. The two juries also awarded a communications building on the University of South Florida campus for its strong regional character, and a restaurant that recalls its former life as a loading dock through timber columns and beams. The only urban project, a department store and parking complex in St. Petersburg, was favored by the architects for its Mediterranean references. ■



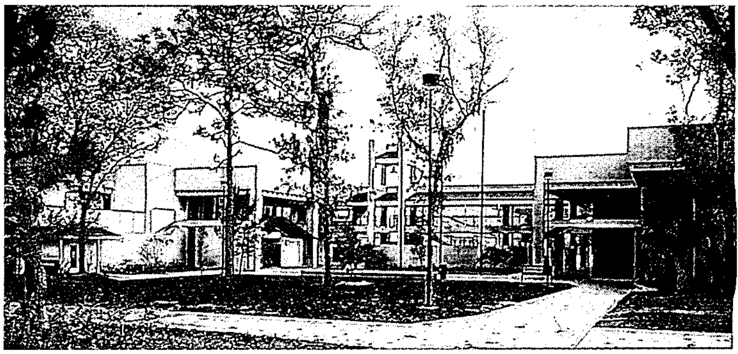
Excellence Award, Peer Jury
Brandon Learning Center, Hillsborough Community College
Hillsborough County, Florida
Ranon & Partners, Architect

Merit Award, Lay Jury
Central High School
Hernando County, Florida
Ranon & Partners, Architect



Merit Award, Peer and Lay Juries
The Loading Dock Westshore
Tampa, Florida
Rowe Rados Hammer Russell Architects

Merit Award, Peer and Lay Juries
State Regional Services Center
Fort Myers, Florida
Rowe Rados Hammer Russell Architects



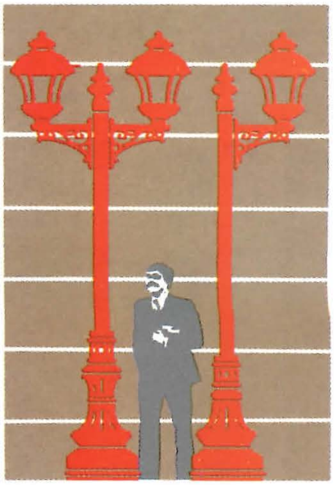
BY GEORGE COTT/CHROMA

Merit Award, Lay Jury
High School West, River Ridge Campus
Pasco County, Florida
Ranon & Partners, Architects

Excellence Award, Lay Jury
Traina Residence
Temple Terrace, Florida
The Jan Abell Kenneth Garcia Partnership

Merit Award, Peer and Lay Juries
Communication and Information Sciences Building
University of South Florida
Tampa, Florida
Woodroffe Corporation Architects
lung/Brannen & Associates, Design Consultant

Merit Award, Peer Jury
South Core Retail and
Parking Complex
St. Petersburg, Florida
APA Architecture with
RTKL Associates, Architects



THE LARGEST M
DID THEIR SHOPPI

Bow String Steel Jo
Mall of America
Bloomington, Min

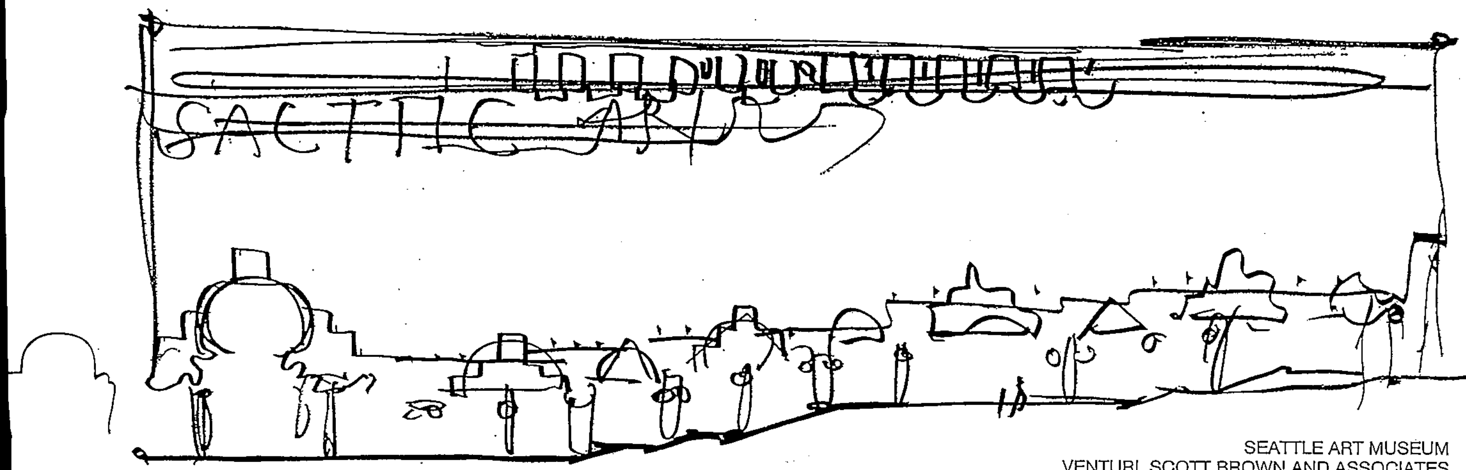
Architecture for the Arts

OVER THE PAST TWO DECADES, THIS COUNTRY HAS WITNESSED A VIRTUAL EXPLOSION IN THE construction of arts-related buildings. Of the 8,179 museums that currently belong to the American Association of Museums, for example, more than 40 percent have been established since 1970. In this issue, we focus on how museums and performing arts centers have changed with this growth. No longer bastions of the elite, they are becoming social centers for the many. Cultural institutions are responding to this philosophical change by locating their buildings in urban settings and commissioning designs with mass appeal, reviving downtowns in the process.

In Seattle, a major new museum by Venturi, Scott Brown and Associates makes a strong urban gesture within the city's downtown waterfront district by connecting two major avenues with a stairway (below) to create a grand public procession. In New York, Gwathmey Siegel & Associates took on the formidable task of restoring and expanding an urban landmark, Frank Lloyd Wright's Guggenheim Museum. The architects' new 10-story annex adds new galleries, offices, and storage space in an orderly and restrained manner that might have appealed to Wright himself. In a museum building boom unequaled in any U.S. city, Montreal has witnessed the recent completion of a quartet of major new museums—Moshe Safdie's addition to the Museum of Fine Arts; the new Museum of Contemporary Art by Jodoin Lamarre Pratte; LeMoyne Lapointe Magne's expansion of the McCord Museum of Canadian History; and the Pointe-à-Callière archaeological museum by Dan S. Hanganu. Although stylistically diverse, the four are all decidedly urban in their posture and greatly enhance Montreal's downtown fabric.

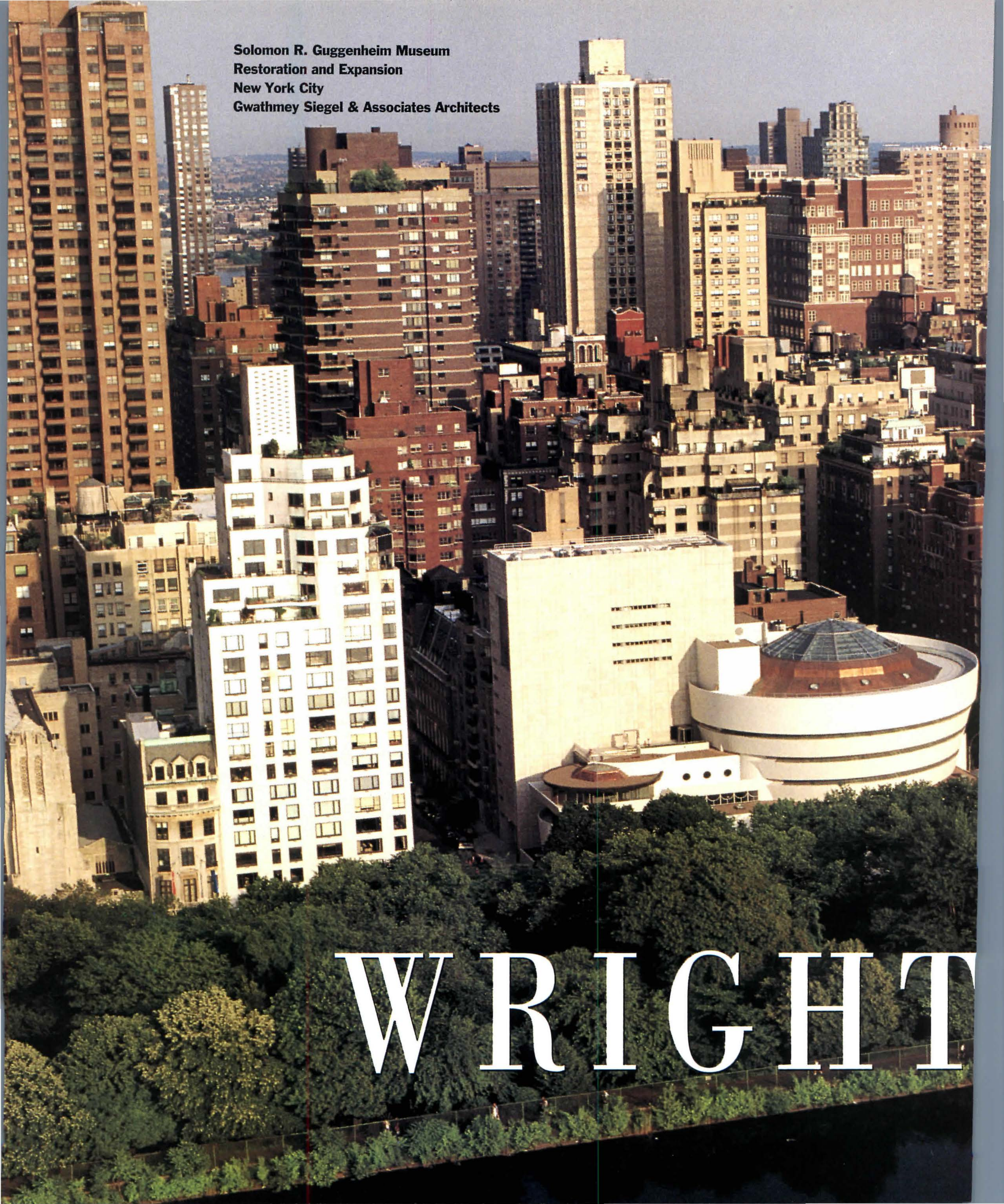
In the heart of Denver and a suburb of Dallas, two new performing arts centers also reinforce their contexts. Beyer Blinder Belle/van Dijk, Pace, Westlake & Partners enlivened the eclectic Denver Center for the Performing Arts, master-planned by Roche Dinkeloo in the 1970s, by transforming a sports arena into a new glass-enclosed theater. For Addison, Texas, a suburb of Dallas, local architect Gary Cunningham assembled sculptural forms around an existing water tower, creating flexible theater space and providing the community with a new civic symbol.

Unlike cultural institutions of the past, the buildings featured in this issue respond idiosyncratically to their urban settings. No longer subservient to black-box formulas for exhibition and performance spaces, their architecture takes center stage. These new museums and theaters achieve the stature Robert Venturi envisioned for his Seattle Art Museum: "not only an accommodating setting for the art, but a work of art itself." ■

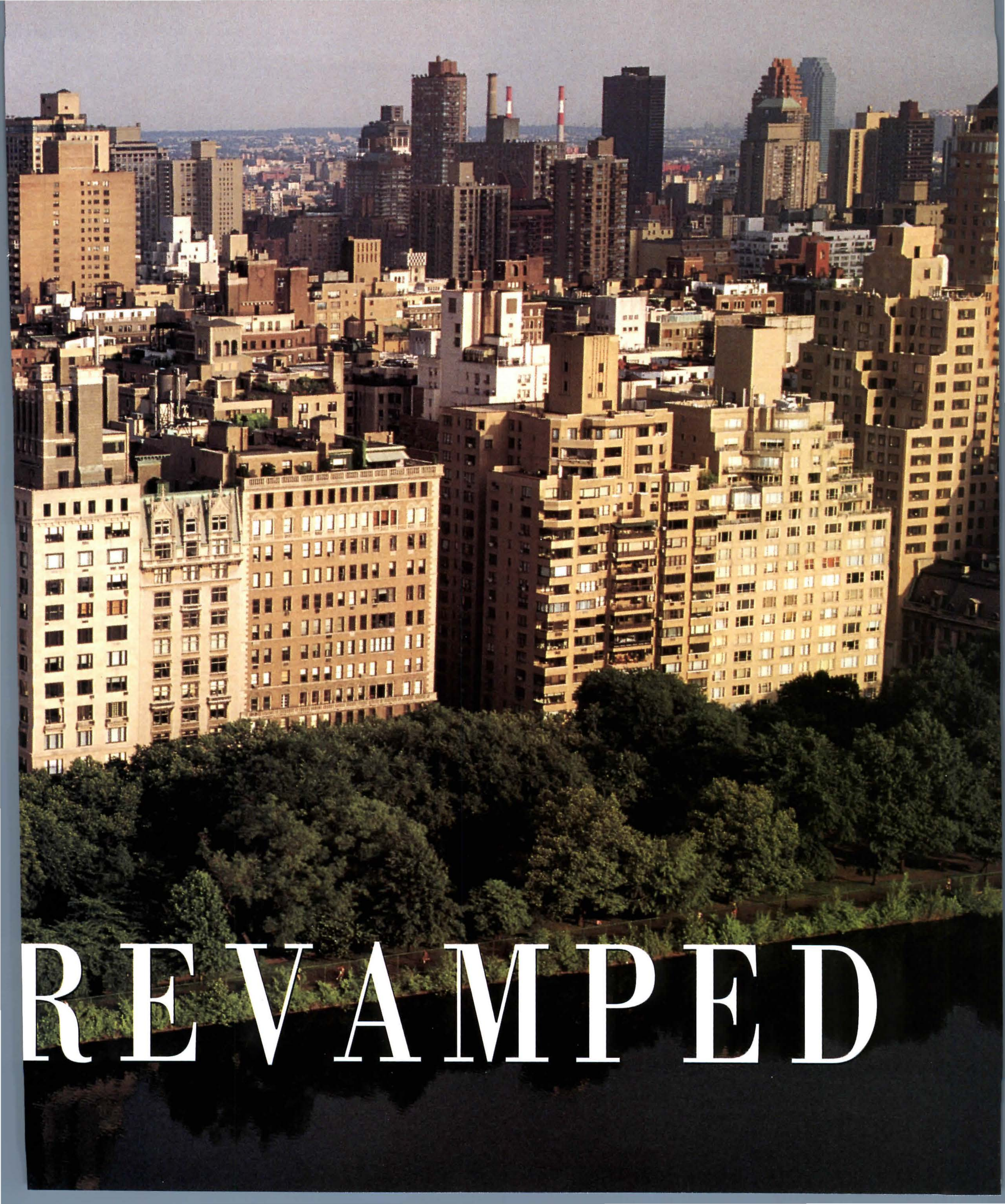


SEATTLE ART MUSEUM
VENTURI, SCOTT BROWN AND ASSOCIATES
SKETCH BY ROBERT VENTURI

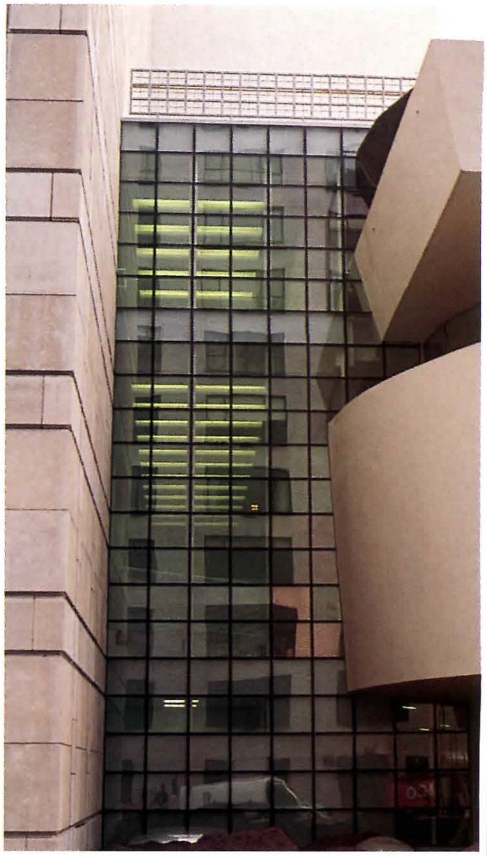
Solomon R. Guggenheim Museum
Restoration and Expansion
New York City
Gwathmey Siegel & Associates Architects



WRIGHT



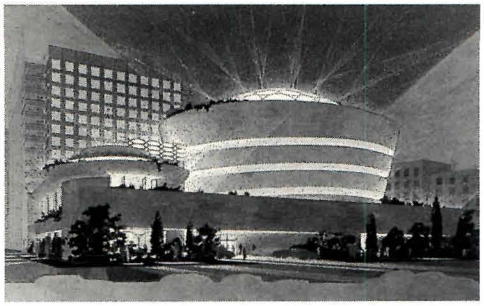
REVAMPED



AFTER UNDERGOING RENOVATION and expansion for two years, the Solomon R. Guggenheim Museum reopened in June. Frank Lloyd Wright's masterpiece, completed in October 1959, is now flawlessly restored, and its new, 10-story annex to the east, designed by Gwathmey Siegel & Associates, appears so tasteful, discrete, and logical that it is easy to forget the furor aroused by the public unveiling of the project in 1985. As originally programmed and designed, Gwathmey Siegel's first scheme horrified admirers of Wright's museum, leading critics to characterize the union between the architects' overbearing tower and Wright's spiral rotunda as a toilet tank and bowl. Such outrage and ensuing community opposition spurred former museum director Thomas Messer to scale back his program and urge the architects to produce a less obtrusive addition. Furthermore, since 1989 would mark the Guggenheim's 30th birthday—the age when New York City buildings become eligible for landmark status—it became urgent to revise the design and obtain the needed building permits before the city's Landmarks Preservation Commission could postpone construction indefinitely.

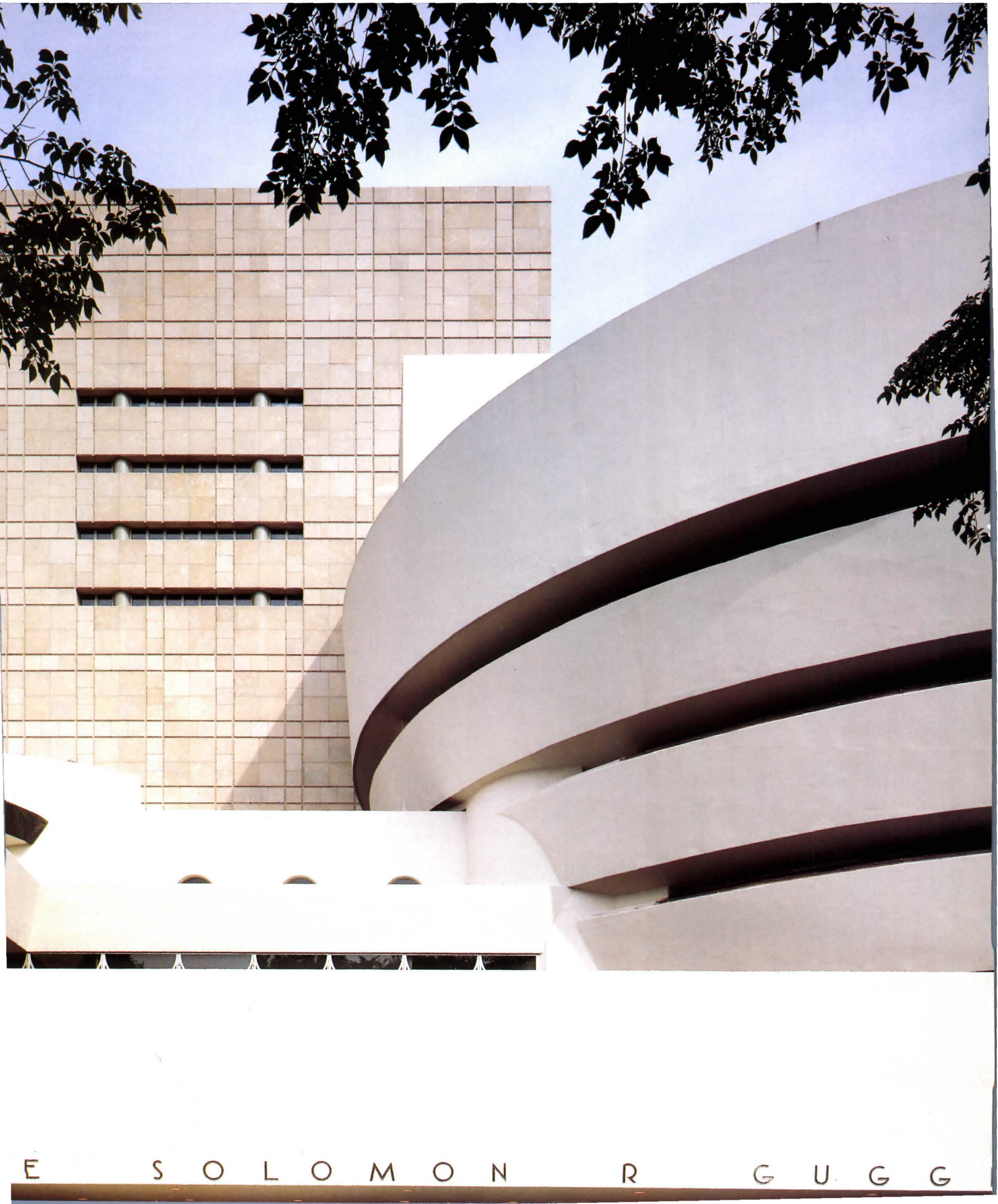
Gwathmey Siegel revised its scheme to loosely resemble a 1949 sketch by Wright (below) for a 15-story-high, 25-foot-wide, 100- foot-deep addition, housing galleries, archives, and artists' studios. In arguing for its expansion, the Guggenheim used Wright's drawing as evidence that the original architect had considered a tower to be an appropriate backdrop for his museum, and that the Gwathmey Siegel-designed slab would conform to his wishes. But the new addition, a simple box that boosts the museum's exhibition space to 51,100 square feet and its offices to 15,590 square feet, merely echoes Wright's scheme in its gridded stone pattern, inspired by the fenestration of Wright's proposed concrete and glass volume.

Tartan-patterned limestone of new annex (top left) is based on gridded concrete and glass facade of Wright's 1949 proposal (below). Small rotunda is joined to annex by curtain wall (top right). Limestone facade of addition awkwardly abuts large rotunda (facing page).



PROPOSED ADDITION, FRANK LLOYD WRIGHT (1949)

Gwathmey Siegel's token nod to Wright, however, has produced an unobtrusive, rectilinear foil to the master's swirling, cascading marvel. As viewed from the north, the slab is well differentiated from the original small rotunda by means of an intersecting glass curtain wall. However, its west-facing limestone wall slams into the uppermost spin of the large rotunda at an angle that subverts Wright's radial geometry. Many find this architectonic offense unforgivable, arguing that Gwathmey Siegel should have devised some sort of vertical notch to reveal Wright's conclusion of the spiral against his V-shaped stair tower. The architects point out, however, that such an interruption would have reduced gallery space within the annex and would have been impossible to successfully accomplish because of the existing freight elevator, fire stair, and penthouse on the roof of the large rotunda. Also unfortunate is the imprecise fabrication of the tartaned limestone veneer; the complicated pattern's many panels fail to align precisely.

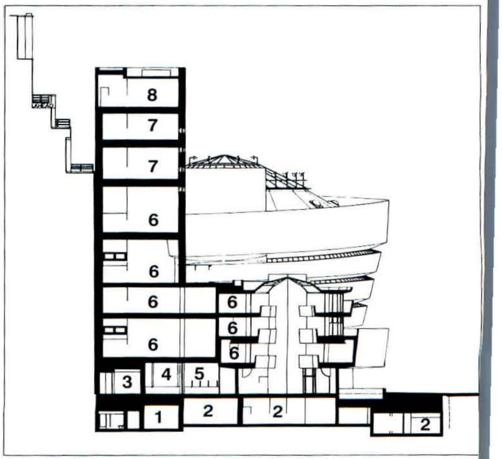

E SOLOMON R GUGG

Inside, however, Gwathmey Siegel's modest tower offers Guggenheim curators workable if narrow settings to mount a broad range of artworks from a collection that has grown to 6,000 works since the museum was founded. Four new floors of galleries, three of which are topped by double ceilings that permit unobtrusive reflected lighting, make it possible for the museum to show large-scale works for the first time.

Intersections between the new building and Wright's large and small rotundas are beautifully accented and defined. The rectilinear exhibition floors of the annex meet the sloping spiral ramp of the large rotunda through passages to the east and west of the V-shaped stair tower, which serves as a knuckle between annex and large rotunda. These passages offer museumgoers exciting vistas into the annex, as well as new angles and levels from which to perceive the main rotunda. The annex's second and fourth floors connect with the mezzanines of Wright's small rotunda, affording fresh perspectives of this stunning space. Originally designed to house offices, the small rotunda has been remodeled to accommodate a gift shop on its first floor and exhibitions on the balconies above. The small rotunda's original cast stone cornice now sweeps into the fourth-floor gallery virtually at eye level, offering a never-before-seen close-up of its intricate leaf pattern. A 900-square-foot sculpture terrace off a new fifth-floor gallery offers a panorama of Central Park and the city.

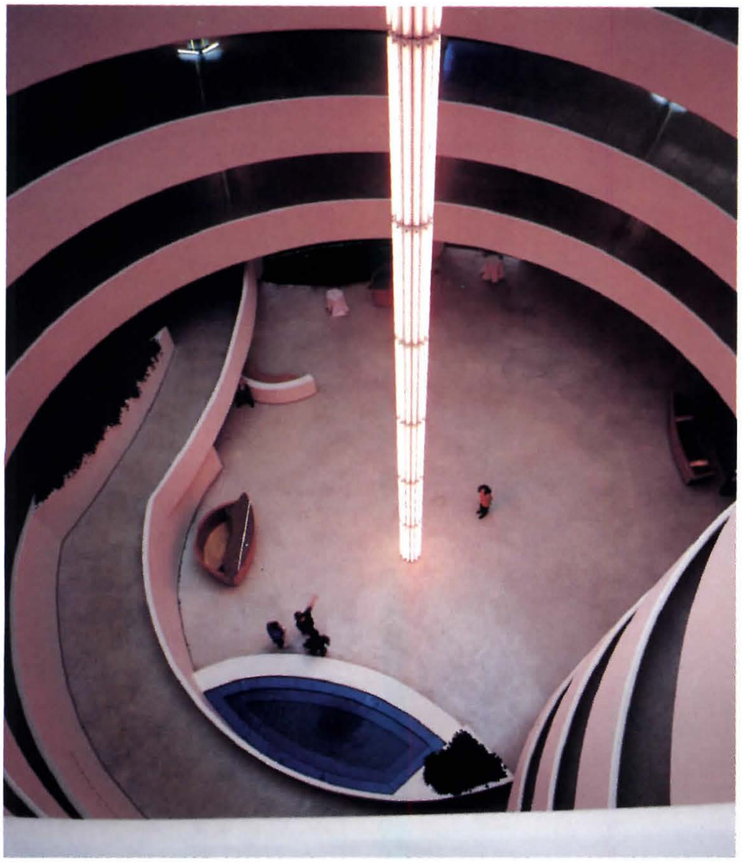
Gwathmey Siegel's respect for Wright is most evident in the restored great rotunda. With a restrained hand, the architects artfully repaired much of the damage wrought by the museum's previous directors. The great spiral has always been viewed as more monument than museum, suggesting that Wright had little regard for the nonobjective art his patron collected. Director James Johnson Sweeney, fed up after only a year of dealing with Wright's eccentric space, resigned in 1960, to be succeeded by Thomas M. Messer. Both men took practical but clumsy measures to tame the spiral for displaying art, efforts driven, at least in the case of Sweeney, by a genuine contempt for the building. A believer in artificial light for artwork, Sweeney sealed the dome over the rotunda as well as the top ring of skylights; the top of the spiral was relegated to storage. Gwathmey Siegel opened the spiral all the way to the dome, and installed new ultraviolet-filtering glass in the dome and skylights. The rotunda, as spare, abstract, and stripped to its essence as a Georgia O'Keeffe desert skull, is Wright's

Fourth floor of annex (above) incorporates Wright's small rotunda (facing page, top) and reveals its cornice (facing page, bottom right). Mezzanines of small rotunda (facing page, bottom left), are now devoted to display of small-scale artworks.



EAST–WEST SECTION

1	RECEPTION
2	TECHNICAL SERVICES
3	LOBBY
4	RECEIVING
5	HOLDING
6	GALLERIES
7	OFFICES
8	MECHANICAL



most austere work—perhaps even more so today, given its fresh coat of stark white paint. Paradoxically, Wright specified a putty-colored exterior in 1959, and his original renderings show a building richer in color, texture, and materials than the original budget allowed.

Over the next five years, the restoration of Wright's masterpiece will continue. The exterior of its concrete shell will be stripped of its coatings, and surface cracks will be stabilized and waterproofed. Meanwhile, the Guggenheim's expansionist policy proceeds under the leadership of museum director Thomas Krens, who replaced Messer in 1988. In June, Krens opened the Guggenheim Museum SoHo, a landmark loft renovated by Arata Isozaki (page 25). Two new museums are being planned abroad—in Salzburg, Austria, designed by Hans Hollein, and in Bilbao, Spain, by Frank Gehry. Preservationists, of course, had been urging off-site building for decades as a way to save Wright's masterpiece from an annex. Had such a policy been implemented earlier, the Guggenheim might have survived without Gwathmey Siegel's controversial addition, thereby respecting Wright's masterpiece as the most remarkable work of art in its entire collection. That would have really honored Wright. ■

—MILDRED F. SCHMERTZ

SOLOMON R. GUGGENHEIM MUSEUM
RESTORATION AND EXPANSION
NEW YORK CITY

ARCHITECT: Gwathmey Siegel & Associates Architects, New York City—Charles Gwathmey, Robert Siegel (principals); Jacob Alspector (associate-in-charge); Pierre Cantacuzene, Gregory S. Karn, Earl Swisher (project architects); Paul Aferiat, Adrienne Catropa, Pat Cheung, Nancy Clayton, Marc Dubois, Steven Forman, David Fratianne, Gerry Gendreau, Siamiak Hariri, Una Heron, Anthony Iovino, Elizabeth Kraft, Dirk Kramer, Dan Madlansacay, David Mateer, Jeffrey Murphy, Roy Perchik, Daphne Poser, Jennifer Pirwitz, Jurgen Raab, Joe Ruocco, Susan Scott, Gary Shoemaker, Christine Straw, Irene Torroella, Alexandra Villegas, Peter Wiederspan, Ross Wimer, Steve Yablon (project team)

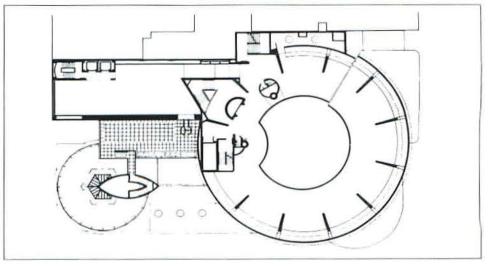
ENGINEERS: Severud Associates (structural); John L. Altieri (mechanical/electrical/plumbing); Feld, Kamintzky & Cohen (forensic)

CONSULTANTS: Office of Pat DeBellis (landscape); Light and Space Associates (lighting); Vignelli Associates (graphics); Peter George Associates (theater); Specifications Associates (specifications); Heitman & Associates (curtain wall); Cole, Gillmann Associates (building codes); Development Consulting Services (zoning); Woodward Clyde (geotechnical); Jaros, Baum and Bolles (circulation)

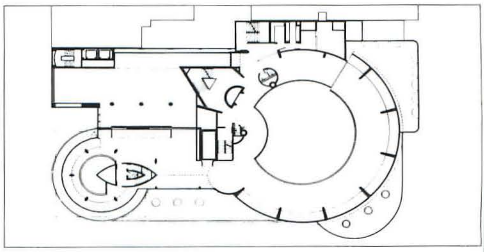
CONSTRUCTION MANAGERS: Lehrer, McGovern & Bovis (annex); George A. Fuller Company (restoration)

COST: Withheld at owner's request

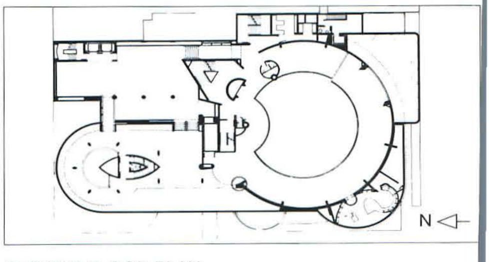
PHOTOGRAPHY: Paul Warchol



FIFTH FLOOR PLAN



THIRD FLOOR PLAN



SECOND FLOOR PLAN

kylight over large rotunda (this page) has een replaced by thermal glass. Light culpture by artist Dan Flavin (facing page, p left) celebrates Wright's magnificent pace. Original V-shaped public stair (facing age, top right) has been refurbished.

Addison Conference and Theatre Centre
Addison, Texas
Cunningham Architects

LOCAL COLOR

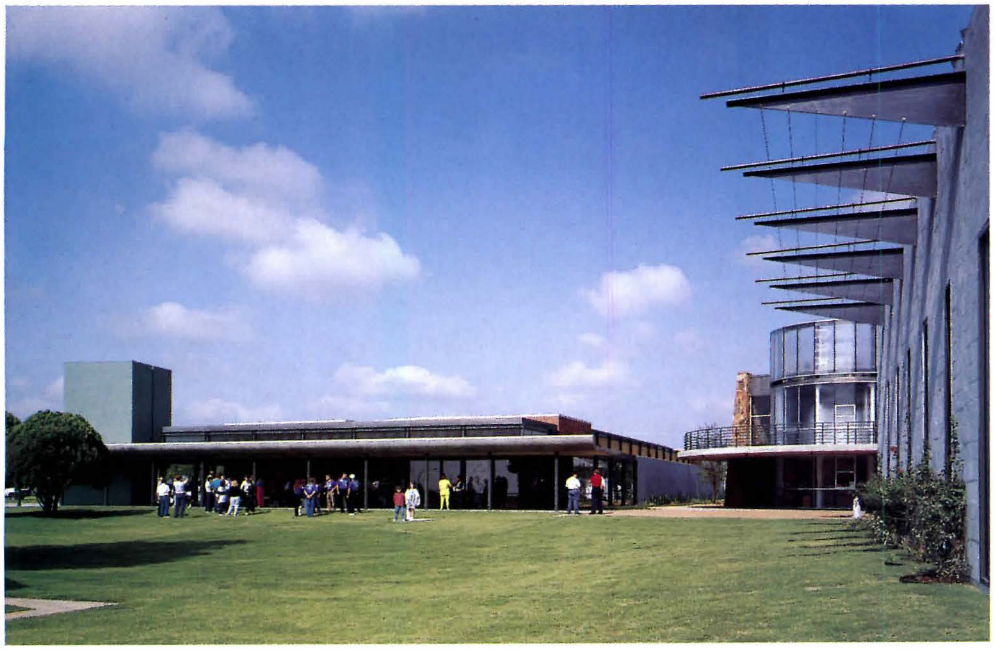
LOCATED JUST NORTH OF DALLAS, TEXAS, Addison is a prototypical centerless suburb sliced by freeways and diced up into shopping centers, office parks, and strips of restaurants specializing in two-for-one margaritas. Troubled by its lack of history and sense of place, the town fathers decreed in the early 1980s that henceforth all civic buildings would be red brick and, whenever possible, embellished with columns, pediments, and other evidence of refined architectural pedigree. "There's no reason why we can't blend traditional influences in with all this chrome and glass," Mayor Jerry Redding, now deceased, declared at the time. "We're not Dallas. We've even changed our name from the City of Addison to the Town of Addison."

Consequently, Addison ended up with more pseudo-Colonial public buildings than Williamsburg, without the corresponding historical rationale. Compounding the problem, some of its new strip centers began sporting Queen Anne turrets and French Quarter ironwork.

In designing the Addison Conference and Theatre Centre, Dallas architect Gary Cunningham successfully skirted this civic confusion without thumbing his nose at Addison's desire for an image and a sense of place. His

Addison complex (these pages) incorporates elements of town history, including water tower, fieldstone walls, and airport imagery in theater (facing page, top left). Brick-clad conference centre features clear references to Mies (facing page, top right).

Strong sculptural forms of conference center (below), cylindrical ticket booth, and boxy theater wing frame a central plaza (bottom) that serves as both entertainment and performance space. Vertical elements counterbalance the horizontality of the overall composition and of the surrounding landscape.



48,000-square-foot complex combines elements of Addison's farming past with fragments of its WPA years and unapologetic references to its current status as a shopping, restaurant, and aviation enclave.

The new $6 million facility sits beside an existing theater—housed in a tiny fieldstone cottage that in the 1930s was a home demonstration club for Addison housewives—and directly beneath the 180-foot-high Addison water tower. In small towns, a water tower is frequently the major landmark, a rural version of a city's skyscraper or suspension bridge. By incorporating it into his overall scheme, Cunningham honors the obvious and the familiar, while heightening the center's symbolic importance. "The existing architecture isn't earth-shattering," the 39-year-old architect says matter-of-factly, "but it's real, and it's what we got, so we decided to accept it and work with it."

Instead of creating a monolithic civic center—the albatross of many ambitious suburbs—Cunningham designed a village of small buildings linked by courtyards and plazas. The one-story conference center is itself a collection of even smaller buildings—offices, meeting rooms, kitchen—that snap together with Miesian crispness. Three verti-

cal elements—an information center, the ticket booth, and a stair tower—balance the horizontality of the composition and visually relate the complex to the water tower in the background. Yet the scale remains intimate and welcoming, and, except for red brick walls and carved pine doors, the materials are rugged and industrial—steel, glass, and polished concrete. Structure is celebrated so that visitors can see how the building was constructed—and, by implication, how cheap and sentimental most of the other town architecture really is.

The Addison Centre Theatre extends these ideas beyond the conference block. A massive steel and glass drum, an idealized version of a 1930s ticket booth, rises like a futuristic sculpture from the plaza. A swelling ring of concrete provides both shelter and an observation deck. At night, the drum becomes a glowing beacon for theater patrons, while in the lobby, it creates numerous odd and surprising spaces where people can linger and chat. The lobby is as theatrical as anything on stage, and includes a large exposed rock that might be part of an archaeological dig, and a veering concrete staircase that appears to be deconstructing before a visitor's eyes.

The cylindrical steel and glass ticket booth, an idealized version of a 1930s kiosk, becomes a glowing beacon for patrons at night (bottom). The theater company plans to use balconies and rooftops (below) as both stages and seating for outdoor performances. Brick plaza will double as a stage.

Theater lobby (below) provides a series of intimate and festive spaces for patrons. The conference center (bottom) is partly wrapped by a glazed gallery, with exposed I-beams, brick walls, and carved pine doors. This blend of contemporary and vernacular details is typical of the entire complex.

The theater proper, containing 200 seats, is the ultimate found space, a new-old warehouse. Addison Centre Theatre made its reputation on environmental productions, in which conventional divisions between audience and actors, indoors and outdoors, were routinely blurred. Over the years, the original "Old Stone House" theater had been turned into a restaurant, a revival hall, a roadhouse, and even a lake.

To accommodate the company's style while allowing it to change and grow, Cunningham designed a combination factory and Renaissance playhouse, with classical proportions (75 feet long, 55 feet wide, and 30 feet high), detailed with the same austere industrial finishes as the conference center. The floor is concrete; the walls, raw concrete block, notched to accommodate a dizzying assortment of joists and I-beams that support new ceilings, galleries, and walls. Lighting, sound, and video hookups have been placed in wall columns so that theater equipment can be plugged in anywhere. The joists and I-beams are merely slotted or bolted on, so that the entire space can be reconfigured in a few hours without breaking the theater's production budget. "It's really all just rock 'n' roll technology," Cunningham explains.

RAY DON TILLEY

"More like U2 than classical theater." (See related article, pages 98-99.)

But the architect's description belies the innovation of the Addison Centre Theatre. There is no space like it anywhere in the country. While flexible, it is not just another anonymous black box that acquiesces to a director's every whim. By placing four structural columns along one side of the room, and arranging the numerous doors so that they can't be ignored, Cunningham has guaranteed that architecture will influence everything that happens on stage. The industrial space is meant to challenge actors and directors instead of fading into the background. Every corner of the theater provides a space of strong character.

The major civic contribution of the Addison Conference and Theatre Centre may be as the new community gathering place, the center that Addison has been hunting for decades. Against the numbing scale of the freeway and the shopping center parking lot, Cunningham has focused on street, block, and path. His buildings are low and compact, and laid out more like a ranch compound than a conventional civic center. The parking lot is subdivided into small rooms holding only 25 cars, so visitors will not have to

Cunningham constructed a rock outcropping at the base of the new theater's main stairway (below). Lobby (bottom) looks out on an enclosed garden featuring native Texas plants and grasses, and is partially framed by a native fieldstone wall that recalls the theater's first home, a stone house nearby.

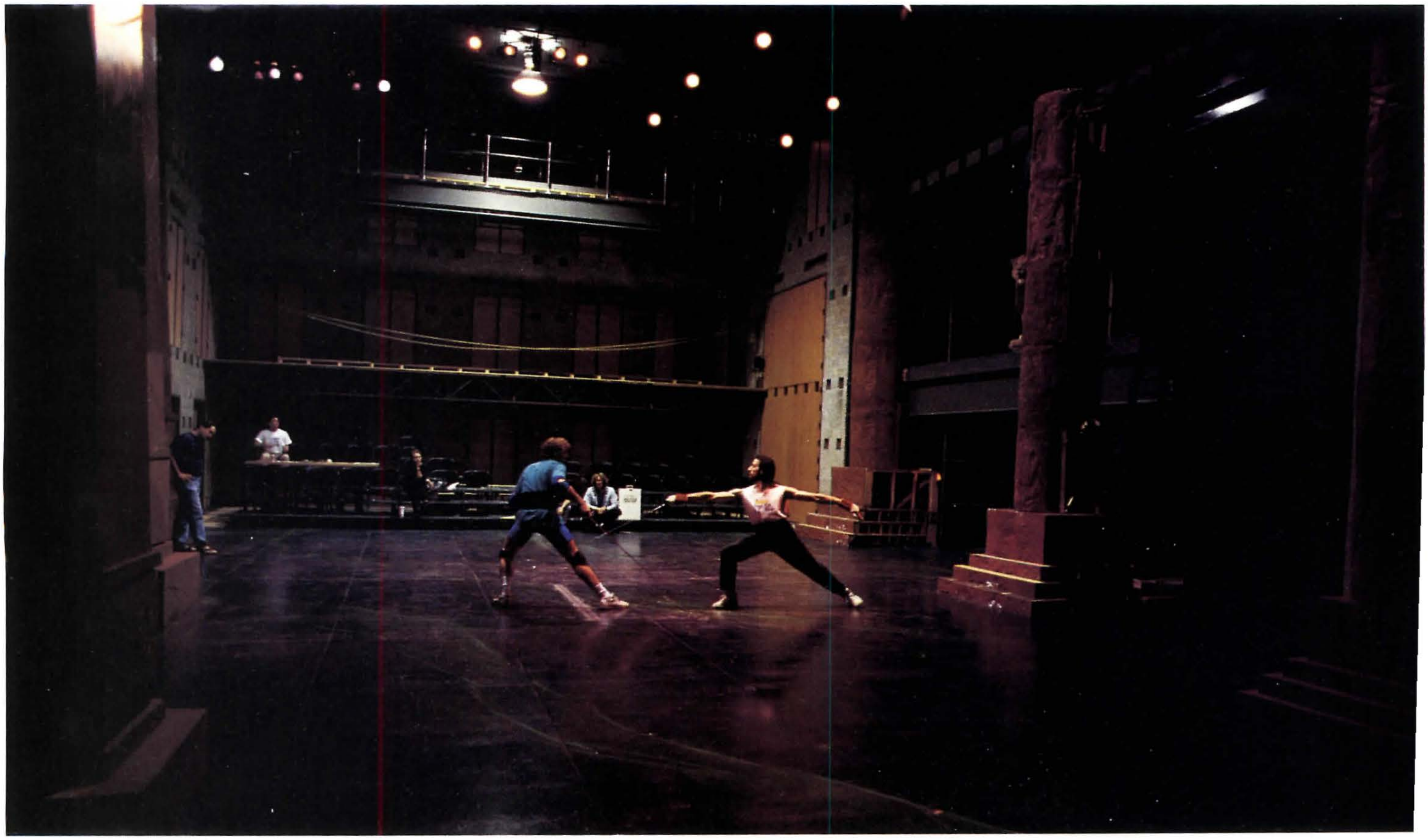
The Addison theater combines the flexibility of a warehouse with the proportions of a classical stage (bottom and facing page, bottom). Cunningham designed the 3,500-square-foot room with notches for beams to support new floors and ceilings (below). The space can be easily reconfigured.

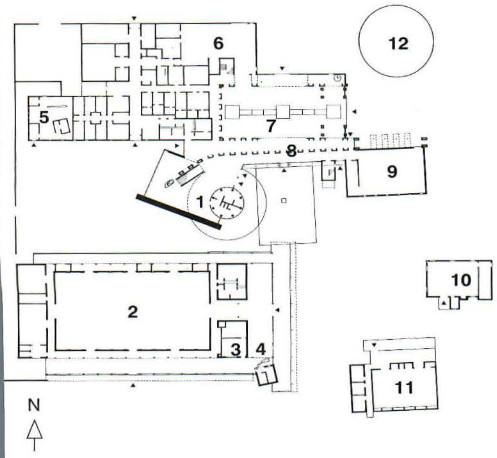
trudge through a sea of fenders to reach the theater. The path from car to theater and conference center is marked by an historic windmill, and by clumps of black locust trees that are indigenous to the site. The courtyard is planted with native trees and grasses; one theater wall is finished in the same tan fieldstone as the Old Stone House.

Cunningham has respected the original grid of streets in his alignment of the central plaza, which now visually terminates a narrow residential thoroughfare. At the same time, his series of stepped vertical elements acknowledges nearby monumental structures such as the water tower and a commercial airport. The steel and cable roof of the theater wing mimics the details of an airplane hangar across the street.

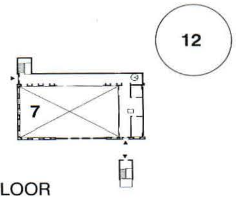
Such planning and material detailing are what "sense of place" ultimately means anyway: not playing architectural dress up, but confronting whatever homely details exist and making something of them. The Addison Conference and Theatre Centre reflects authentic images of what this Texas town is really like—for which its residents should be grateful, and from which other communities can learn a great deal. ■

—DAVID DILLON

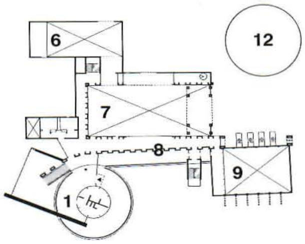




GROUND FLOOR



THIRD FLOOR



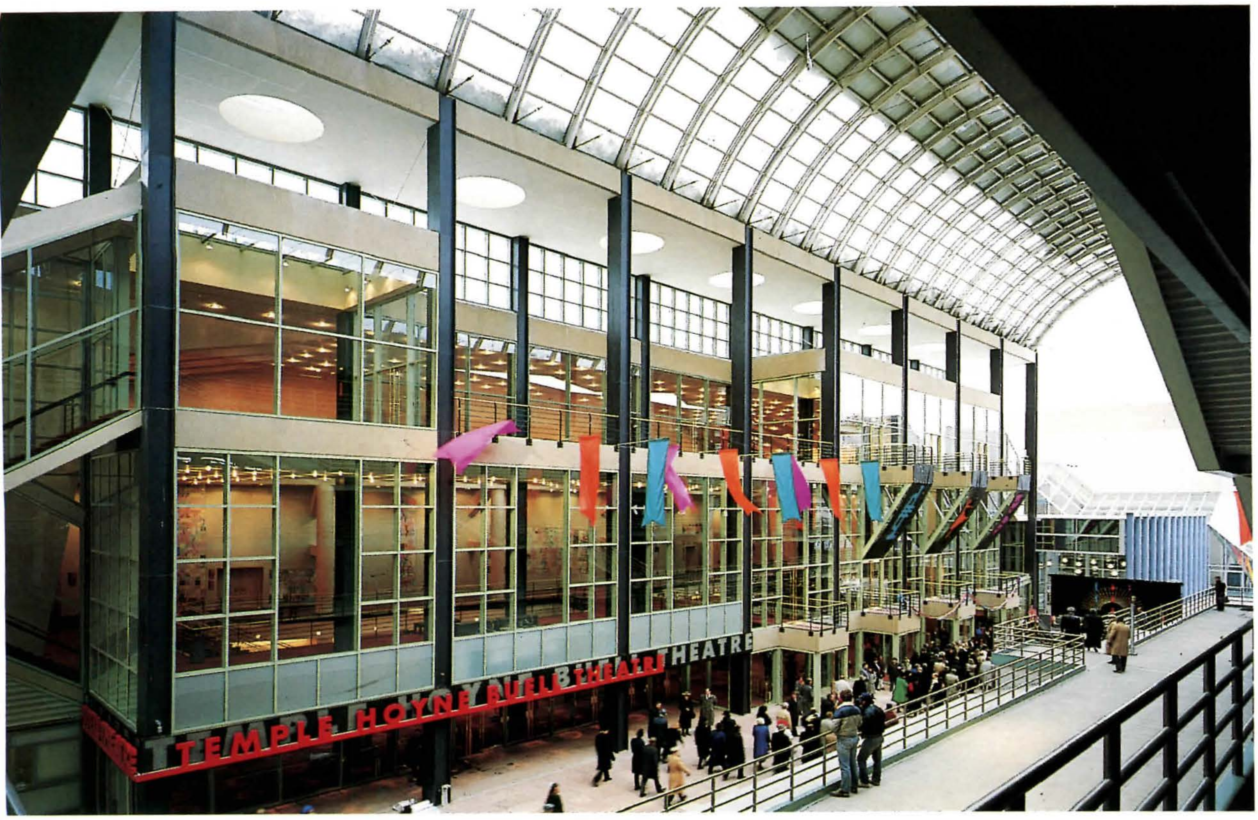
SECOND FLOOR

1 LOBBY
2 EXHIBITION HALL
3 OFFICES
4 RECEPTION
5 CHILD CARE
6 SHOP
7 THEATER
8 GALLERY
9 REHEARSAL/EDUCATION
10 OLD STONE HOUSE
11 FUTURE COMMUNITY HOUSE
12 WATER TOWER

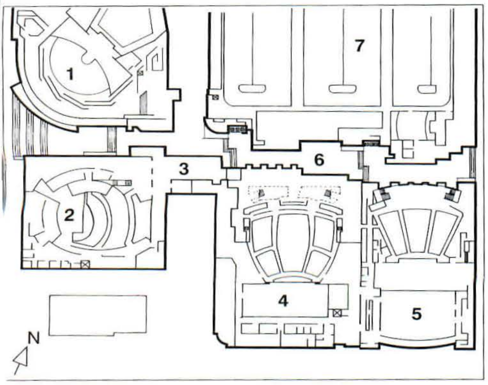
ADDISON CONFERENCE AND THEATRE CENTRE
ADDISON, TEXAS

ARCHITECT: Cunningham Architects, Dallas, Texas—Gary Cunningham (principal); Russell Buchanan, Sharon Odum, Chris Fultz, Tim McLaughlin (design team)
LANDSCAPE ARCHITECT: The Kellams Group
ENGINEERS: Ellisor & Tanner (structural); M.E.P. Systems (mechanical/electrical); Jim Kurtz (civil)
CONSULTANTS: Pamela Hull Wilson (lighting); Jim Johnson + Joiner Rose (acoustics); Theater Projects Consultants (theater); David Sines (fountain)
GENERAL CONTRACTOR: The Cadence Group
COST: $6 million—$125/square foot
PHOTOGRAPHER: James F. Wilson, except as noted


Temple Hoyne Buell Theatre
Denver, Colorado
Beyer Blinder Belle/van Dijk, Pace, Westlake & Partners



STAGE PRESENCE



SITE PLAN

- HELEN BONFILS THEATRE
- BOETTCHER CONCERT HALL
- PAVILION
- TEMPLE HOYNE BUELL THEATRE
- AUDITORIUM THEATRE
- GALLERIA
- PARKING GARAGE

DENVER'S TEMPLE HOYNE BUELL THEATRE EXPANDS THE MILE-HIGH city's cultural complex into one of the largest in the country, second only to New York City's Lincoln Center. The new theater, built within the shell of a characterless 1940s sports arena, adds 2,830 seats to the three-theater complex, a major performing arts center constructed in the early 1970s. But unlike the monolithic architectural groupings of Lincoln Center, Los Angeles' Music Center, and Washington's Kennedy Center, the Denver Center for the Performing Arts based its downtown assemblage around an historic landmark. The 1907 Auditorium Theatre, a Neoclassical building of brick and terra-cotta, is the cornerstone of the evolving complex.

Situated approximately midway between the city's financial core and revitalized Larimer Square, Denver's 12-acre complex appears to have evolved as a haphazard grouping, though the cultural center was in fact master-planned by Kevin Roche John Dinkeloo Associates in 1973. Roche created a cross-axis by placing two new theaters along the western edge of the site to frame distant mountains. He also bridged 13th Street and closed Curtis Street to vehicular traffic, creating a linear galleria crowned with an 80-foot-high, glass-covered vault. Within his master plan, Roche designed the Helen Bonfils Theatre (1979) with four houses ranging from 150 to 550 seats, which anchors the northwest corner of the complex.

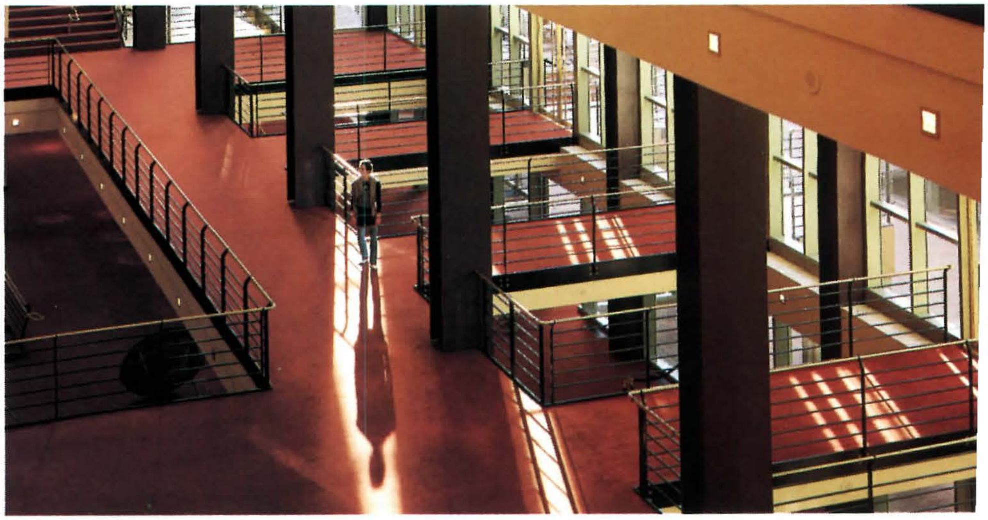
Inserted between Auditorium Theatre and Boettcher Hall (site plan, left), the new exterior wall of the Buell (top and facing page) incorporates existing vault of galleria (above, before renovation).

After commissioning Roche, the city brought in Hardy Holzman Pfeiffer Associates to design the 2,600-seat Boettcher Concert Hall (1978), which anchors the southwest corner of the complex. The local firm Muchow Associates was commissioned in 1979 to create an eight-level parking structure opposite the Auditorium Theatre. Although designed within a few years of one another, the boxy, brick Boettcher; the sculptural, concrete Bonfils; and the bare-bones, concrete parking garage are stylistically diverse.

Now, after a 12-year hiatus from expansion, the city has added Beyer Blinder Belle/van Dijk, Pace, Westlake & Partners's Temple Hoyne Buell Theatre to this eclectic mix. Originally, New York-based Beyer Blinder Belle was hired to update the 1973 master plan while Cleveland-based van Dijk, Pace, Westlake & Partners was commissioned to design the theater. As the project progressed, however, the firms worked in collaboration, maintaining a design autonomy that is reflected in the contrast between the building's animated lobby and its serene proscenium theater.

"Most performing arts centers have been aloof from cities, designed as temples to enshrine the arts," partner Richard Blinder maintains. "But the elitism built into their design has become a detriment. We felt that this concept would be particularly unsuitable in Denver." Accordingly, Beyer Blinder Belle treated the Buell as a populist stage set. The architects opened the arena to the galleria by removing its 200-foot-long brick facade. By incorporating the existing steel structure of the vaulted canopy, they created a frame into which a new exterior wall of glass was inserted. This minimalist, transparent envelope is enlivened by projecting balconies and bold signage, designed by Sussman Prejza.

However, the true measure of a performing arts center is in its performance spaces, and here the Buell shines. Van Dijk, Pace, Westlake & Partners took the design lead, achieving the all-too-often elusive combination of intimacy and grandeur. The house is arranged into a wide and gently tapered plan that accommodates 1,750 seats on the orchestra level and minimizes the distance between audience and stage. The architects faced the concave interior walls with buff-colored Colorado sandstone, accentuating its unpolished texture with projecting string courses and overlapping sawtooth panels for acoustical diffusion. Against this backdrop, they staggered a series of side boxes that float away from the walls.



The new glass envelope of the theater (facing page, top) is enlivened with colorful graphics designed by Sussman Prejza. The architects created a 60-foot-high lobby punctuated with angled balconies (facing page, center), bronze railings (*facing page,* bottom), and a lighting-bolt-shaped skylight (left).

As part of a their new master plan, the team designed a glass-enclosed pavilion that links the Buell and HHPA's Boettcher, providing space for overflow and special functions. Although plans for the galleria's third vault and other additions are on hold until funding is authorized, the historic Auditorium Theatre is undergoing restoration by Denver architect Semple Brown Roberts. New landscaping along Curtis Street accentuates the center's connection to I.M. Pei & Partners' 16th Street Mall, two blocks to the east.

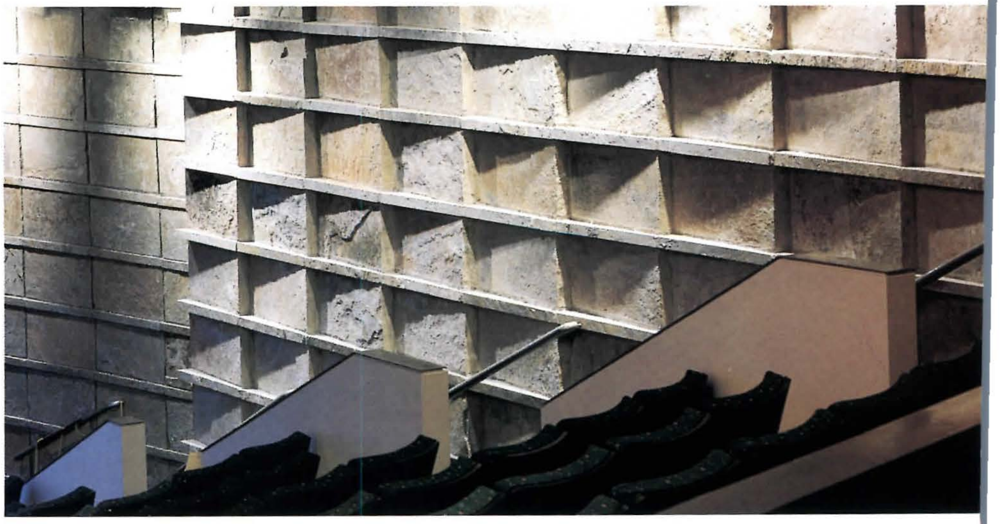
The Buell Theatre is a strong addition to the Denver Complex in terms of both urban design and architecture. The transparent exterior wall opens the room to not only the galleria, but the city beyond, while the state-of-the-art theater provides a flexible performance space that has successfully accommodated sold-out events, ranging from "The Phantom of the Opera" to high school graduations. Design principal Paul Westlake maintains that the architects' goal was to unify a collection of disparate building types and styles. The success of the new theater, however, lies in the architects' willingness to accept the eclectic buildings of the center and design a decorated glass facade in clear opposition to its solid masonry neighbors. Vibrant and kinetic, the Buell Theatre upholds the tradition of individualism so revered in the West. ■

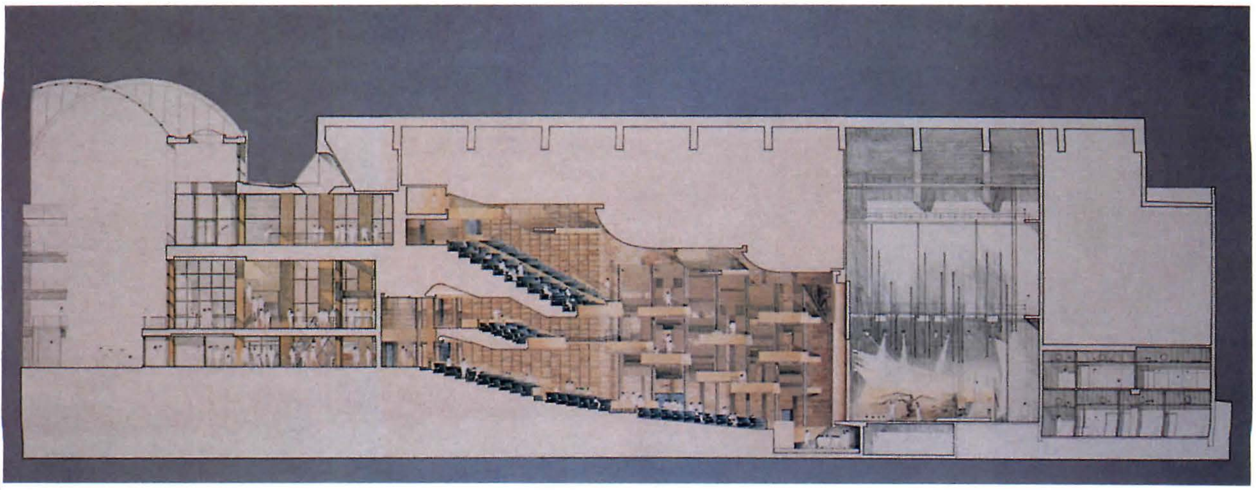
—LYNN NESMITH

TEMPLE HOYNE BUELL THEATRE
DENVER, COLORADO

ARCHITECTS: Beyer Blinder Belle/van Dijk, Pace, Westlake & Partners. Beyer Blinder Belle, New York City—Richard Blinder (partner-in-charge); Peter DeWitt (design partner); Laurence Marner (project manager); Robert McMillan (project architect/exteriors); Tim Dibble (project architect/interiors); Mariko Takahashi (project designer). Van Dijk, Pace, Westlake & Partners, Cleveland, Ohio—Peter van Dijk (design partner); Paul Westlake, Jr. (senior designer/partner); Phil Schroeder (architect); George Regula (job captain); Cristina Redi (designer)
ASSOCIATE ARCHITECT: Semple Brown Roberts, Denver, Colorado—Candy Fudge Roberts, Rusty Brown, Sarah Semple Brown (principals); Marc Applebaum (project architect); Rick Geiser (project manager)
ENGINEERS: Flack & Kurtz (mechanical/electrical); Martin & Martin (structural)
CONSULTANTS: Roger Morton Studio (theater); R. Lawrence Kirkegaard (acoustics); James Gundlach (audio designer); Howard Brandston Lighting Design (lighting); Sussman Prejza & Company (graphic design)
GENERAL CONTRACTOR: P.C.L. Construction
COST: $24 million—$185/square foot
PHOTOGRAPHER: Peter Aaron/Esto, except as noted

KREBS PHOTOGRAPHY



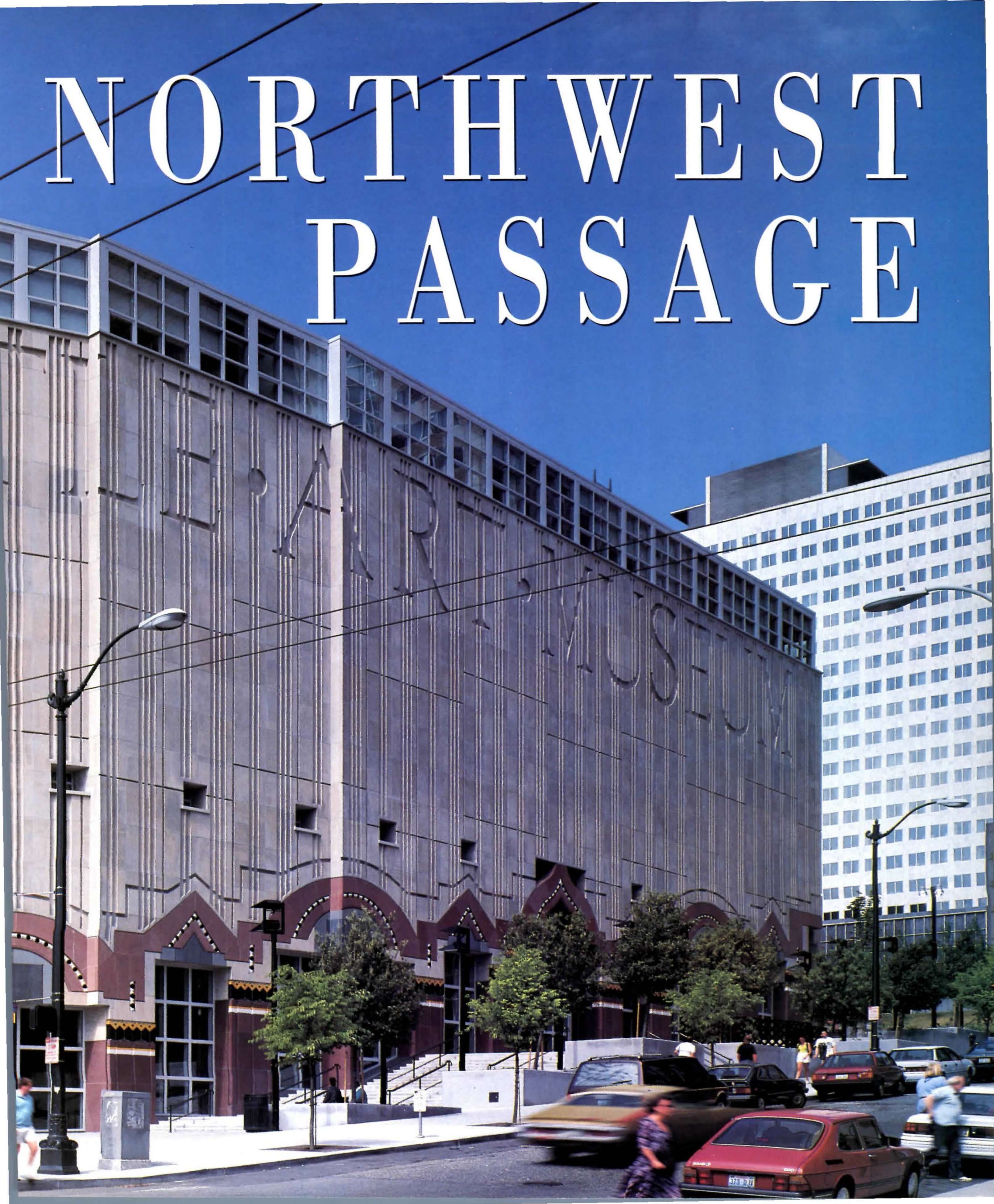


LONGITUDINAL BUILDING SECTION

Three-story lobby corresponds to each seating level (section, left); arc-shaped mezzanine appears to float free of theater's rear wall (facing page, top). Walkways leading to boxes (facing page, center) are screened behind panels of perforated metal to create theatrical scrims against sandstone walls (top and facing page, bottom).

Seattle Art Museum
Seattle, Washington
Venturi, Scott Brown and Associates, Architect

NORTHWEST PASSAGE



The portal marking the entrance to the museum on First Avenue (above left and preceding pages) will be accompanied by sculptor Jonathan Borofsky's 55-foot-high "Hammering Man," to be erected this month. Up the hill, the second-level entrance opens onto Second Avenue (above).

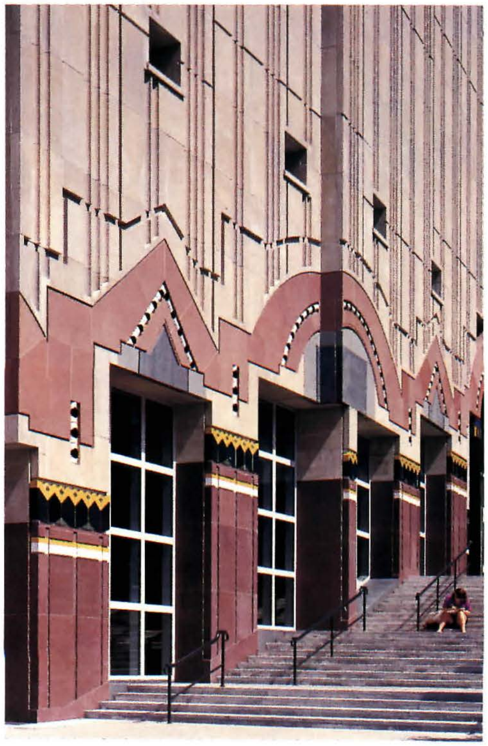
IT IS HARDLY SHOCKING TO SEE that Venturi, Scott Brown's Seattle Art Museum is revved up by an ornamental pattern jumping along a curved facade. This bold movement, along with the building's energetic juxtaposition of convex and complex curves, its active play of small- and large-scale elements, and its boxy massing that bends around the corner site, are all elements well situated within the Venturi, Scott Brown lexicon. What is surprising is the substantiality and craftsmanship of the fluted limestone exterior. All the building materials—including granite, reddish sandstone, bluestone, and polychromed terracotta—give the museum a monumental weight and texture. The detailing, elegant if quixotic, adds a level of refinement. Even the billboardlike lettering of the museum's name is carved in stone. All in all, the contradiction between solid materials and abstractly referential patterns, between impeccable details and chunky form, emphatically delivers the message of the "both-and" principle governing much of the architecture of Robert Venturi and Denise Scott Brown.

To be sure, many viewers may be predisposed toward a calmer, less idiosyncratic facade. But the Seattle Art Museum's amiable klutziness, combined with a solidity of deportment, exudes a civic bonhomie appropriate for an American urban museum. Robert Venturi remarks that his firm's recent museum projects, including the much-publicized Sainsbury Wing of the National Gallery of Art in London, belong to a special category of effort. The firm is attempting to create, as Venturi explains, a "current urban art museum that is popular yet esoteric, closed but open, monumental yet inviting, an accommodating setting for the art, but a work of art itself." If the Seattle Art Museum is a work of art of unconventional beauty, or a work of art that hardly pushes into new design frontiers, it is nevertheless a work of art that lives up to the architects' intentions.

The Seattle Art Museum was formerly housed in an Art Moderne structure by local architects Bebb and Gould in Volunteer Park on the outskirts of downtown Seattle. Hoping to reach the public by getting closer to th thriving downtown waterfront, the museu raised $62 million through a county bon and private donations. The area of downtow Seattle targeted for the new museum ha been transformed in the last several decades first by the renewal of nearby Pike's Plac Market, then by the revamping of the waterfront piers and the conversion of 19th-century industrial loft buildings into offices, antique shops, showrooms, and restaurants. Mos recently, the skyline has been further transfigured by the addition of 1980s Postmoder skyscrapers, including the nearby "Classicalesque" Washington Mutual Tower by Koh Pedersen Fox. The overall mix of old and ne

buildings, corporate and casual activities, and industrial and recreation spaces, gives the city a particularly lively air. In the midst of this jumble squats the Seattle museum, its corner entrance facing the waterfront, its back embracing the hill that slopes up to meet the rest of downtown's office towers.

Since Venturi and Scott Brown were required by zoning to keep a view corridor open to the Puget Sound harbor, they designed an outdoor staircase bordering the south wall that cascades from the hill at the back of the building at Second Avenue, down to the entrance portal at First. Inside the museum's soaring lobby, where limestone sheathes walls and columns, the architects stretched another broad staircase parallel to the outside stair, separated from the outdoors only by large glazed expanses. This grand stair takes visitors from the first level (where the auditorium, classrooms, and other functions are contained) past a café tucked onto a mezzanine, to the second-floor galleries devoted to temporary exhibitions.



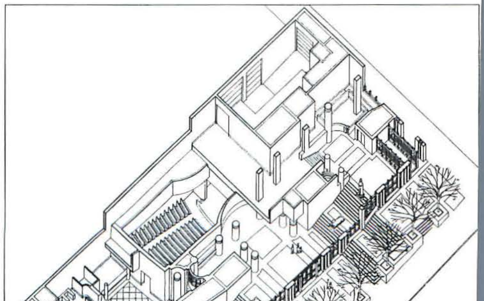
University Street *elevation* (above), *bordered* by broad outdoor staircase, follows slope of hilly site. Clad in fluted limestone and lively stone and terra-cotta ornament (left), facade features windows that step up with interior staircase. Setback penthouse level houses offices and library.

The similarity between the processional staircases and, indeed, the parti for the Seattle and London galleries, is striking. Both museums were designed at roughly the same time, although Venturi maintains the Seattle museum was begun first and finished later. As he explains, "It happened that both of the buildings needed to make big-scale urban gestures. Both have the large stairs with an inner wall of masonry, where the outer wall is a kind of glassed-in porch." In Seattle, however, the stair follows the grade of the hill, establishing a strong kinesthetic link to the contours of the site. Since the interior stair is separated from the exterior stair by windows, a visual connection between the parallel circulation systems strengthens the processional experience. As Venturi notes, "The museum

stair brings the exterior scale inside, giving the lobby a civic presence."

Punctuating the interior staircase are imposing marble Chinese sculptures solidly implanted in the stairway itself. They include large Ch'ing dynasty military guardians and Ming dynasty camels and rams that were formerly positioned outside the entrance of the museum's Volunteer Park building, but removed due to damage by airborne pollutants, lichen, and algae. Now that this awesome ensemble is housed inside the new building, the group dramatically transforms the stair into exhibition as well as circulation space. To keep the stair from being too grand, however, Venturi, Scott Brown has interrupted the ceiling's expanse with a series of two-dimensional proscenium arches painted a bright sienna on one side and marigold on the other. The colors and cut-out arches are blatantly scenographic—of the sort not usually seen in monumental museums. They clearly subvert the sense of majesty that almost prevails, and recall the energetic juxtaposition of traditional and pop elements on the exterior.

Ch'ing and Ming dynasty statues and painted arches dramatize grand staircase (above left, above right, and facing page). In the lobby, curved check room, emblazoned with Venturi's sketches (below left) and clustered limestone columns subtly guide movement (axonometric, below).



AXONOMETRIC

Central hallway divides galleries longitudinally (top left); west end, facing Puget Sound, is terminated by educational resource room (above left and facing page, top). Second Street entrance lobby (above) includes check room, wheelchair access, and stairway leading to temporary exhibition area.

The one confusing moment in the processional experience occurs at the museum's second level, devoted to temporary exhibitions, when a visitor begins searching for the stair to the third floor. Then it becomes clear: the grand stair's moment is over; now it's time for the elevator.

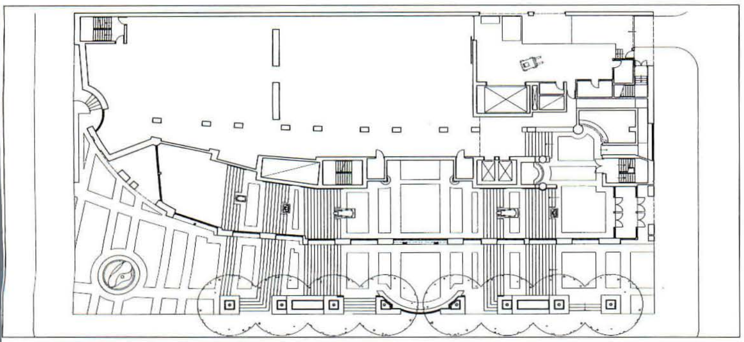
Within the Sainsbury Wing, Venturi, Scott Brown and Associates designed roomlike galleries with an axial procession of spaces for Early Renaissance and Northern European art. But in the Seattle Museum, the architects treated the galleries, which are located on the second, third, and fourth levels, as generic loft spaces. They have been shaped with added help from associate architects Olson Sundberg to accommodate a diverse but small collection that includes Asian holdings and African artifacts.

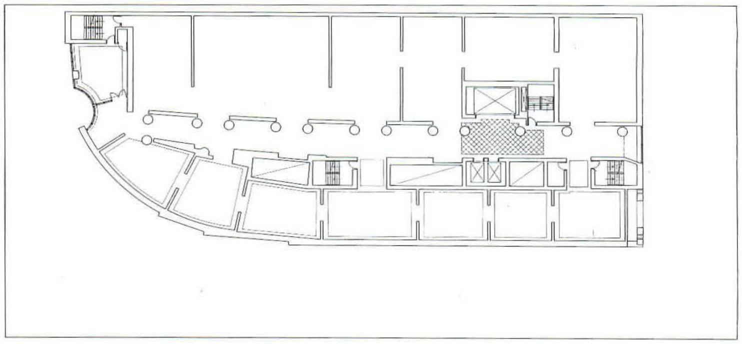
On the south side of the central corridor, these loft spaces are divided into the traditional, small-scale settings that best display decorative art objects. Here, smaller and more intimate galleries are arranged en suite behind the bowed south wall of the museum. They are carpeted, given traditional cornice moldings, and painted various shades of gray-blue, dark beige, and ivory that subtly alter the perception of the space. Several achieve stunning, chamberlike settings for installations, such as an 18th-century Tiepolo ceiling and painted door.

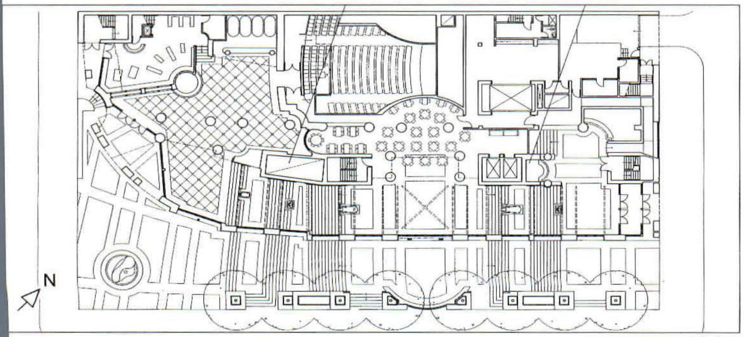
On the north side of the central spine, larger, more loosely organized galleries are outfitted with wood floors, planar walls, and freestanding movable partitions. Their Modernist disposition of spaces permits artworks to be displayed with architectonic bravura, spectacularly evidenced in the large, totemic interior houseposts of the Native North Americans installed on the third floor. On the fourth floor, galleries function as quiet backdrops for a choice collection of paintings by Helen Frankenthaler, Morris Louis, and other 20th-century artists.

Providing flexibility when needed, the well-ordered, layered division of Venturi, Scott Brown's longitudinal spaces provides a sense of orientation and hierarchy in exhibiting anything from a teacup to a teahouse (on the third floor). At the same time, one should recognize that this downtown museum provides only 38,000 square feet of gallery space within its 150,000-square-foot structure. It is not surprising that the 1933 museum in Volunteer Park is being renovated to house more of the Asian collections and a study center.

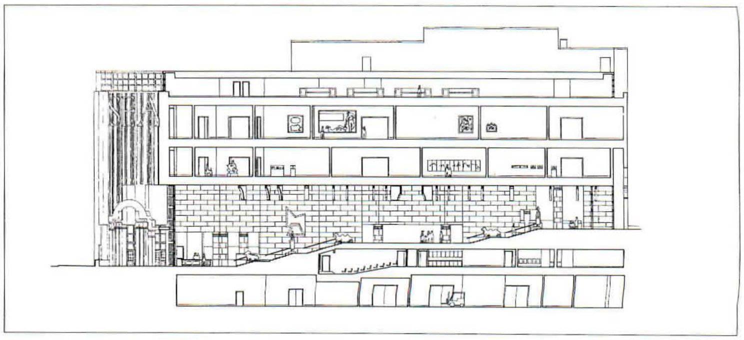
However pleasant the Seattle galleries, they lack the drop-dead quality of the rooms at the National Gallery. In the Sainsbury Wing, columned portals poetically frame gilt-edged altarpieces and paintings, drawing one through the enfilade, past bold, freestanding and engaged columns, where capitals and cornice moldings seem to fade into the gray walls. Natural lighting from clerestory windows in monitors softly permeates


SECOND FLOOR PLAN


THIRD FLOOR PLAN



COMPOSITE PLAN OF STAIRWAY THROUGH FIRST AND SECOND FLOORS


NORTH–SOUTH SECTION

the space, and is artfully combined with artificial light to bathe the works and the surrounding spaces in an almost sanctified aura.

The galleries in Seattle, on the other hand, are straightforward and comparatively spare in their detailing. They are lit primarily by spots on tracks, while natural light is confined to circulation areas and the offices and library on the penthouse floor. Daylight enters through large side windows that offer striking views; for example, the central hallway on all gallery floors curves slightly toward the entrance elevation, allowing a breathtaking panorama of water and sky to be viewed from a built-in sitting area wrapped around a concave window. At the opposite end of the corridor, facing east onto Second Avenue, a large, gridded window overlooks a park that rises to the downtown's main thoroughfares. Like the stair, these glazed ends of the corridor help orient visitors not only within the museum itself, but within the city as well.

In spite of its contextual gestures, the Seattle Art Museum does not bedazzle in the way that the acclaimed museums of the 1980s did, such as James Stirling and Michael Wilford's Neue Staatsgalerie in Stuttgart, Germany, which nestles energetically into a steeper hill. Yet Venturi, Scott Brown's museum makes important architectural statements in unifying the architects' themes into a coherent, architectonic whole. The consistency of the architects' vision is carried out in such devices as the site-responsive contour of the inside and outside stairs; the bend of the corridor following the curve of the outer wall; the odd and unexpected repetition of curved and arched design motifs. Such reverberations are consistently expressed in plan, section, and elevation, as well as detail. The Seattle Art Museum clearly attains what Robert Venturi and Denise Scott Brown indicated was their intention: to create a museum that is American, that has both popular appeal and a sense of permanence. And that's an accomplishment. ■

—Suzanne Stephens

Suzanne Stephens is a New York-based writer.

Galleries are designed as generic loft spaces, tempered to the objects displayed within. South galleries are traditional for Western art (top left and facing page); north galleries are flexible for exhibiting African sculpture (above left) and Native American artifacts (above).

SEATTLE ART MUSEUM
SEATTLE, WASHINGTON

ARCHITECT: Venturi, Scott Brown and Associates, Philadelphia, Pennsylvania—Denise Scott Brown (principal); Robert Venturi (principal-in-charge); John Pringle, James C. Bradberry (project managers); John Bastian (project architect); John Forney, Douglas E. Seiler, James G. Winkler (project team)

ASSOCIATE ARCHITECT: Olson Sundberg Architects, Seattle, Washington

LANDSCAPE ARCHITECT: Jongejan/Gerrard/McNeal

ENGINEERS: Leslie E. Robertson Associates (structural); John L. Altieri (mechanical/electrical) KPFF (civil/curtain wall)

CONSULTANTS: Ostergaard Associates (acoustics); Jules Fisher and Paul Marantz (lighting); Jules Fisher Associates (theater)

GENERAL CONTRACTOR: Howard S. Wright Co.

COST: $28 million—$155/square foot

PHOTOGRAPHER: Strode Eckert Photographics


JANET WRIGHT KETCHAM
WASHIN

CULTURAL

Montreal celebrates its 350th anniversary with four new museu


RODERICK CHEN

Pointe-à-Callière museum of history, designed by Dan S. Hanganu, is built over the archaeological remnants of Montreal's first settlement.

The Museum of Contemporary Art by Jodoin Lamarre Pratte has moved to Place des Arts, the city's primary cultural complex.

CANADA, THE MONTREAL NOVELIST MORDECAI RICHLER writes, is "justifiably better known for its spaces rather than the places we have built." With the possible exception of historic Quebec City, Richler's sentiment rings true. Even Montreal, which rivals Toronto as Canada's financial, commercial, and industrial center, and is the world's second-largest French-speaking city, has never been known for provocative architecture. Apart from Ernest Cormier's Université de Montréal, Moshe Safdie's Habitat, and, recently, Peter Rose's Canadian Centre for Architecture, Montreal has few architectural treats to offer visitors.

But what the city lacks in architecture, it makes up for in culture. That is why it is not surprising that Montreal's newest buildings house cultural institutions. Four new museums—two devoted to art and two to history—have opened over the past nine months. While stylistically diverse, all four buildings not only elevate the city's cultural and architectural profile, but reinforce its urban patterns.

The most visually prominent member of the new quartet is Moshe Safdie's L-shaped addition to the Montreal Museum of Fine Arts (pages 68-73). Located on Sherbrooke Street, the city's main boulevard, the museum's expansion incorporates a former pedestrian lane that traverses its site. Safdie designed this passage as a lively indoor shopping arcade and link to a busy subway station—an urban connection that has temporarily been deferred by Canada's recession. Nevertheless, the architect's boldly variegated ensemble adds 120 percent more exhibit space to a thriving institution devoted t changing exhibitions. Known for expansive shows with popula themes ranging from Michelangelo to Snoopy, the museum has become Montreal's number-one tourist attraction.

The Museum of Contemporary Art, formerly marooned on the distant Expo '67 fairgrounds, is now housed in a copper-roofed assemblage on the western edge of Place des Arts, Montreal's Lincol Center. Although the building regrettably echoes the stark facades o its 1960s-era neighbors, it more than doubles the space devoted t Canada's only contemporary collection. Improvements to the site include a new subway station, sculpture garden, and waterfall, animating a plaza in which daytime activity has long been overdue.

Sensitively preserving the remains of Ville Marie, Montreal's firs settlement, the Pointe-à-Callière museum is marked by a Moder belvedere, symbolizing the Victorian clocktower that once stood o its site. Devoted to the archaeology and history of the city, Dan S

QUARTET

voted to art, archaeology, and history.

Moshe Safdie's new pavilion (left in photo) for the Museum of Fine Arts connects to the original museum (right in photo) by a tunnel.

RICK KERRIGAN

Addition to the McCord Museum of Canadian History by LeMoyne Lapointe Magne reflects the 1906 building's tripartite rhythm.

Hanganu's triangular museum has an unfinished quality—rough concrete and steel—that defers to the ruins it protects. Nautical forms resonate with Montreal's nearby port, as if commemorating the arrival of the French by water.

Similar gestures to the past are incorporated into Montreal architects LeMoyne Lapointe Magne's expansion of the McCord Museum of Canadian History, an institution housed in a 1906 mansion owned by McGill University (pages 74-77). Adding on to the older building with a contemporary sensibility, the young architects' minimalist vocabulary achieves continuity with the older structure without losing ts dignified personality.

Several of the museum openings coincide with the celebration this ummer of Montreal's 350th anniversary, for which the city has been planning for a decade. The mayor's office used the birthday to secure unds from government and private coffers to finance the new museums, as well as several open-space improvements aimed at stimulating private development. Beneficiaries include a renovated plaza near ity hall; an important square in the eastern part of the city; and the efurbished port area along Commune Street.

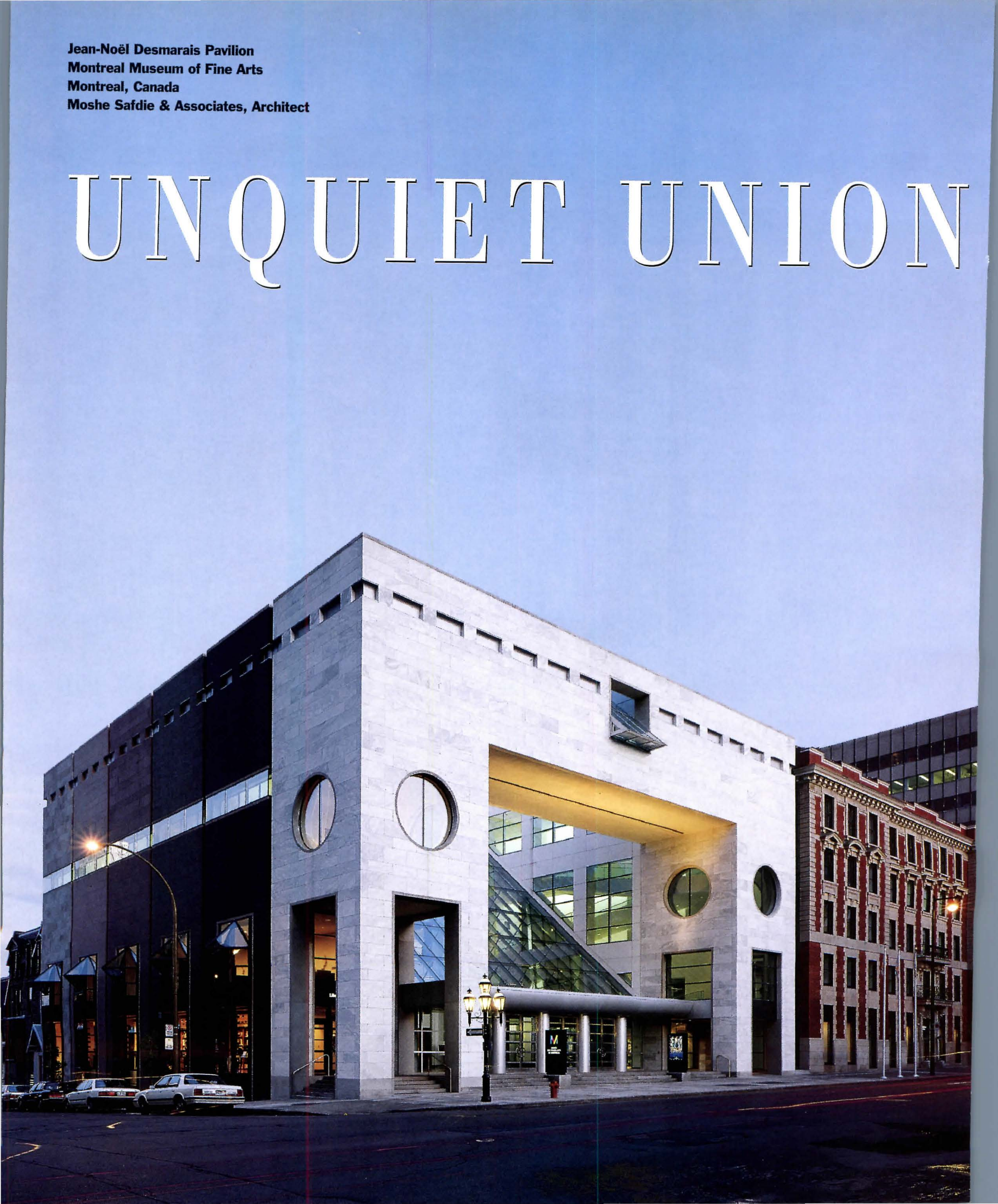
But despite its blockbuster array of urban enrichments and cultural showpieces, these are not cheerful times for Montreal. Unemployment is high, and Quebec's French-speaking majority seeks autonomy for the province within Canada's increasingly fragile union. Many of Montreal's lures to investors—such as Safdie's museum retail passage—await a decision on Quebec's political future.

Montrealers, however, have largely grown weary of the age-old contest between English and French. "The unity question will all heat up again after summer vacation," sighs Peter Jacobs, an architecture professor at the Université de Montréal. Jacobs is proud of Montreal's new face, and singles out Safdie's building in particular as a signal of confidence and renewal. Indeed, adamantly French Montreal is an earnest, no-nonsense city, and the trio of museums by local firms, while contemporary, are soberly conservative when compared with Safdie's brash statement at the Museum of Fine Arts. It is not surprising that it took the expatriot Safdie—who knows Montreal well—to build a museum that offers the city a breath of life. If his mixture of facades aims to please Montrealers of all stripes, it nevertheless speaks to Anglophones and Francophones alike, begging them to forgo their linguistic battles and share in a Canadian celebration of culture.

—Heidi Landecker

Jean-Noël Desmarais Pavilion
Montreal Museum of Fine Arts
Montreal, Canada
Moshe Safdie & Associates, Architect

UNQUIET UNION



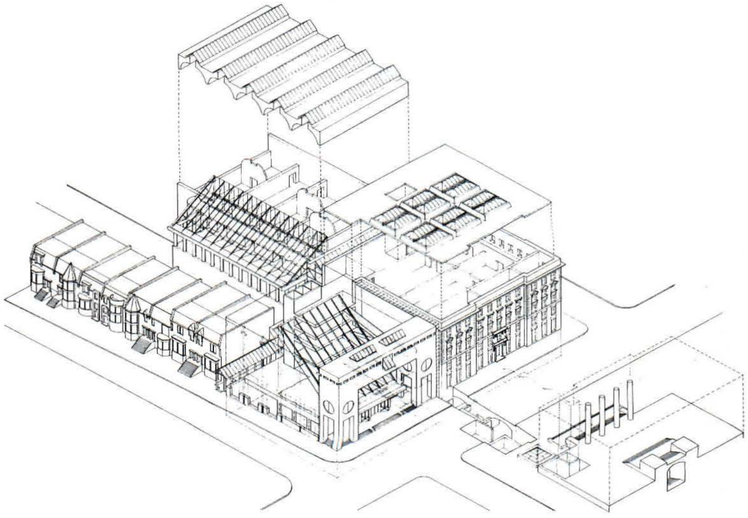
For Moshe Safdie, the addition to the Museum of Fine Arts in Montreal seemed like a perfect assignment. As the architect of the Museum of Civilization in Quebec City (1987) and the National Gallery in Ottawa (1989), Safdie has proved his skill in designing Canadian museums. He is also comfortable working in Montreal, the city where he studied architecture, opened his practice, and won international recognition for the modular Habitat (1967), his first completed building.

But the Museum of Fine Arts's directors and the Montreal community handed Safdie a thornier task than had his previous cultural clients. Located across one of the city's main east-west boulevards from the museum's original 1912 Beaux-Arts building, designed by Edward and W.S. Maxwell, the site comprises an L-shaped segment of a block that included a turn-of-the-century apartment building on its northwest corner. Selected from a handful of architects invited to interview for the project, Safdie was initially asked to draw two schemes—one that preserved the brick apartment building, called the New Sherbrooke, and another that eliminated it. Although the apartment building's architectural significance is debatable, a battle over its fate began brewing between the museum and Montreal's preservationists, including Phyllis Lambert, the persuasive director of the Canadian Centre for Architecture.

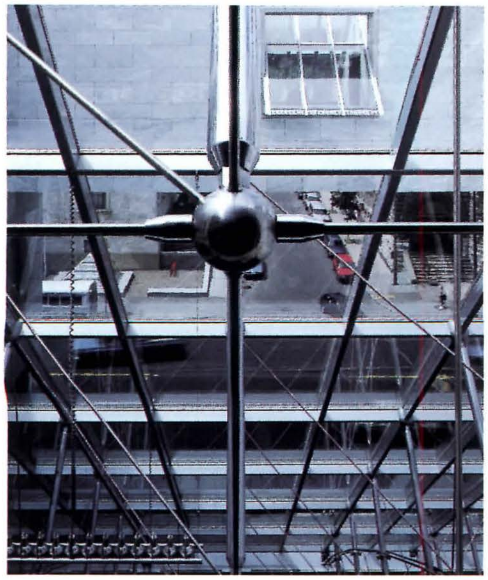
Safdie's two schemes were presented to the public, and a heated controversy ensued. Although the architectural winner (and, clearly, Safdie's favorite) was the scheme that eliminated the New Sherbrooke, the preservationists convinced the museum to save the 1905 building. Safdie drew a third design, affording the historic brick facade more prominence. Unfortunately, the building he produced, known as the Jean-Noël Desmarais Pavilion, is a complicated jumble of varied elevations that tries to incorporate references to all the disparate elements of its surroundings. "As I worked the building into the site," the architect confesses, "I felt compelled to relate it to everything." The most successful result of Safdie's fragmented contextualism is that it breaks down the scale of the 246,000-square-foot addition, affording sectional variety and numerous types of galleries.

Safdie reserved his major architectural statement for the entrance pavilion, where a portico reflects the palette and scale of the original Neoclassical museum across the street, rather than the neighborly New Sherbrooke. Behind this marble facade is a grand reception hall that supports a north-facing glass roof, angled to capture the winter sun. The facades of this pavilion and the existing apartment block, which have about as much in common as Quebec's English and French cultures, are simply joined by a glass slot.

One can't help but wonder whether even preservationists, in hindsight, might wish they had awarded Safdie the whole block. Unsaddled with the New Sherbrooke, Safdie would gladly have given the city a thoroughly contemporary counterpoint to the museum's prog-



Marble gateway (top right and facing page) is coupled to historic facade (facing page, right in photo). Glass "porch" overlooks Victorian assembly along Crescent Street (above center). New building and original museum are linked by a tunnel under Sherbrooke Street (right).



enitor across the street. The design that was constructed is, Safdie admits, "three buildings, attached": the entrance hall, its New Sherbrooke appendage (which retains only the apartment building's facade, further angering preservation purists), and, behind it, a west-facing brick wing along the Victorian ensemble of Bishop Street that is so contextual it almost disappears.

Within the porticoed entrance on Sherbrooke Street, all the five above-grade levels of the museum are apparent, linked by an energetically ramped stair that zigzags along the west side of the hall. Safdie employed such circulation to great effect at his National Gallery of Canada in Ottawa, but Montreal's code requirements mandated a stair-ramp combination. The resulting short risers and sloping treads are the wrong dimensions to accommodate most adult gaits, though they delight the very elderly and young children—not, Safdie would defend, the worst groups to enfranchise.

Patrons can forgo the stair and take the elevator, stopping at the second-floor cafeteria or members' lounge, or third and fifth-floor galleries. (The fourth floor is given over to offices.) However, the elevators open onto balconies from which the view down into the reception hall, or directly ahead into the thicket of the glass roof's space frame, is so dizzying that it can stagger the steadiest sailor. "I like creating a little vertigo," Safdie says happily to visitors, who invariably step back from the glass railing.

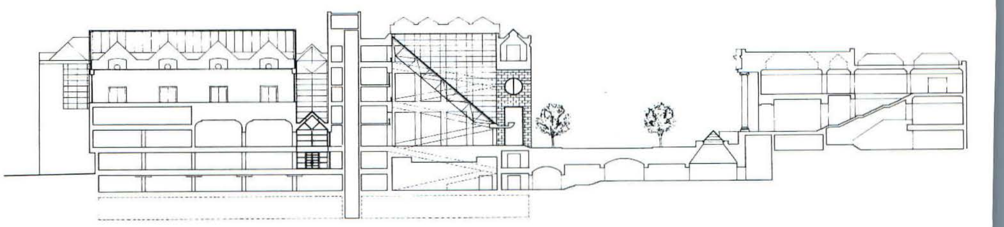
The galleries, however, are spectacular and varied, exhibiting Safdie's museum experience and spatial finesse. Throughout the building, the design of each room is in keeping with the art it houses: subterranean spaces for contemporary art are large to accommodate the scale of Modern paintings; rooms displaying period works are more intimate. In the passageway beneath Sherbrooke Street that connects the new building to the Maxwell brothers' original, the vaulted galleries are tomblike, as befits their exhibitions of antiquities. All the galleries are serene, with white oak floors and black-stained oak doorways.

After the reception hall, Safdie reserved his grandest gesture for a glass court on the east side of the building. From this third-story "porch," a viewer peers out over the city's rooftops to the St. Lawrence River. The room is used for exhibition openings, or rented out for private events, and is already reserved into 1995. The entrance pavilion and even a small space below a pyramidal skylight, an obvious gesture to Pei's Louvre expansion, are also rented for private celebrations.

These diverse spaces are Moshe Safdie's extraordinary gift to the city of Montreal—evidence of his understanding that today's museums are required to do more than show art. As museum director Pierre Théberge points out, the building is "a fabulous tool."

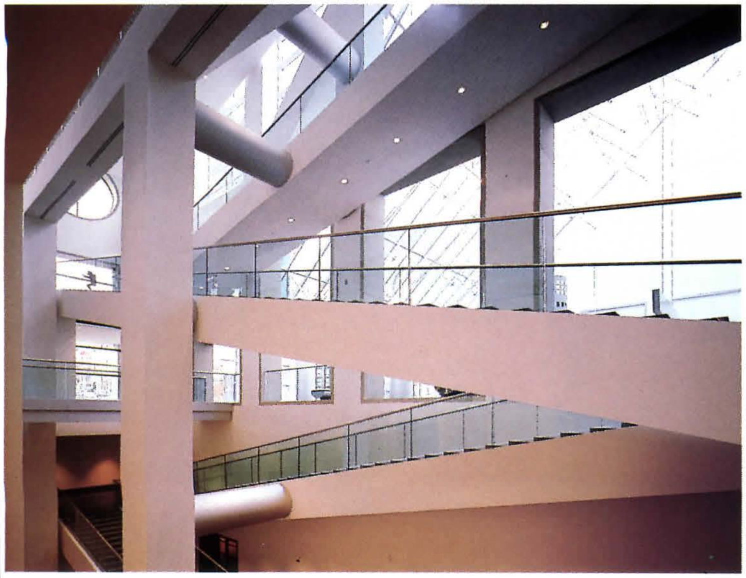
And if the pavilion's primary facade presents to the city a less-than-perfect marriage of old and new, perhaps this was no accident. Montreal is the urban heart of unapologetically Francophone Quebec, whose politics today are perhaps at their most troubled since the British defeated the French at the Plains of Abraham in 1759. With an impending referendum in October, Quebec swings between retaining its uneasy union with English-speaking Canada, within which the French majority feels threatened, and autonomy, which could bring economic disaster to the province. The Jean-Noël Desmarais Pavilion can be interpreted as Safdie's witty comment on this condition: its bold, marble arch represents the engine of the French renaissance, reluctantly coupled to the historic caboose of the English establishment. As an expression of this duality, the Montreal Museum of Fine Arts is uniquely reflective of its time and place. —H.L.

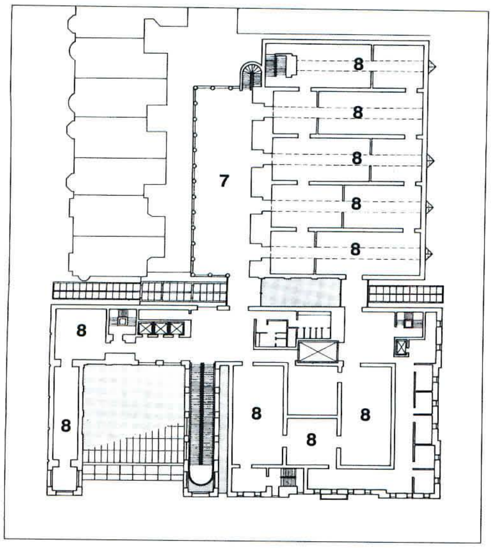
Angled glass roof over entrance hall (facing page top) is designed with a lightweight space frame (top and center left) that permits views yet withstands snow loads and resists wind uplift. Largest compression members are limited to the top chord, and to vertical struts connected by stainless steel rods (bottom left). Ramped stair (facing page, bottom photos) angles up the west side of entrance hall.



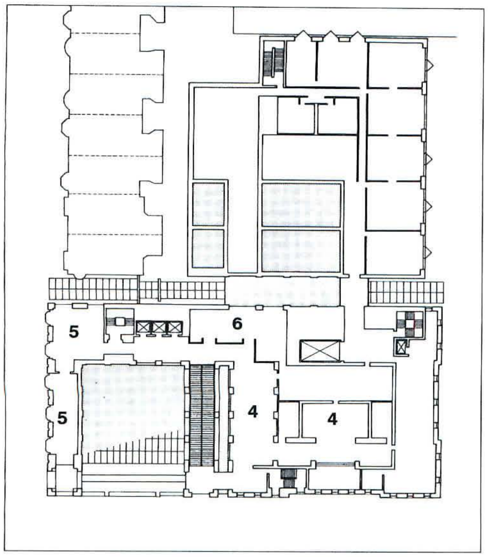
NORTH–SOUTH SECTION


Boutique du Musée
Museum Shop

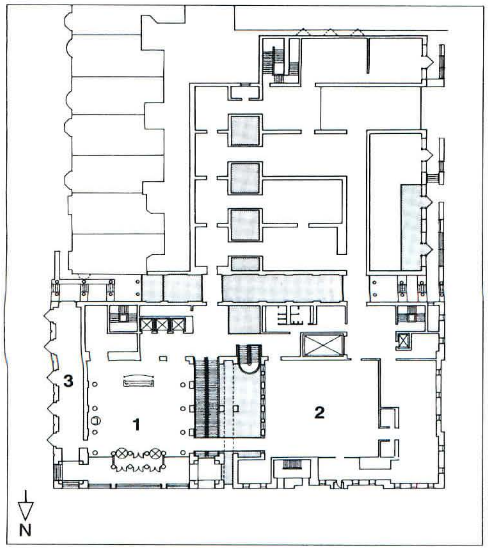




THIRD FLOOR



SECOND FLOOR



FIRST FLOOR

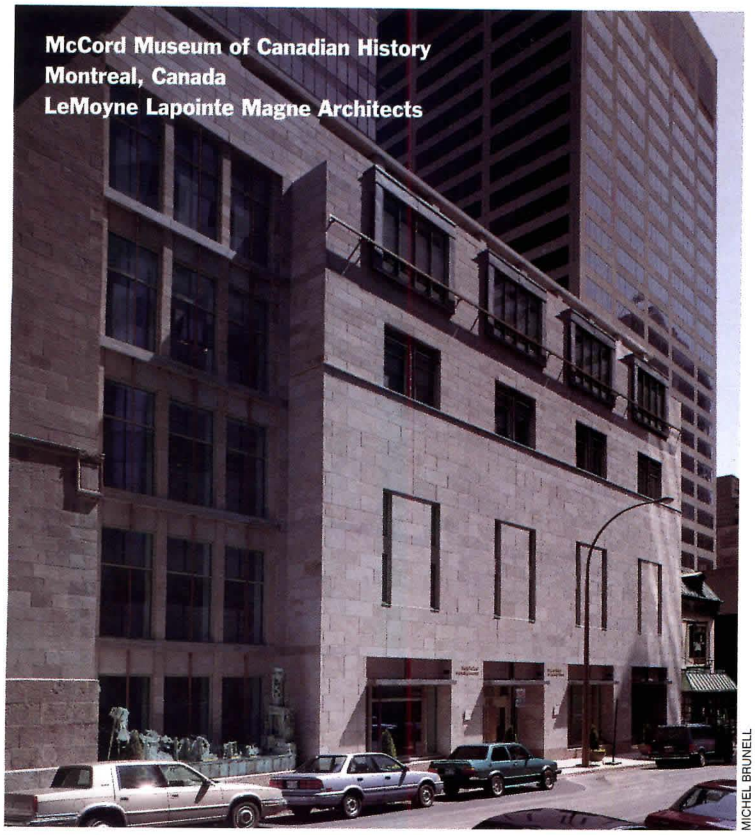
Stair landings are used as exhibition spaces and daylit by windows facing Sherbrooke Street (above). Vaulted galleries on top floor of Bishop Street wing include linear skylights (facing page, top); flat-ceilinged galleries in New Sherbrooke wing include larger skylights (facing page, bottom left). Subterranean rooms house contemporary art exhibits (facing page, bottom right). Galleries are detailed with white oak floors and ebonized oak doors.

1 RECEPTION HALL
2 BOUTIQUE
3 BOOKSTORE
4 CAFETERIA
5 MEMBERS' LOUNGE
6 RESTAURANT
7 GLASS COURT
8 GALLERIES

JEAN-NOËL DESMARAIS PAVILION
MONTREAL MUSEUM OF FINE ARTS
MONTREAL, CANADA

ARCHITECT: Moshe Safdie & Associates, Somerville, Massachusetts; Desnoyer, Mercure, Montreal; Lemay, Leclerc, Montreal–Moshe Safdie (design principal); Isaac Franco (principal-in-charge); Maurice Desnoyers (administration); Georges Lemay (production); Andre Mercure (construction supervision); Louis Lemay, Maria Desnoyers, Joseph Zorko, Pierre Joly, Toshihiko Taketomo, Rainier Goeller, Joseph Morog, Claude Holmes, Luc Boivin, Peter Smale (project team)
ENGINEERS: Dionne Olechnowicz; Gascon, Vigneault, Dumas; Martineau, Vallee, Regimbald (structural); CRS; Pageau Morel et associes (mechanical); Bouthillette Parizeau et associes; Dupras Ledoux associes (electrical); Dionee Olechnowicz (structural)
CONSULTANTS: Jules Fisher and Paul Marantz (lighting); MJM Conseillers Acoustique (acoustic); Adamson Industrial Design (interiors); Axion (graphics)
GENERAL CONTRACTOR: Herve Pomerleau, Inc.
COST: $51 million—$207/square foot
PHOTOGRAPHER: Timothy Hursley

McCord Museum of Canadian History
Montreal, Canada
LeMoyne Lapointe Magne Architects



MICHEL BRUNELL

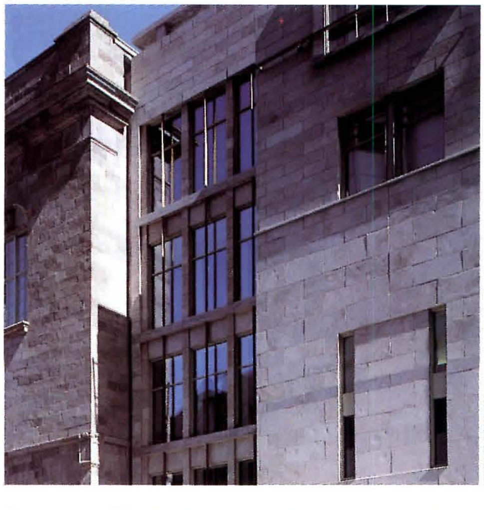
TIMOTHY HURSLEY

MONTREAL MUSEUMS

MAKING HISTORY

FRONTING MONTREAL'S BUSY SHERBROOKE Street at the edge of McGill University, to which it belongs, the McCord Museum of Canadian History houses a trove of diverse historical objects, including the nation's largest collection of Native American artifacts. An odd but intriguing assemblage that ranges from Micmac beaded purses to silver tea sets, the museum's holdings were amassed by a wealthy attorney, David Ross McCord (1844-1930), and housed since 1971 in a stately limestone palazzo. The building, designed in 1906 by Montreal architect Percy Nobbs as McGill's student union, was gutted when the McCord moved in to create exhibitions in the "black box" display style that was prevalent at the time. Its windows were covered over, its vaulted ballroom interrupted by a new floor, and its 23,700 square feet divided into galleries devoted to sheltering a somewhat scholarly collection.

In 1987, the museum's governing board selected the 15-person Montreal firm of LeMoyne Lapointe Magne to renovate the museum. The architects reopened its windows, restored some historic details, and added a 55,400-square-foot addition to the south of the older building. However, they purposefully refrained from imitating the original structure, preferring to create a thoroughly modern expansion that complements its turn-of-the-century host. To that end, the addition boasts a facade of limestone, which harmonizes with but doesn't precisely match the original's. Old and new elevations are joined by a gridded transparent link that is set back from the two facades. Bronze details echo the mullions of the 1906 building, while adding a contemporary flair.



RICK KERRIGAN

New wing (top left and right) is connected to original museum by a window wall (above) that lights main staircase (facing page). Inside, bench and wood panels are stained maple; stair and lobby feature slate floors.

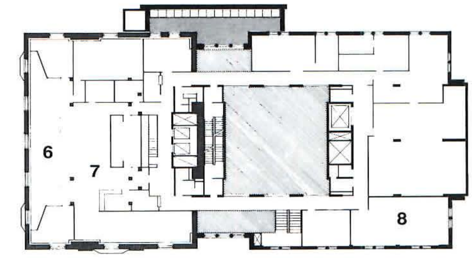
The six-story addition's visage captures the tripartite rhythm of the palazzo. Storefront windows punctuate its street level; eight tall slots front the two main gallery floors; and, along the top two administrative

TIMOTHY HURSLEY

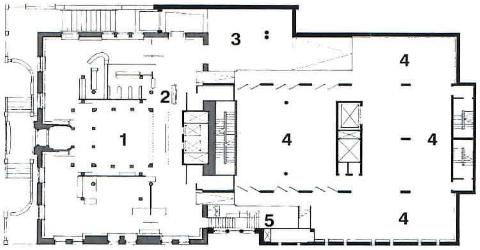
levels, four simple openings are topped by jutting windows that echo the original's single bay. A ribbon of bronze continues the cornice line from old to new, and the setback above it echoes the older building's top.

Visitors may now enter the McCord at its understated Victoria Street entrance on the addition's west side. Inside, they are greeted by a daylit staircase comprising all the materials of the building: slate, gray-painted steel, glass, maple, and board-formed concrete. The stair is the museum's primary circulation between exhibits, which occupy the first two floors, and it displays a 35-foot-tall Haïda totem pole. As Venturi, Scott Brown placed Chinese statuary on the grand staircase of the Seattle Art Museum (pages 56-65), the McCord's stair is similarly designed around this artifact, with less ornate interference.

The simplest renovation scheme would have placed offices in the old wing, galleries in the new, but chief designer Michel Lapointe did not want the old building to become "an artifact," so he inserted exhibition areas on two levels of both the 1906 structure and its expansion. Anchored by the new daylit stairwell on the addition's west side and a three-story interior courtyard to the east, the exhibition spaces comprise two large rooms: a northern gallery in the old segment, a southern one in the new. Museumgoers move from north to south gallery—and from old to new wing—along walkways that bridge the interior courtyard and stairwell. The exhibition areas surround a shared central elevator core and light well, echoing the courtyard plan of the original Italianate building. "This circulation pattern is our way of making a connection with the 1906 building's intention," Lapointe explains.



THIRD FLOOR PLAN



GROUND FLOOR PLAN

1 ENTRY FOYER
2 INFORMATION DESK
3 INTERIOR COURT
4 GALLERY AREA
5 STAIRWELL
6 READING ROOM
7 STACKS
8 LABORATORY

Stairwell features slate floors, painted steel railings (top left) concrete walls, maple wall panels, and glass (top right). Eastern court (facing page) is designed as open space for museum festivities.

The architect continues, "We tried to prove that we could do a modern building with the soul of an old building." By reviving the original structure's scheme, borrowing from its materials, and incorporating its rhythms, LeMoyne Lapointe Magne has indeed created a museum that befits the 21st century, without relinquishing the spirit of its past. ■

—H.L.

McCORD MUSEUM OF CANADIAN HISTORY
MONTREAL, CANADA

ARCHITECT: LeMoyne Lapointe Magne, Montreal, Canada—Michel Lapointe (associate-in-charge); Robert Magne, Frederic Dube, Nicole Pelletier (design team)
ASSOCIATE ARCHITECT: Jodoin Lamarre Pratte and Associates, Montreal, Canada
ENGINEERS: Nicolet Chartrand Knoll Limitee (structural); Pageau Morel et Associes (mechanical/electrical)
GENERAL CONTRACTOR: Construction McNicoll
COST: $11.9 million—$123/square foot

Technology & Practice info

Information on building construction, professional development, and events

Architects Convene at Earth Summit in Rio

IN JUNE, THE UNITED NATIONS CONFERENCE ON ENVIRONMENT AND DEVELopment in Rio de Janeiro assembled representatives from 170 nations to wrestle with the issues of environmental degradation. In what has come to be known as the Earth Summit, government officials scrambled for two weeks at the Rio Central Conference Hall to reach a consensus on "sustainable" development, through which countries can raise their standards of living while preserving the earth.

Most of the agreements on such issues as global warming and biodiversity had, of course, already been formulated in a series of conferences prior to the summit. Those meetings, which took place over a two-year period and included participants from hundreds of nongovernmental organizations, produced "Agenda 21," a 500-page blueprint for sustainable development. The document, which emerged as the Earth Summit's primary position paper, covers issues ranging from women's rights and disease control to protection of the world's oceans.

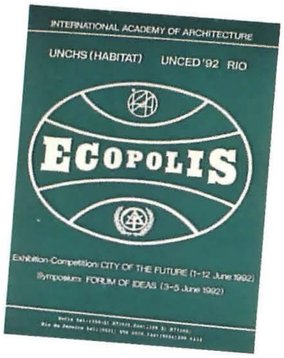
One of the groups that participated in developing "Agenda 21" was the International Union of Architects (UIA), which represents 960,000 architects in 93 countries. During the final preparatory conference at the U.N. last April, UIA introduced the issue of the built environment into the agenda by contributing to a chapter on improving human settlements. In doing so, the organization hopes that the architect's role as a shaper of cities and towns will receive greater acknowledgement from the international community.

While the Rio meeting focused primarily on world leaders concluding agreements that had been made beforehand, there were also those who believed that global environmental problems should not be left in the hands of government. If a new world order was in the making, it was not by the career diplomats, but by another group that gathered 25 miles away. The Global Forum, as the satellite meeting was called, was a kind of environmental jamboree, the unofficial portion of he Earth Summit. Representatives from some 7,900 organizations, including many from he groups that had participated in the presummit meetings, gathered to reinforce the ideas of the official conference. Many representatives issued independent declarations; others, having lost faith in the U.N.'s process, formed new, grassroots coalitions to produce change independent of government.

Architects participated in the Global Forum as well, coming from as far away as New Zealand, Bulgaria, Australia, Israel, South Africa, Switzerland, Mexico, and the U.S., whose contingent included AIA's President-Elect Susan Maxman, Committee on the Environment Chairman Robert Berkebile, board member Randolph Croxton, and environmental committee member and New York architect William McDonough.

Architects' involvement in the forum, according to Bulgarian architect Sergei Stepanov, who represented the International Academy of Architecture in Sofia, was "to generate new ideas for environmentally sound, sustainable cities." Stepanov believes that cities are vital to a sustainable future because they accommodate the greatest numbers of people with the smallest energy waste. Arcot Ramachandran, undersecretary-general of the United Nations Centre for Human Settlements and a liaison to the Bulgarian academy, stressed the importance of cities in controlling population growth. "In all cities," Ramachandran said, comparing them to villages, "fertility declines with greater access to education and healthcare."

Asked what architects should do to deal with environmental degradation, Ramachandran urged them to become more involved in producing adequate housing, clean water, hygienic sanitation, waste management, and green space in urban areas. "As long as they plan their future projects around these issues," he maintained, "architects will be rele-



INTERNATIONAL ACADEMY OF ARCHITECTURE

UNCHS (HABITAT) UNCED '92 RIO

ECOPOLIS

Exhibition-Competition: CITY OF THE FUTURE (1–12 June 1992)

Symposium: FORUM OF IDEAS (3–5 June 1992)

NICOLE DOMENICI PHOTOS

An international group of architects presented ideas of sustainable cities (top) at the Global Forum in Rio (second from top). AIA representatives included Randolph Croxton (standing, third from top), and President-Elect Susan Maxman (second from left, bottom photo).

vant in the 21st century."

Despite an overwhelming consensus on the importance of cities, architects expressed different points of view on outlying regions. Paolo Soleri, who for 20 years has been building Arcosanti, a self-sufficient, solar-powered community in Arizona, criticized American suburbia as the "most wasteful, polluting, and dehumanizing development model in history, and a recipe for ecological catastrophe if replicated on a global level." In a forum about the future of cities, Soleri suggested that suburbs, at least as they are conceived in the U.S., should be abandoned for denser, medium-sized settlements that are self-reliant and linked by high-speed trains.

While North American architects focused on energy efficiency, nontoxic materials, and urban greening, Brazilian architects stressed such issues as poverty, sustainable agriculture, and political action.

But to Croxton, Soleri's approach is unrealistic and wasteful. "You can't simply throw away the concrete, the asphalt, the embodied energy that we already have," he pointed out. Instead, the New York architect advocated upgrading existing buildings and the infrastructures that support them, taking into account such issues as recycling, source reduction, and energy efficiency.

Architect William McDonough maintained that today's buildings are not designed with a sensitivity to climate. He told a group of environmental managers, "We must reintegrate nature and natural systems into our thinking." McDonough proposed that buildings incorporate such old-fashioned features as daylighting and operable windows for natural ventilation.

Jim Morgan, vice chairman of Arc Peace International (USA), an organization of architecture and design professionals who advocate social responsibility, expressed a pragmatic skepticism: "As long as the world continues to collectively spend a trillion dollars a year on arms," he complained, "we won't have a dime to correct social or ecological problems." His remark was borne out toward the end of the summit, when the industrialized nations committed only $6 billion to "Agenda 21." This figure represents only about 5 percent of the estimated $125 billion needed annually to implement the document's recommendations, according to the U.N.

AIA President-Elect Susan Maxman warned that architects should regain their moral bearings. "Our profession needs to clean itself of the frivolousness of the last 20 years," Maxman advised. Robert Berkebile urged architects to "build linkages" with other professionals, such as engineers, business people, and environmentalists. "A solution to environmental decay has to occur on a societywide basis," he maintained.

Groups like the Brazilian Institute of Architects reflected the split between industrialized and developing nations over the causes of environmental degradation. While North Americans focused on energy efficiency, nontoxic materials, and urban greening, Brazilian architects stressed such issues a poverty, sustainable agriculture, and political action.

As if the intensity of the Earth Summit and its companion Global Forum afforded the sense that architects might be heard, the UIA offered to strengthen the human settlements section of "Agenda 21." The chapter, UIA members pointed out, lacked any mention of the need to preserve existing buildings and infrastructure, both of which signify enormous investments in natural resources. It also failed to address the amount of energy consumed by the construction and operation of buildings—some 54 percent of the world's total output. "It's not the best possible statement," admitted Allan Rodger, an architect from Melbourne, Australia, and a UIA representative to the Earth Summit. "It's quite deficient in many respects, but at least it is on the agenda, and that's a start." Rodger indicated that, following the summit, he and others would introduce a proposal to the U.N. reflecting their concerns.

As for continuing the process of leading the world on a sustainable path, the AIA has already begun to gear up for a kind of Earth Summit II, according to Maxman. The Institute plans to hold its 1993 convention in Chicago, alongside the UIA's triannual congress. The theme of both events will be sustainable development. Stay tuned. ■

—MICHAEL WAGNER

Michael Wagner is a senior editor of Interiors.

AIA's Continuing Environmental Agenda

Following the Global Forum held in Rio de Janeiro, Brazil, architects can expect to see the AIA increase its efforts to address environmental design issues over the next year. "In Rio, we got energized to take action," claims Robert J. Berkebile, chairman of the AIA's Committee on the Environment. "U.N. officials expect the AIA to provide a strategy to support the treaties signed in Rio." President-Elect Susan Maxman has already set an agenda for an international conference on sustainable communities at the 1993 AIA convention in Chicago, which she hopes will be cosponsored by the United Nations Council on Environment and Development. Over the next year, the committee will produce a "Road from Rio" document that will define what constitutes an ecologically sustainable settlement and outline what directions a region's development should take to protect its natural resources. The committee will also stage an international competition, soliciting projects that illustrate model sustainable communities. Winners will be displayed at the 1993 convention. Additionally, the AIA will sponsor three national teleconferences on environmental design, following the format of the recent ADA series. The first of the teleconferences, which will be held this fall, will address the broad scope of sustainable design practices and deal specifically with energy conservation. Two other televised forums will be staged in the winter and spring of 1993. The AIA also intends to publish a guide for building owners and consultants, outlining ways to achieve an environmentally conscious facility. The subscription-based "*Environmental* Resource Guide" (Architecture, January 1992, pages 99-101) also continues to expand. Its third quarterly installment, released last month, covers indoor air quality and materials assessment of paints, carpets, and sealants. Steel, vinyl, tile, aluminum, and particle board were covered in the two previous editions. —M.S.H.

Wired for Sound

A new system allows architects to electronically improve a concert hall's acoustics.

TODAY'S MULTIPURPOSE CONCERT HALLS offer so many diverse programs that it is difficult to achieve perfect acoustics for all occasions. The acoustics that work for symphonic music will render a Shakespeare soliloquy unintelligible, and a hall that lets a musical theater show sparkle may leave an orchestral interlude sounding flat.

To create the best possible acoustics in these chameleonlike facilities, designers are turning to a controversial technology known as electronic architecture. When turned on for symphonic performances, these systems pick up, manipulate, and redirect music within a hall to create warmth, presence, resonance, and fullness. The technology essentially dissociates sound reflections from the physical environment, making acoustics largely independent of architectural form and eliminating the need for movable, sound-absorbing elements.

Christopher Jaffe, principal of Norwalk, Connecticut-based acoustical consultants Jaffe Holden Scarbrough Acoustics, has been the leading proponent of electronic architecture in the U.S. for almost 20 years. Theoretically, Jaffe maintains, almost any concert hall can be fitted with electronic enhancements, enabling it to mimic the sounds of the best orchestral settings in the world.

Multipurpose halls are challenging because their interiors can produce only one reverberation time—the amount of time required for a mid-frequency sound to fade away—while the changing activities they support require different reverberation times. A hall's reverberation time determines its "liveness" or resonance; for many types of musical performances, the longer the life of the sound, the better. Orchestral music, for example, generally requires a reverberation time of about 2 seconds, while opera needs only about 1.7 seconds. Performance halls with a shorter reverberation time of 1.5 seconds or less are considered "dry," and best suited for amplified musical shows or speech.

Musical presence, or intimacy, corresponds to the time delay between when the original sound and the first reflected sounds reach the listener. Optimally, the first sound reflections should arrive 20 to 30 milliseconds after the initial sound from the source. Since sound travels approximately 1 foot per millisecond through air, a hall's best seats are often those less than 30 feet from a reflective surface.

Jaffe has designed a system to adjust the time delay between initial and reflected sounds, giving some poorly positioned seats the early sound reflections they lack. The system controls other acoustical components of the reflected signal as well—its direction, frequency composition, and intensity—to improve sound quality. Unlike amplification systems, which make sound louder, these systems allow direct source sound to reach the audience unchanged, according to Jaffe.

To achieve the best acoustics in new and renovated multipurpose performance halls, designers are turning to a controversial technology known as electronic architecture.

The latest example of Jaffe's technology, called the Electronic Reflected Energy System (ERES), was installed in 1990 at the Tennessee Performing Arts Center's Andrew Jackson Hall in Nashville. Designed by local architects Taylor & Crabtree, the 2,398-seat, fan-shaped multipurpose hall was completed in 1980. Soon after Jackson Hall opened, however, musicians complained that the hall was too dry, according to Thomas K. Baker, director of operations for the center's management corporation. Jaffe's firm studied the hall's acoustics, and installed an ERES system.

Paul Scarbrough, a Jaffe associate who designed the Nashville system, says the hall initially lacked musical presence and articulation, problems that stemmed partly from its unusual width: 150 feet at its widest point. Although the hall met the classical reverberation time of about 2 seconds, the sound emanating from the stage did not carry loudly enough throughout the hall. Larry Kirkegaard, principal of Kirkegaard and Associates and Jackson Hall's initial acoustical consultant, attributes the problems to design changes made due to budget cuts: sound-absorbing ductwork was built within the acoustical volume rather than in the attic, and the hall's split-block walls were not sealed as recommended.

The ERES system at Jackson Hall uses three microphones to pick up sound and transmit it through wires to digital-signal computer processors. The processors divide the sound into three subsystems: mid- and high-frequency signals that are delivered first; low-frequency signals that follow; and a reverberation system that lengthens the time required for the sound to decay. These simulated reflections are transmitted to the hall through 50 speakers. In addition, Jaffe used a new technology called "dithering," which varies the time delay between the sound source and the speaker, to make it more difficult for a listener to pinpoint the source of the sound.

Baker was skeptical when the symphony first proposed electronically enhanced acoustics, but has since been persuaded. "It really, really works," he says. Kenneth D. Schermerhorn, conductor and music director of the Nashville Symphony, adds that the system "has made a great difference in the audience's appreciation of live concerts," primarily by extending the life of the sound for about 1/2 second. "We don't have the money to invest in the reconstruction of the hall to improve acoustics," he adds. "This is one way to do it, and it works well."

Kirkegaard questions whether adding the electronic system was the best way to improve Jackson Hall's acoustics, suggesting that an architectural solution could have been implemented at a comparable cost. The choice of electronics over natural acoustics has been at the heart of a controversy over Jaffe's system and others like it. "Traditional musicians generate pure music, and the audi-

Jaffe calls his Electronic Reflected Energy System an "emotional issue," adding that some musicians fear that the new technology is manipulating their sound.

ence is expecting natural sound," says acoustical consultant Dennis A. Paoletti of Paoletti Associates of San Francisco. "When concertgoers hear anything that sounds at all amplified, they get very upset."

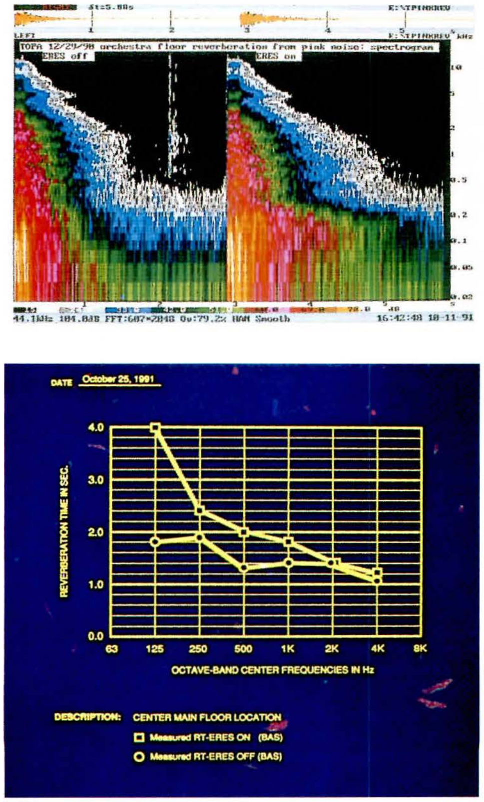
The lure for musicians to rely on natural acoustics—even though they may be imperfect—is strong. Lawrence Leighton Smith, conductor and musical director of the Louisville Orchestra, works in the 2,416-seat, multipurpose Kentucky Center for the Arts and says he seldom uses an electronic acoustics system installed there by Jaffe in the mid-1980s. Smith explains that the electronics do give the hall the musical presence lacking in the original acoustical design, but maintains he can achieve better presence by moving the orchestra forward on the stage.

The strongest objections to electronic architecture occur when architects incorporate these systems into new halls, rather than striving to achieve natural acoustics. Electronic architecture was installed at the Hull Center for the Performing Arts in Eugene, Oregon, in 1982, and at the Alaska Center for the Performing Arts in Anchorage in 1988. Jaffe calls the ERES system an "emotional issue," adding that some musicians fear that the technology is manipulating their sound. "When they put valves on the horn, did that detract from the player's skills, or create artistic opportunities?" he asks.

Few criticize a Jaffe system installed at the Jackie Gleason Theater of the Performing Arts in Miami Beach during a $17 million renovation of the facility in 1990 by Borrelli Frankel Blitstein/Sasaki Associates. The theater, built in 1930 as a wrestling arena with a flat floor, was plagued by poor acoustics due to its low ceiling. An additional problem was a huge under-balcony area, as low as 8 feet, at the rear of the hall. Before the system was installed, sound under the balcony was muffled, described by some as seeming to come from another room.

Designers first used available architectural means to try to improve the theater's acoustics. President Jaime Borrelli explains that the city of Miami Beach even studied raising the hall's roof, but the plan was scrapped because it doubled the project's cost. The ERES system designed by Jaffe Holden Scarbrough for the theater uses 158 speakers to lengthen reverberation time and reduce the time between source sound and reflected sound. As in Jackson Hall, this system divides sound reflections into early-field, warmth-field and reverberation-field components. Seventy-four speakers bring appropriate reflected sound to the under-balcony area. ERES "makes an obvious, extreme difference, much for the better," says Melinda M. Hipp, orchestra manager for the Ft. Lauderdale-based Florida Philharmonic Orchestra, which sometimes plays at the Jackie Gleason theater. "The system brings the sound out, especially the strings."

Jaffe's latest electronic design is for a new hall within the Tokyo International Forum, now under construction. The $1 billion, 1.5 million-square-foot cultural and business complex, designed by New York City-based Rafael Viñoly Architects, will include four theaters. The largest, known as Hall A, will be acoustically fine-tuned with a system combining Jaffe's ERES technology and components developed by Yamaha Acoustic Research Laboratories of Hamamatsu, Japan. Such an electronic system was needed because of the theater's enormous size: 5,000 seats. "There was no other option," contends Jaffe's Scarbrough. "In such a large room, the orchestra can't hope to have an impact without electronic architecture."



Both spectragram (top) and line graph (above) illustrate a sound's amplitude in relation to the time it takes to dissipate. These charts depict the increased reverberation time an electronically enhanced acoustical system provides at the Jackie Gleason Theater of the Performing Arts.

The electronic enhancement system will consist of six arrays of microphones—two on either side of the proscenium and four within the house—and 181 speakers hidden near the ceiling. Jaffe will provide the early-field and warmth-field components of the system, and Yamaha will provide reverberation technology and other components.

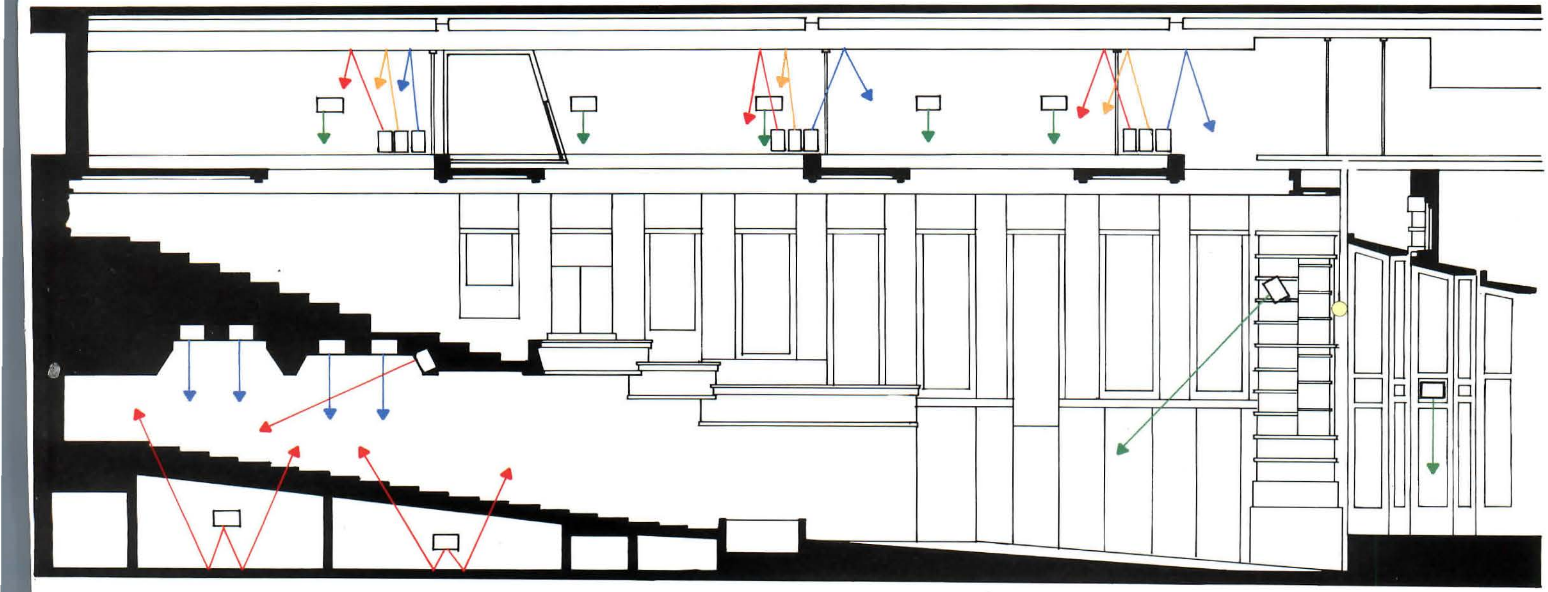
One development that will set the Tokyo enhancement system apart from most in the U.S. is that it will be adjustable. Technicians will set reverberation-time options ranging from those that create a fairly dead space to a very live one. Owners will be able to change the acoustics of the hall at will, simply by turning a dial.

Jaffe says this advance illustrates a cultural preference rather than a technological achievement. Although he has been able to create adjustable systems for some time, musicians in the U.S. generally do not want them, preferring to simply turn the system off or on. Yamaha, on the other hand, has built flexibility into other electronic enhancement systems in Japan, where they have achieved greater acceptance.

Whether electronic architecture will achieve greater acceptance in the United States remains to be seen. Advances in digital signal processing technology make each new system more sophisticated than the last, and other acoustic consultants, working with different electronic components, are refining related technologies. Although purists may still decry electronics in the concert hall, a new generation of concertgoers—accustomed to nearly flawless sound from compact disk players at home—may come to appreciate or even expect such sound at live performances. For architects, such systems offer greater design possibilities, independent of conventional acoustical elements.

—VIRGINIA K. DORRI

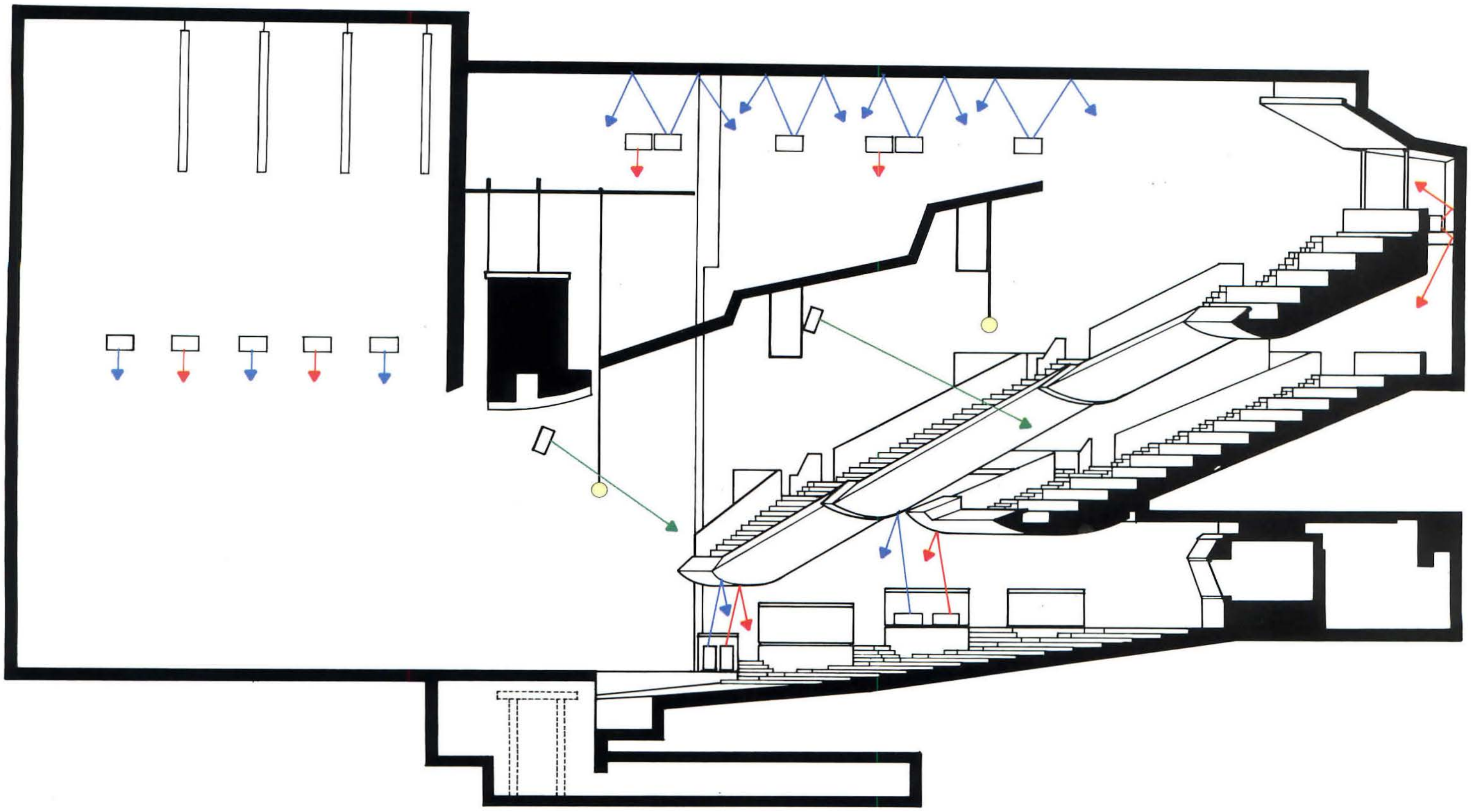
Virginia K. Dorris is a freelance writer based in New York City.



JACKIE GLEASON THEATER SECTION

Jackie Gleason Theater of the Performing Arts
Miami Beach, Florida
Borrelli Frankel Blitstein/Sasaki Associates

The city of Miami Beach, owner of the Jackie Gleason Theater of the Performing Arts (left), initially considered raising the roof of the long, low building to improve its acoustics. Constructed in 1930 with a flat floor as an arena for boxing and wrestling matches, the room was later turned into a multipurpose theater and television studio. Until a major renovation in 1990, the theater suffered from poor sight lines and offered notoriously poor acoustics, not only for symphonic music but for touring musical theater productions. Visibility was improved when architects added raked seating (above); acoustics were improved through a combination of architectural and electronic means. The rear wall was moved forward to shorten the theater, thereby reducing the number of seats from 3,100 to 2,700. In addition, the front of the theater was narrowed, an acoustical shell was installed, and variable acoustic drape was added to upper wall surfaces to reduce lateral sound reflections from the side walls. Jaffe Holden Scarbrough designed an electronic system to improve the hall's musical intimacy and warmth as well as to lengthen its reverberation time. The system, installed during the renovation, is particularly effective for seats under the theater's deep balcony (bottom left), which covers 40 percent of orchestra seating.



ANDREW JACKSON HALL SECTION

○ MICROPHONE

🟥 WARMTH SPEAKERS

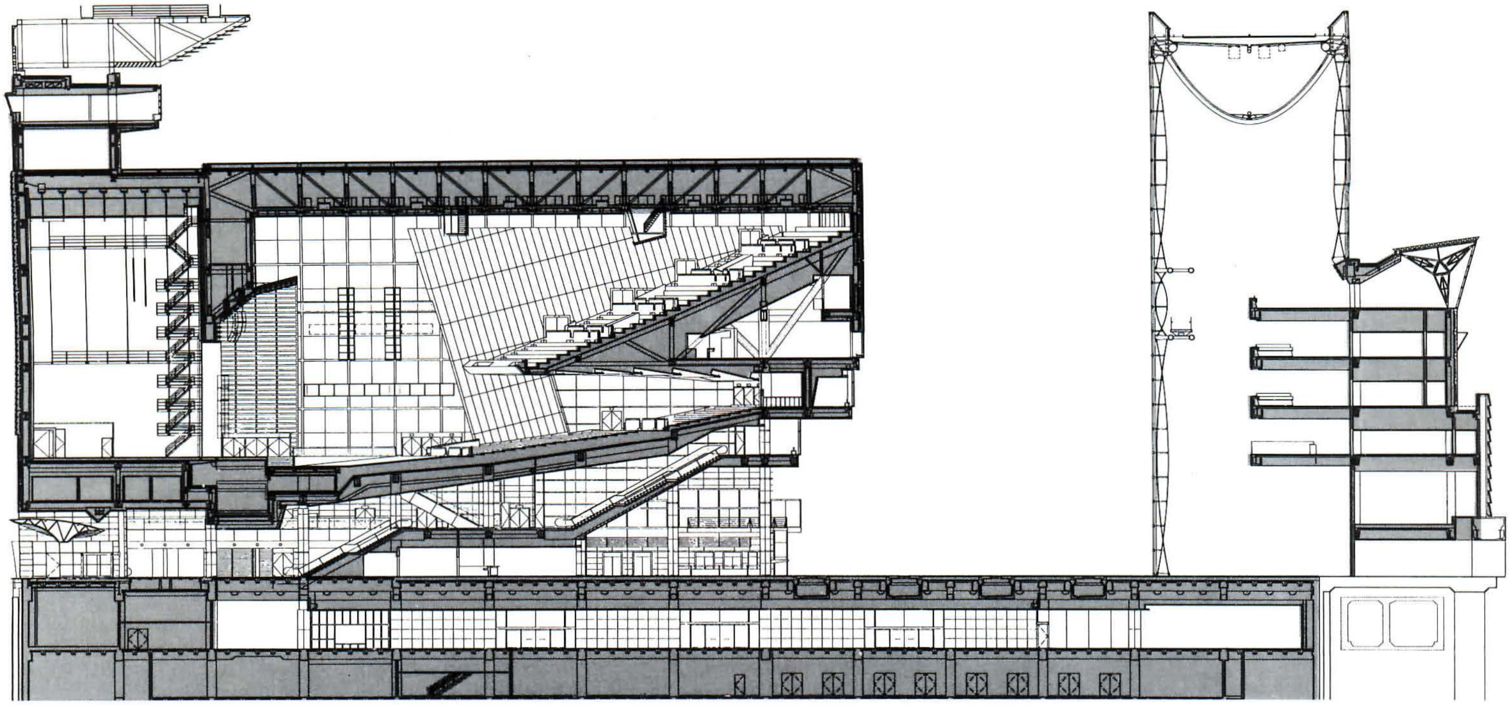
🟩 EARLY-REFLECTION SPEAKERS

🟦 LOW-FREQUENCY REVERBERATION SPEAKERS

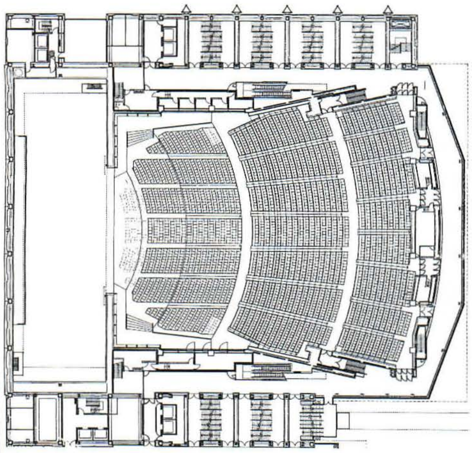
BRUCE I. CRABTREE, JR.

Andrew Jackson Hall
Tennessee Performing Arts Center
Nashville, Tennessee

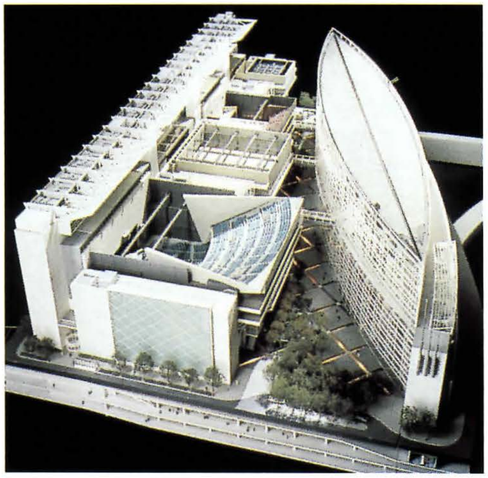
The newest version of Jaffe Holden Scarbrough's electronic architecture was installed at Andrew Jackson Hall (left and inset) at the Tennessee Performing Arts Center in Nashville in 1990. This system was designed after symphony musicians complained that the fan-shaped, multipurpose hall was too "dry." The electronic system, designed to increase the 1980 hall's presence and the strength of the musical signal, picks up the sound and feeds it into digital-signal processors. Computers divide the sound into subsystems and retransmit it into the hall through speakers (above). Mid- and high-frequency signals are transmitted to reach the audience 20 to 30 milliseconds after the initial source sound, optimal for early reflected sound, while the low-frequency signals that provide musical warmth are transmitted later. The reverberation system transmits 72 replicas of the original source sound, each one softer than the one before it, designed to mimic the sound decay of the finest concert halls.



SECTION THROUGH TOKYO FORUM – HALL A

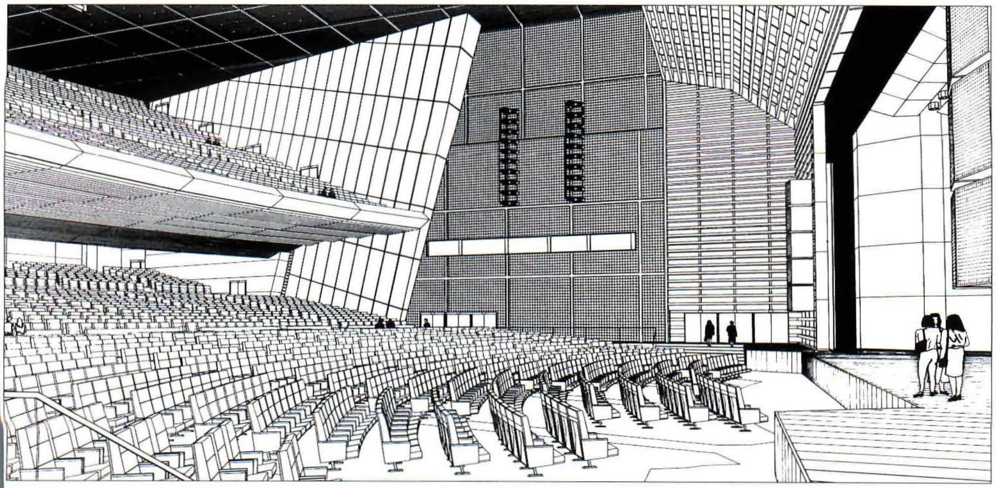


GROUND FLOOR PLAN – HALL A



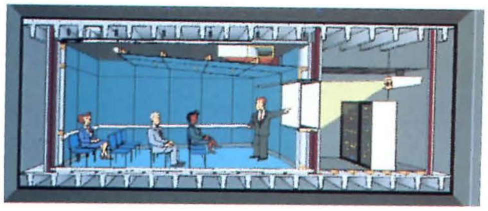
Tokyo International Forum
Tokyo, Japan
Rafael Viñoly Architects

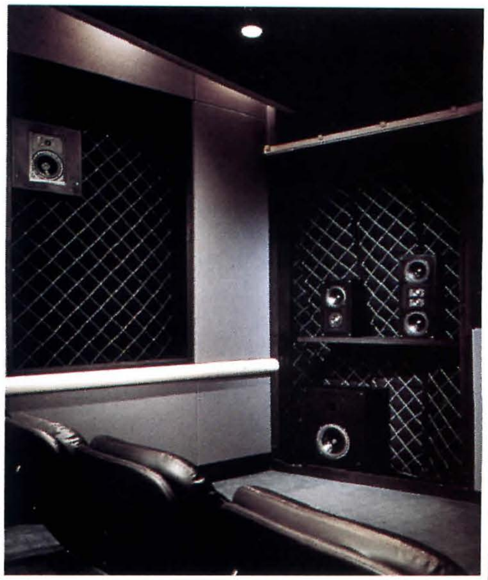
Hall A, the largest of four theaters in the $1 billion, 1.5 million-square-foot Tokyo International Forum (left in model photo), will be equipped with an electronic acoustical enhancement system developed by Jaffe Holden Scarbrough and Yamaha Acoustic Research Laboratories of Hamamatsu, Japan. The 78,000-square-foot, multipurpose theater incorporates 5,000 seats on a raked floor and a balcony (section). The theater (plan), to be used for international conferences as well as major musical and theatrical productions, features an electronic system comprising six arrays of microphones throughout the hall and 181 speakers hidden near the ceiling. The system is designed to provide the early sound reflections that would not occur naturally in such a large hall. It also allows theater managers to adjust the hall's reverberation time for different types of performance—ranging from drama to symphonic music—by simply turning a dial. Located on a busy urban site, the steel-framed concert hall will be acoustically protected from the outside noise of passing subway trains by a "box-in-box" foundation isolation system. In this system, inner and outer foundation walls separated by rubber pads absorb unwanted vibrations.

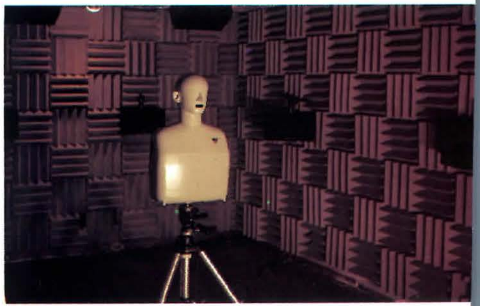


VIEW OF HALL A FROM STAGE

Acoustical Simulation Rooms







Acoustical simulation rooms, built in San Francisco by Charles M. Salter Associates (top) and in Minneapolis by Orfield Associates (second from top), allow architects and clients to listen to audio situations in existing or planned structures. The simulations are created using sophisticated digital computer processing equipment (third from top), and broadcast into the acoustically isolated rooms (bottom) through large speakers.

ACOUSTICAL DESIGN HAS ALWAYS BEEN A subtle mix of art and technology. But the scales have clearly tipped toward technology for a pair of acoustical consultants who have recently developed acoustical simulation rooms that allow architects to hear the results of design changes before they are made.

Charles M. Salter Associates of San Francisco and Orfield Associates of Minneapolis are using sophisticated recording and digital processing equipment to simulate acoustical designs in new, acoustically isolated listening rooms. Any sound, ranging from a new air-conditioning system for an existing building to a school band playing in a new auditorium, can be simulated and understood before a single construction dollar is spent. "For years, architects have enjoyed being able to build a model to show their clients a project," notes David R. Schwind, vice president of Salter Associates. "Now we can answer the question, 'What does it sound like?' "

An advantage of the simulation rooms is that they allow clients to listen to sound without relying on headphones, according to Steven J. Orfield, president of Orfield Associates. Since headphones isolate the listener, they can bias a response to acoustical differences that, in fact, may be insignificant.

Salter's Presentation Studio, built in San Francisco about a year ago, measures 16 by 25 feet and seats 15 people. To prevent sound intrusion, the room is constructed with a concrete floor slab floating on resilient isolation pads and 12-inch-thick, double-framed walls built of steel studs, rubber isolators, and batt insulation, finished in gypsum board. Interior walls are framed in wood studs covered with fabric, creating a cavity for quilted, sound-absorbent blankets. The space also features two ceiling systems: a gypsum board and plywood ceiling suspended from a concrete slab, and a plywood and fabric ceiling below it to hide lighting and an air-distribution system. Sixteen speakers are mounted in the walls and ceilings.

The resulting room forms an acoustically neutral environment in which the firm conducts project-specific simulations, as well as demonstrates educational presentations on acoustical design. Simulations are created using a laboratory-grade microphone and a digital audio tape recorder to record sound that is fed into a computer. For one client, Salter recorded traffic sounds outside a condominium complex and then used electronic overlays to demonstrate how much sound would penetrate the units with different types of windows. Any combination of acoustical components, such as variations in reverberation and background noise levels, can be examined in the simulations.

Orfield built a similar facility, called the Acoustical Simulation Room, in Minneapolis last year in collaboration with Yamaha Professional Audio of Japan. The 10-by-20-foot carpeted room is acoustically isolated by 8-inch-thick foam wedges placed on the ceiling and walls, and contains 16 wall-mounted speakers. Orfield's simulation room was recently used by the Minneapolis firm Architectural Forum to test its acoustic design of a theater/gymnasium addition for a private school in Maplewood, Minnesota.

The school's new addition, now under construction, will serve as two physical education classrooms, a basketball court for high school games, and a theater for the school's drama productions. Because the school wanted to avoid the poor acoustics that result from holding theater productions in a highly reverberant gymnasium, the architects gave priority to developing good theater acoustics, using the simulation room to model different architectural shapes and materials. The final design includes 690 fully upholstered seats on a stepped, carpeted structure that rolls away into storage when the gym is in use. A wooden stage at one end of the room flips up, sealing off the backstage area.

After the design was developed, the school's theater and choral directors and trustees were invited to listen to simulations of how a children's chorus would sound in the space when a variety of acoustical panels and sound-absorbent materials were added or eliminated. "It was useful for us to understand the alternatives," points out Jack H. Buxell, principal of Architectural Forum. "It helped the clients understand what they were getting. They didn't have to take our design on faith." ■

—V.K.D.

Flexible Theaters

Performance spaces are playing multiple roles with movable architecture.

WHILE REGIONAL INTEREST IN THE ARTS HAS increased in this country, most communities cannot afford to build a separate opera house, concert hall, and theater to house each touring company. And in this era of fiscal austerity, even cultural facilities that are home to resident theatrical, dance, or musical companies must attract alternative sources of revenue, ranging from business meetings to bridge tournaments. For economic survival, performing arts centers that serve a variety of functions have become essential.

But accommodating different performing arts, each with its own spatial needs, within one theater is difficult. Concerts, for example, demand a single, undivided hall; opera requires an orchestra pit and space for elaborate scene changes; drama calls for intimate settings. Mixing these functions requires careful orchestration of architectural elements so that each art form remains uncompromised.

To accomplish this seemingly unsurmountable task, leading architects throughout this country are collaborating with Theatre Projects Consultants, a 35-year-old multidisciplinary company with experience in all facets of theater development, from program feasibility to equipment design. Founded in London, the firm expanded to North America in the late 1970s and now has offices in Toronto, Los Angeles, and Ridgefield, Connecticut. Its 32-person staff includes lighting and sound designers, theater engineers, architects, and arts administrators.

Unlike many theater consultants, who are *traditionally* called in to specify technical equipment after an auditorium has already been conceived, Theatre Projects collaborates with architects and acousticians early in the planning stage to bridge the gap between design concepts and performance needs. The company has developed a reputation for creating new types of flexible performance spaces with strong architectural character. "Theater Projects is motivated to push the edge of the envelope and help the spatial nature of theater evolve," notes Kelly Cotten, artistic director of the Addison Centre Theatre (pages 42-49).

Flexible theaters are not new. In Europe's Baroque theaters, for example, audiences were often ushered into the lobby after a performance while seating was removed and the auditorium floor flattened with ropes and pulleys. Guests were then invited back in for a formal ball. But such versatility was lost in the 20th century, buried within technically equipped black boxes. A barren room lined with black curtains, such experimental spaces were both characterless and impractical, "better suited to a funeral parlor than a play," jests Richard Pilbrow, one of Theatre Projects' founding partners. The time and cost required to fill these unimaginative spaces with stage, seating, and scenery were more than most artistic companies could afford. "In practice," Pilbrow maintains, "90 percent of the black boxes in the world are reconfigured only a few times a year."

Rather than serving as a static frame for scenery, architecture is becoming a dynamic part of the performance, accommodating symphonies, plays, and operas with versatility.

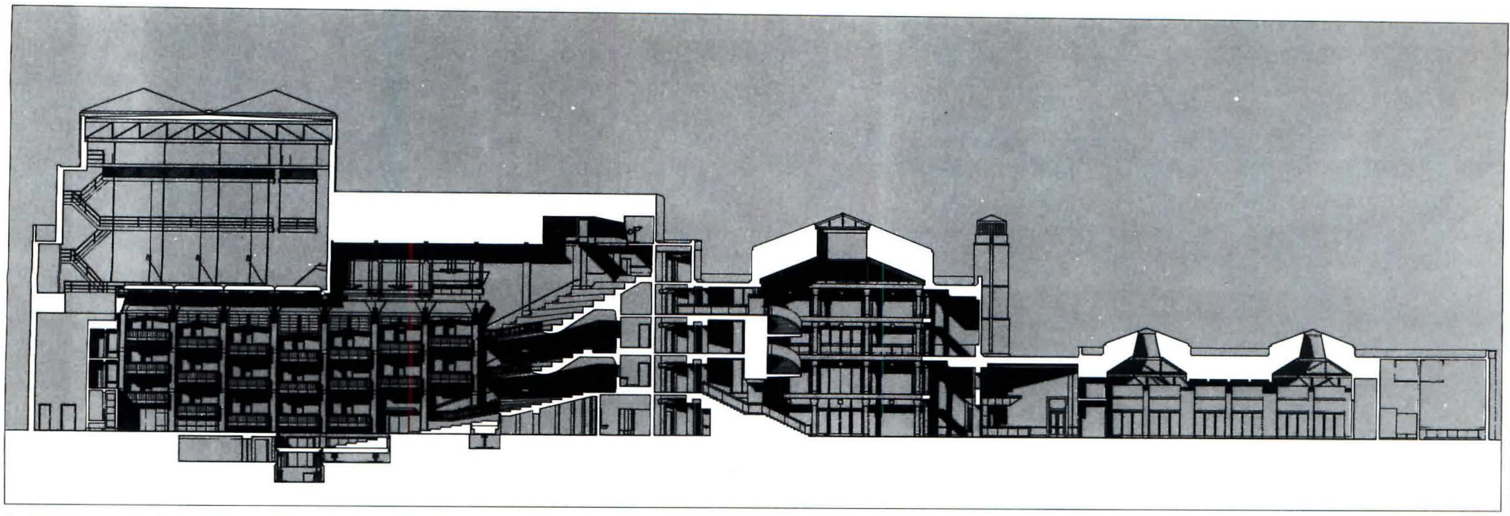
Searching for alternatives, Theatre Projects recognized that flexibility can be achieved through the manipulation of traditional elements, such as stage and seating, as well as the architecture of the theater itself. One of the firm's signature design elements, for example, is a movable seating tower that allows a room's interior to be reshaped while retaining its basic architectural envelope. Simple versions, such as those for the Head Theatre (page 102), sit on castors and can be pushed to any part of the room by two or three people. Larger, more elaborate seating towers, such as those planned for the Cerritos Arts Center (pages 96-97), rotate or slide on "air castors," a technology borrowed from the aerospace industry that relies on compressed air to lift hefty structures an inch off the ground during transport.

But seating towers are not the only elements designed to move. Theatre Projects has detailed stages to adjust from a raked to flattened position and to be disassembled and reconfigured into any shape. The firm has specified proscenium arches that widen to accommodate different sized productions; low-rise seating platforms that roll out when needed and can be stored below the auditorium when not; and floors that can be raised or lowered to form stage, orchestra pit, and level surfaces as required.

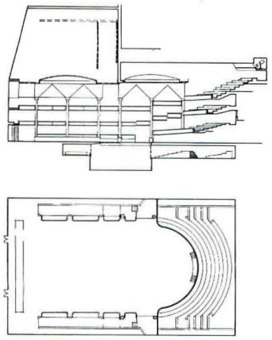
Theatre Projects is also exploring another form of flexibility, derived from experimental theater in "found" spaces, such as warehouse lofts and garages. In these unconventional arenas, the traditional division between audience and performers is blurred. The rectangular hall of the Addison Centre Theatre, (pages 100-101), for example, is built with multiple doors, windows, balconies, floortraps, and other technical systems that can be woven into the stage set as necessary. A new theater for Emory University (pages 98-99), mixing old and new architectural features within a spiral shape, promises to be even more innovative. Instead of serving as a static frame for the scenery, the architecture of both these theaters becomes a dynamic part of the performance. By enlisting different aspects of the built environment, an artistic director can build different spatial relationships between audience and performers to reinforce the particular psychological tenor of each theatrical event.

Although designed to be flexible, each theater in the following portfolio illustrates a different character: a grand auditorium that blends high-tech mobility with traditional courtyard sensibilities, a modest hall built of movable parts, an organically sculpted theater, and a renovated space that retains elements from its past. They all reflect Theatre Projects' innovative approach and the potential for moving architecture back into the spotlight.

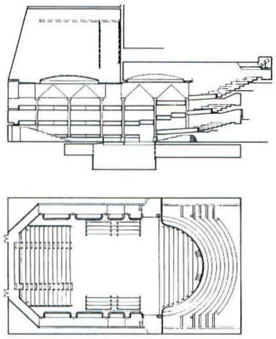
—NANCY B. SOLOMON



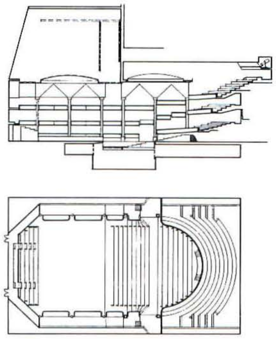
SECTION THROUGH AUDITORIUM (CONCERT CONFIGURATION)



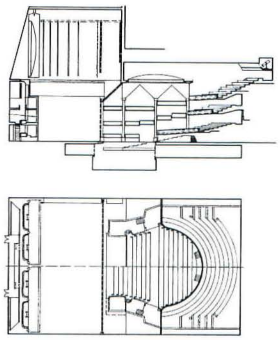
FLAT FLOOR (6,390 SF)



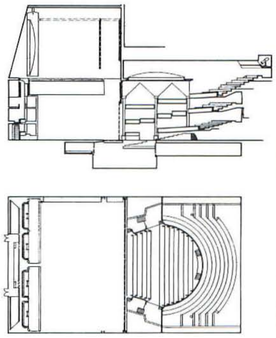
ARENA (1,800 SEATS)



CONCERT (1,750 SEATS)

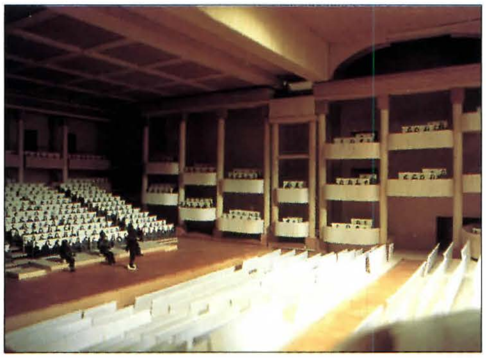


LYRIC (1,450 SEATS)

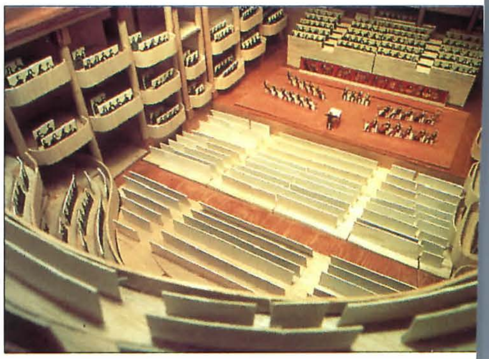


DRAMA (950 SEATS)

FLAT-FLOOR CONFIGURATION



ARENA CONFIGURATION



CONCERT CONFIGURATION

LYRIC CONFIGURATION

LYRIC CONFIGURATION (IN TRANSITION)

DRAMA CONFIGURATION

Five Easy Pieces

Cerritos Arts Center
Cerritos, California
Barton Myers Associates, Architect

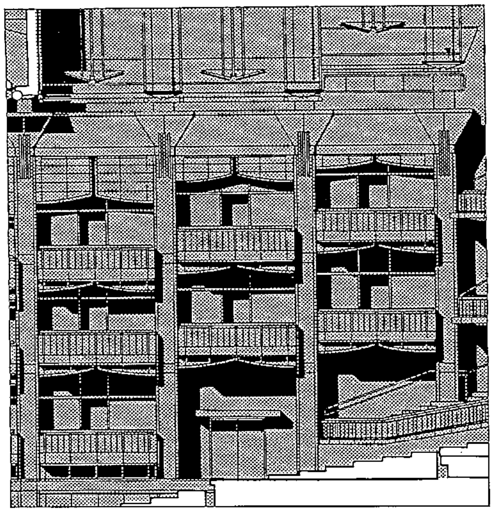
EAGER FOR ITS OWN CULTURAL CENTER THAT could accommodate music, drama, and convention spaces, the city of Cerritos turned to Los Angeles architect Barton Myers in collaboration with Theatre Projects Consultants for a cost-effective solution. The result is a single performance hall that seamlessly changes into five basic configurations (facing page): flat floor (for banquets and conventions), arena (for theater-in-the-round performances), concert, lyric (for opera and musicals), and drama.

The almost instantaneous transformation of the 17,000-square-foot theater, which is scheduled to open in 1993, is made possible through movable floors, a suspended ceiling, portable seating platforms, an adjustable proscenium arch, and five sets of rotating and sliding seating towers.

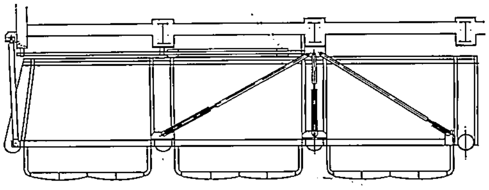
In the flat-floor configuration, the auditorium and side-stage seating towers (top left) are lined up against the side walls, and the rear-stage seating towers can be slid downstage. To create the appearance of one large hall—rather than an auditorium and stage—an acoustical ceiling drops above the stage to hide the fly loft. The ceiling panel that defines the top of the proscenium arch in drama and lyric modes (left section and right detail) is rotated horizontally.

The arena and concert configurations result in similar ceiling and seating tower arrangements. In the arena format, the floor remains flat and seating platforms surround the central area. For a concert, floor lifts lower to differentiate the auditorium from the stage and to support seating platforms that extend the rake of the auditorium.

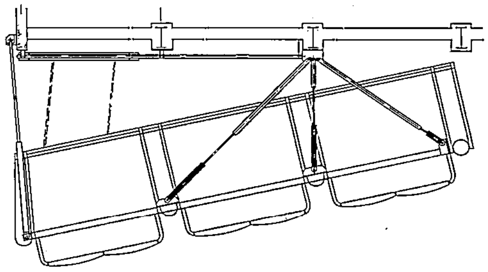
In drama and lyric modes, the suspended ceiling is tilted and raised above the stage o expose the fly loft. The rear-stage tower lides upstage, and the side-stage towers roate toward the rear to create wing space on he sides. The auditorium towers are angled oward the orchestra seats for greater intimacy (top right, bottom plan). Floor lifts adust to form the stage, additional seating evels, and, when appropriate, a forestage or rchestra pit. For larger seating capacity in he lyric configuration, the proscenium arch s set back by angling the ceiling panel away rom the audience. For drama, the panel roates into a vertical position so that the actors erform as close to the audience as possible.



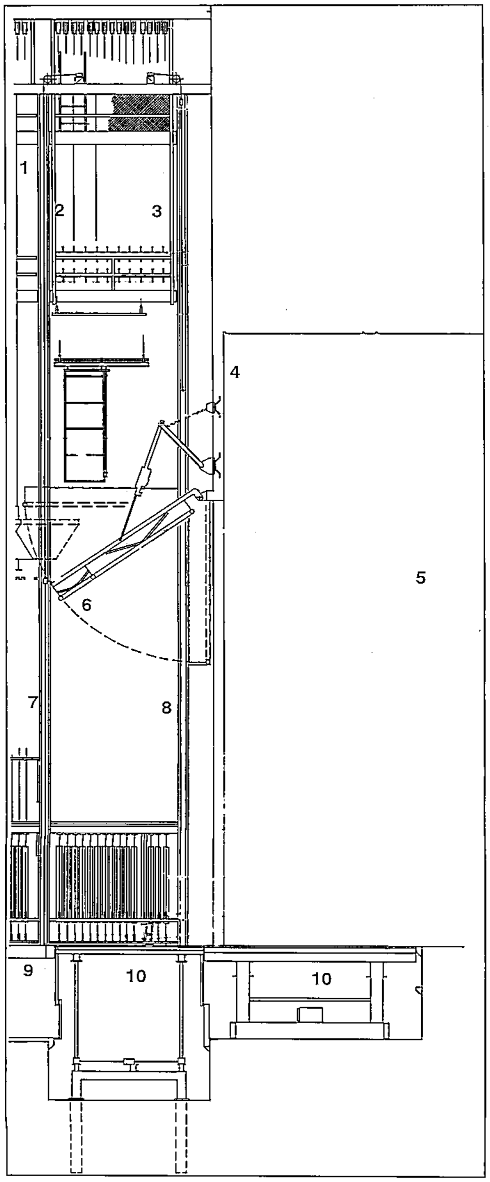
AUDITORIUM SEATING TOWER



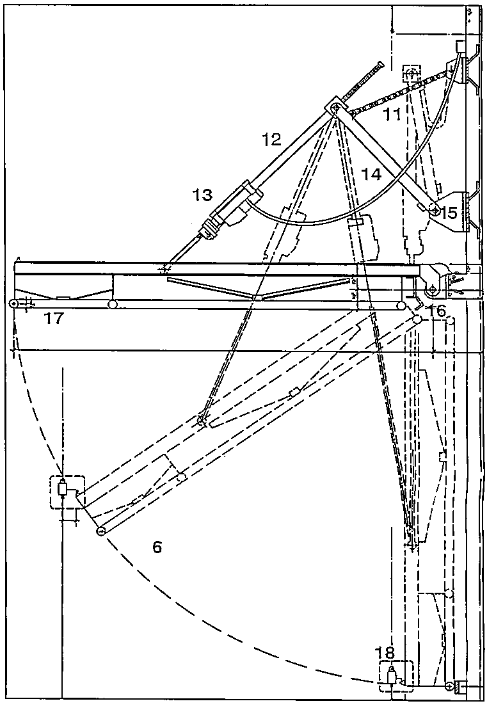
SEATING TOWER RETRACTED



SEATING TOWER EXTENDED

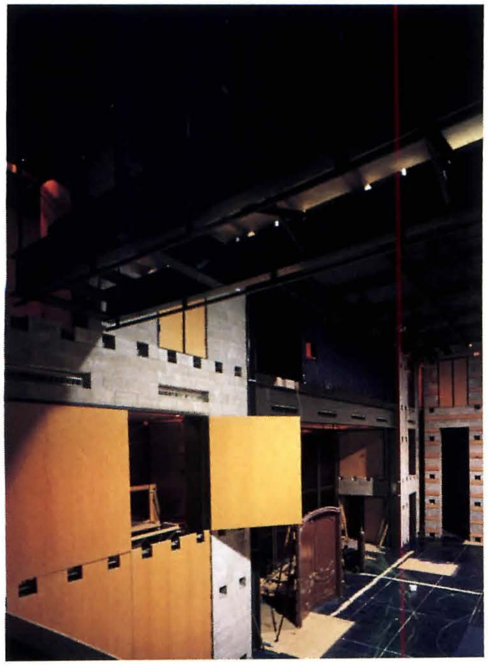


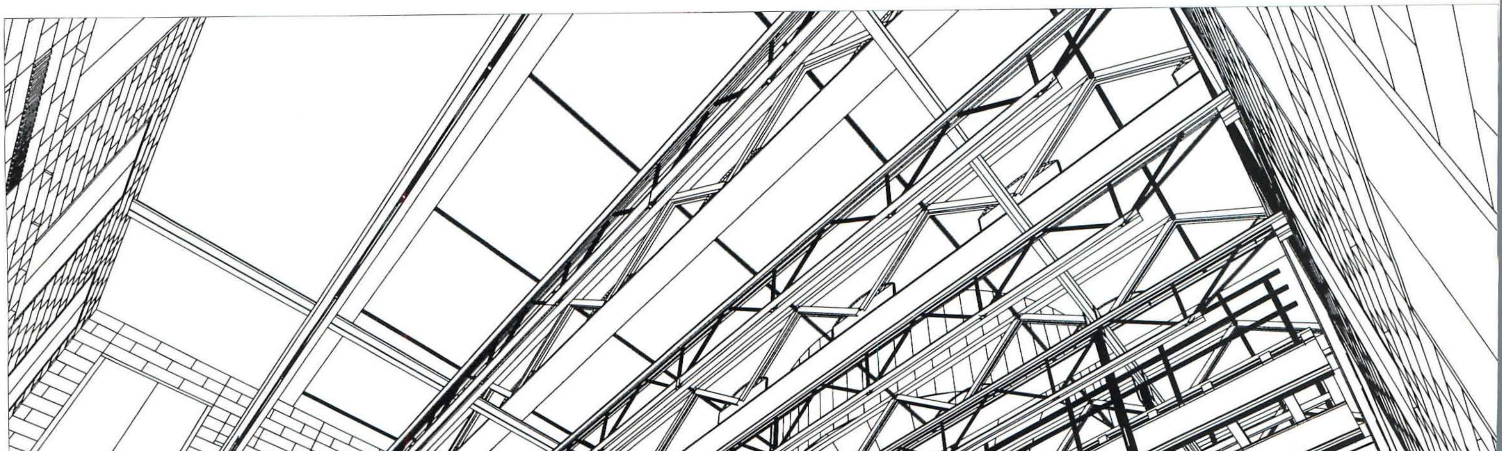
SECTION THROUGH PROSCENIUM ARCH



ADJUSTABLE CEILING PANEL DETAIL

1	FLY LOFT
2	FIRE CURTAIN NO. 2
3	FIRE CURTAIN NO. 1
4	PROSCENIUM WALL
5	AUDITORIUM
6	CEILING PANEL, LYRIC CONFIGURATION
7	PROSCENIUM POSITION, LYRIC CONFIGURATION
8	PROSCENIUM POSITION, DRAMA CONFIGURATION
9	STAGE FLOOR
10	FLOOR LIFT
11	RESTRAINING CHAIN
12	SCREW JACK
13	TRUSS
14	HINGED ARM
15	*ANCHOR BRACKET*
16	HINGED BRACKET
17	CEILING PANEL, CONCERT CONFIGURATION
18	CEILING PANEL, DRAMA CONFIGURATION





Theatrical Constructs

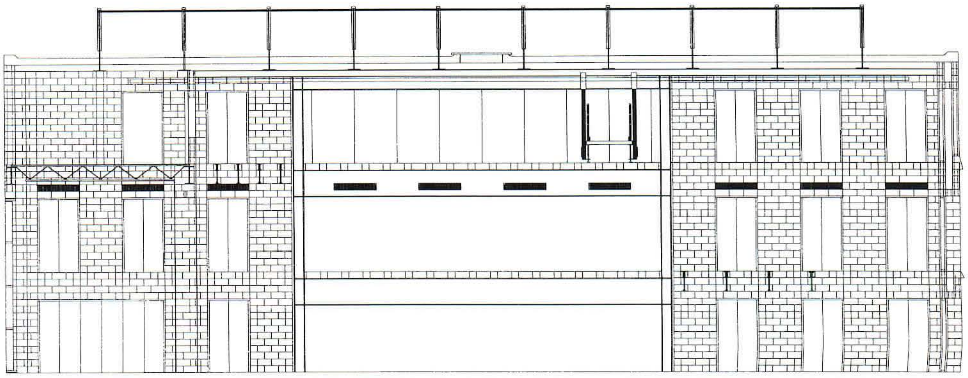
Addison Centre Theatre
Addison, Texas
Cunningham Architects

IN THE ORIGINAL ADDISON CENTRE THEATRE, a 1939 stone cottage, Executive Director David Minton and Artistic Director Kelly Cotten established a reputation for novel staging. For one show, Minton and Cotten hauled in tons of dirt to create a playing field. For another, they began a play with headlights of a car sweeping through the windows of the darkened theater. When the town of Addison decided to build a new theater as part of a larger civic center, Minton and Cotten requested that architect Gary Cunningham and Theatre Projects foster their continuing experimentation.

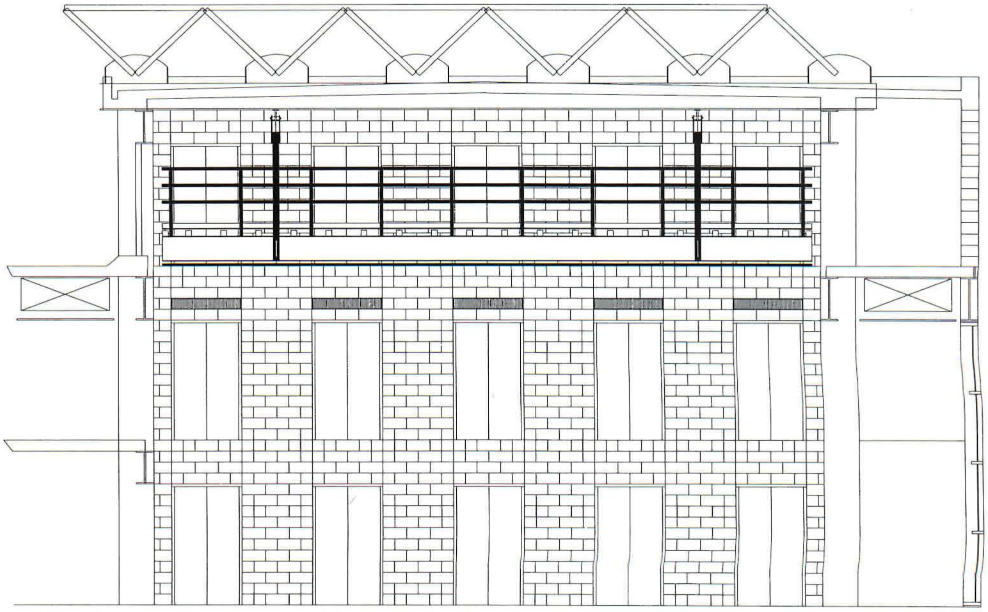
The project team responded by designing a concrete block shell with movable steel joists that supports an infinite variety of productions. Like a giant erector set, the 40-by-88-foot hall is lined with 75 fir doors, allowing for unlimited stage entrances. Eight-inch-square beam pockets (facing page, top) puncture the walls at 2-foot-wide and 4½-foot-high intervals to receive joists, so that a stage floor or audience platform can be assembled anywhere in the three-story space. Lighting, sound, video, and power lines are threaded through wall columns along the perimeter so that equipment can be positioned at any point.

Each elevation presents the actors with different options. A classical arch on the east wall (top right) is well suited to frame a proscenium stage. Glass doors, which can be blocked when necessary, offer an urban view and allow the actors—and audience—to spill out-of-doors. On the south face of the room (above center), a steel balcony on the second level spans two concrete block walls. Doors and windows on the third level of this wall and the west wall (right) open to the sky, so that daylight can pour in from above and actors can emerge from an adjacent rooftop. To the north (facing page, bottom), glass doors and windows overlook a garden landscape. A steel girder can be inserted between the concrete block walls to create a temporary balcony on the second floor.

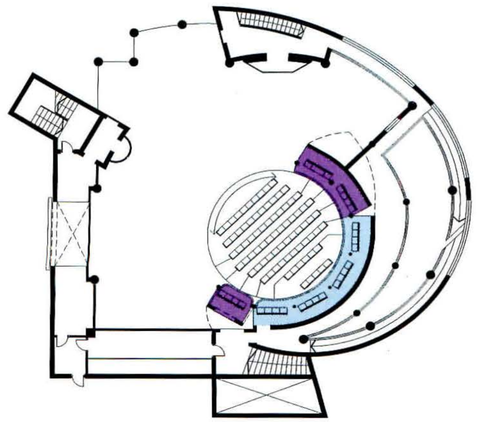
The floor and ceiling open up further creative opportunities. Actors can drop from a hatch in the concrete roof, prance across the motorized catwalk at the third level, or emerge from a series of traps running along the center of the floor.



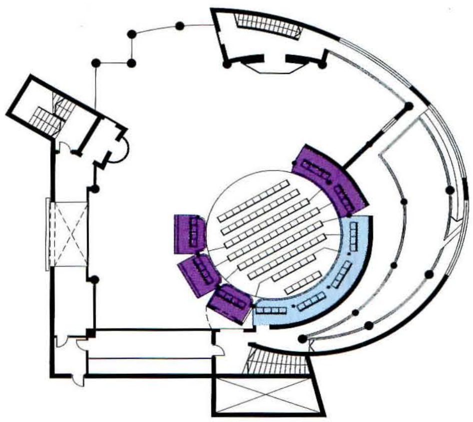
SOUTH INTERIOR ELEVATION



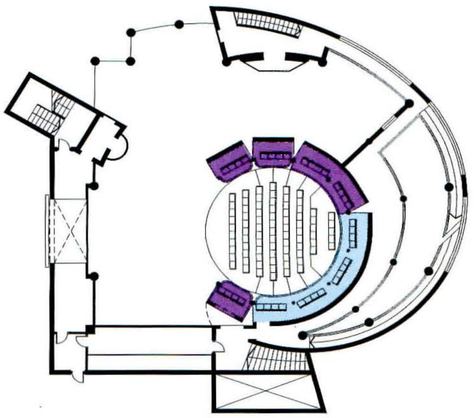
WEST INTERIOR ELEVATION



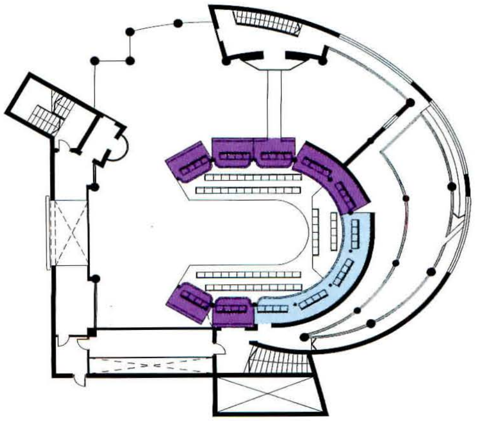
BASIC FORMAT



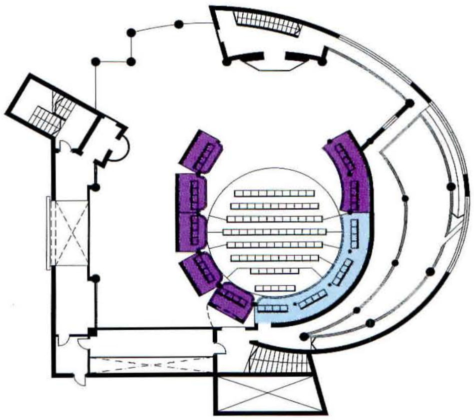
STAGE TO GARDEN



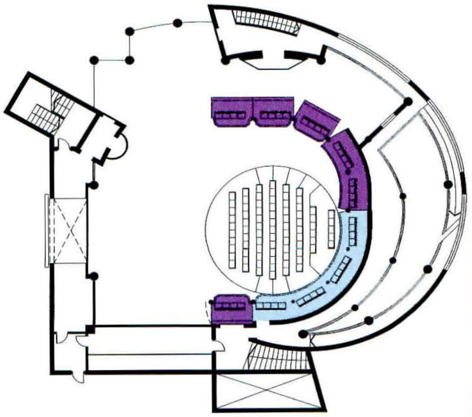
PROSCENIUM



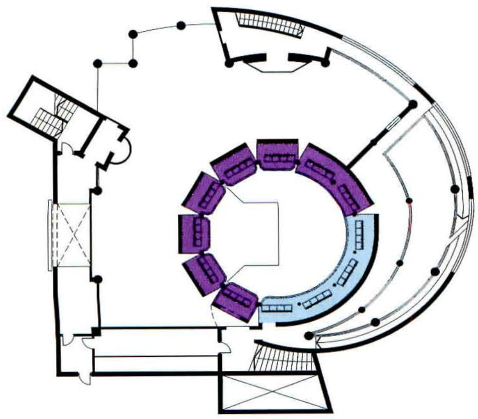
THRUST



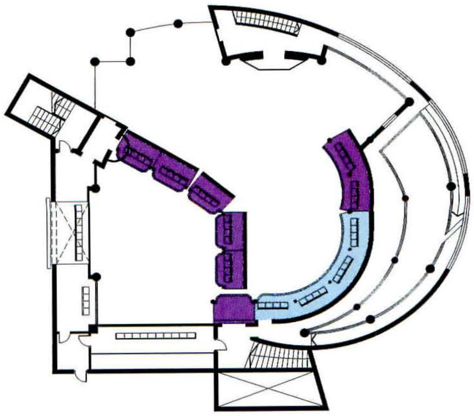
STAGE TO TOWER



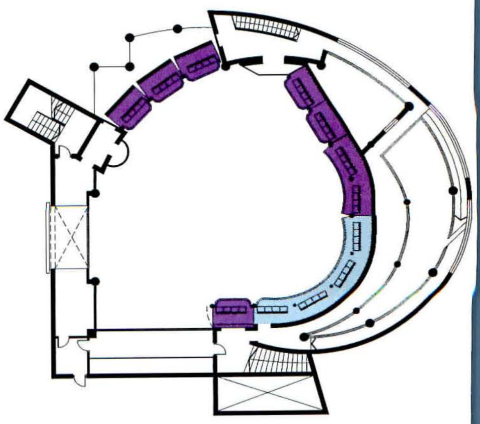
WIDE END STAGE



ELIZABETHAN



DOUBLE STAGE



REVERSE SPACE

Living Room

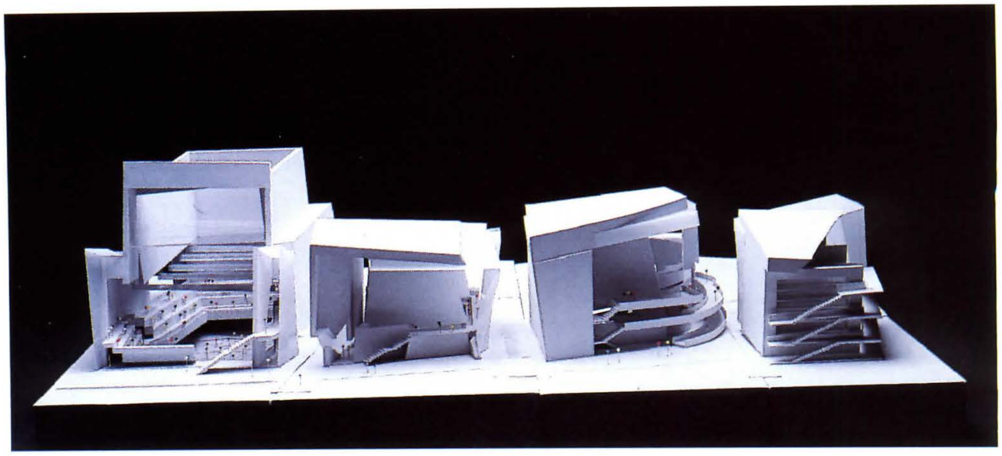
Center for the Arts, Emory University
Atlanta, Georgia
Eisenman Architects

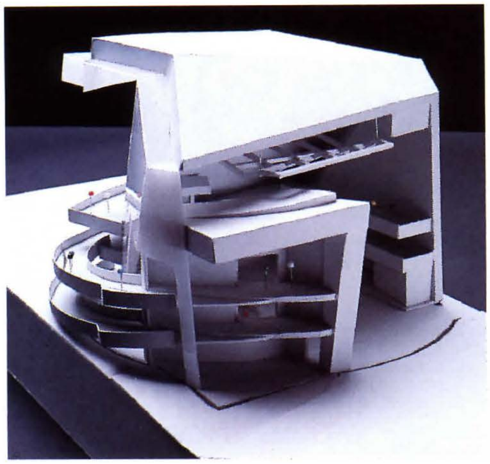
THEATRE PROJECTS IS PUSHING ARCHITECture to center stage in a new 200-seat theater proposed for Emory University. This auditorium, musical hall, cinema, and recital hall are the major components of a 125,000-square-foot art center designed by Peter Eisenman (top right). The university intends to complete the entire complex in time for the Cultural Olympiad in 1996, which runs concurrently with the Atlanta-hosted Summer Olympic Games.

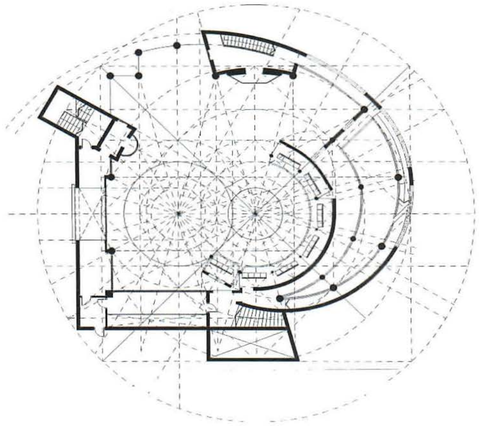
Theatre Projects partner Richard Pilbrow calls the Emory playhouse (center left) a "living room," an experimental space with varied architectural shapes and features that represents the antithesis of the rectangular, neutral black box that became popular in the 1960s. The consultants proposed a three-dimensional shape based on a nautilus curve (center right) and developed both fixed and movable architectural elements. "The ever-changing, spiraling form allows for many foci," explains Eisenman. "Natural conditions for a proscenium, thrust, and theater-in-the-round are built into the architecture."

The permanent features include a perimeter wall, three stair towers punctuated by window and balcony openings, and a curvilinear ramp. An arc of fixed seating galleries, either transported from an older theater facing demolition or built to resemble a theater from the past (bottom), will comprise half of the auditorium. Additional seating will be provided by contemporary towers that are rolled into different positions and low-level seating that rotates on a turntable. A glazed wall overlooking a garden may be opened when access to the outdoors is desired.

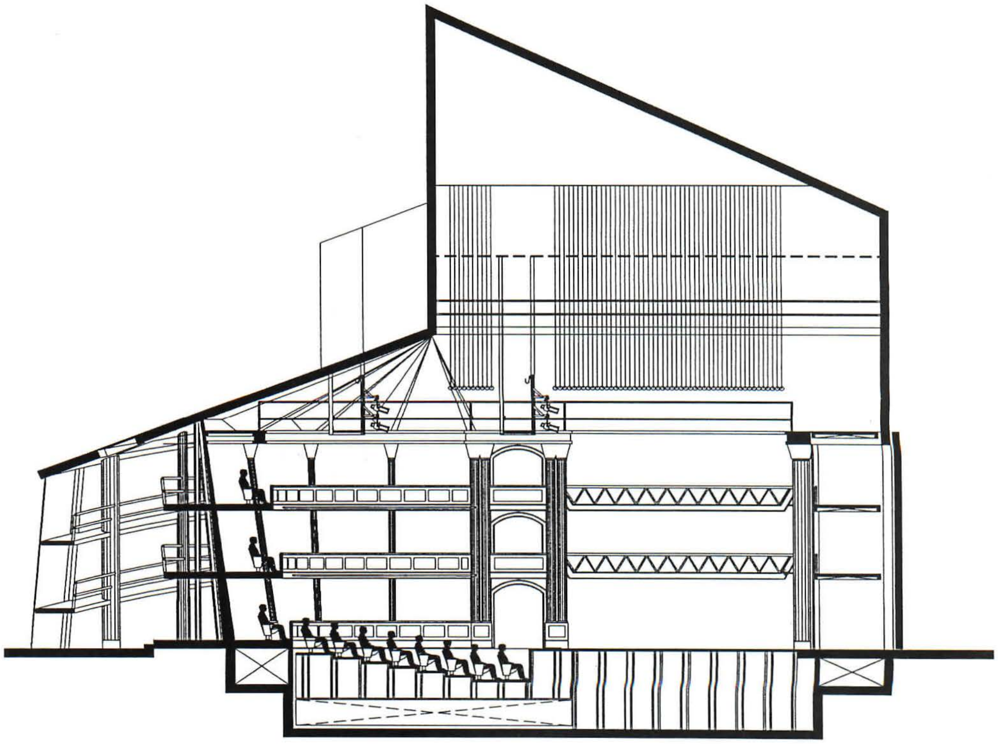
With these elements in place, the theater can be arranged in at least nine configurations (facing page). A proscenium stage along the flat wall of the theater is created when the movable seating towers are lined up to continue the curve of the permanent galleries. This arc can be elongated to surround a thrust stage, or completed into a circle for an Elizabethan theater. The entire seating arrangement can be rotated to face either stair tower or transparent garden wall. The seatng towers can be lined up along the edge of he theater to form one very large performance space, or down the center to divide the oom in half for two concurrent events.



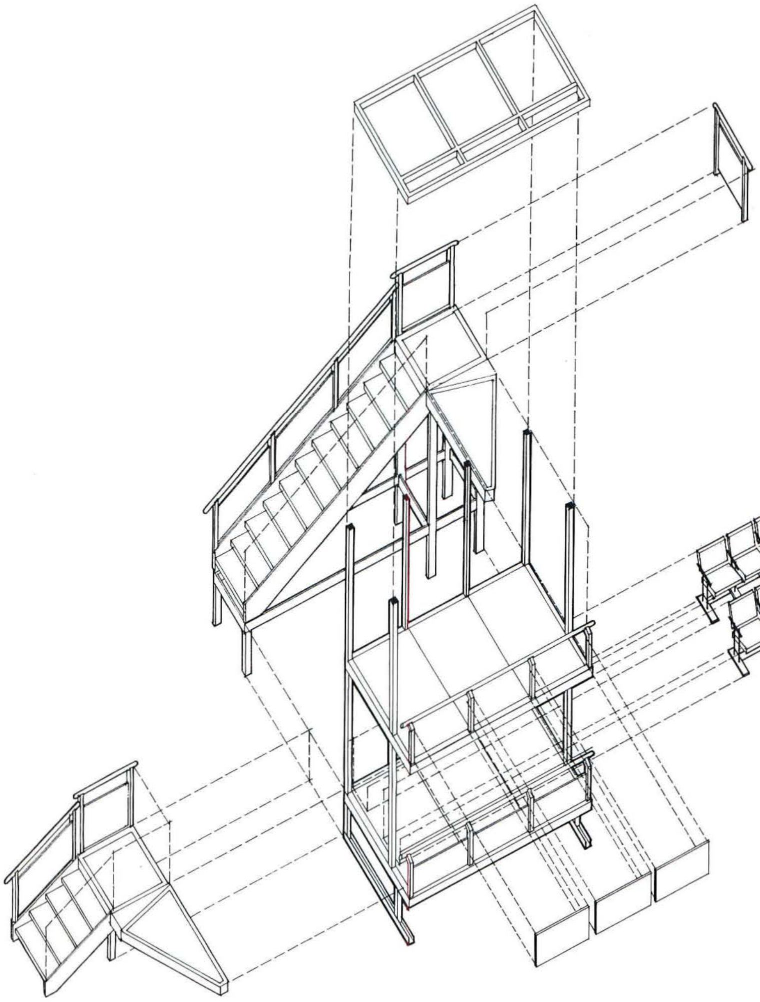




COMPOSITE PLAN AND NAUTILUS CURVE



SECTION THROUGH THEATER



AXONOMETRIC OF SEATING TOWER

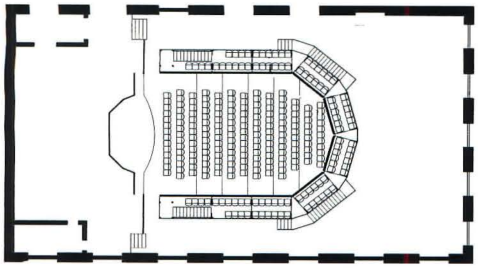
Historic Setting

The Head Theater
Baltimore, Maryland
Ziger, Hoopes & Snead Architects

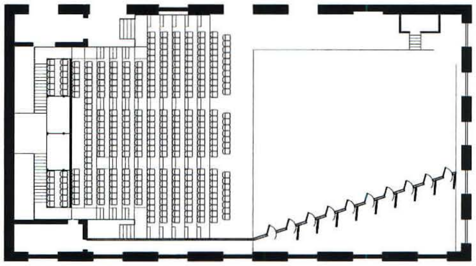
THE DESIRE TO PRESENT A WIDER RANGE OF dramatic work drove Center Stage in Baltimore to develop the Head Theater. Since 1975, Center Stage had been staging its productions in a 541-seat fixed auditorium on the ground floor of a renovated 19th-century Jesuit seminary. With no backstage and small wing space, this theater limited the size and scheduling of shows.

In 1989, the theater commissioned local architects Ziger, Hoopes & Snead and Theatre Projects Consultants to design a second, more versatile performance space within the fourth and fifth floors of the former seminary. The new theater's flexibility is derived from a movable kit of parts that includes stage and riser platforms and two-level, 18-foot-high seating towers (left).

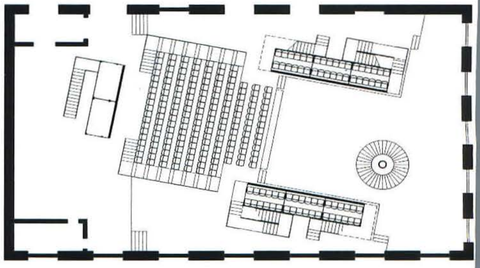
A more subtle flexibility results from the architects' decision to retain the room's existing architectural features, including arched windows on the east wall, a raised floor on the west end, base and cove moldings, and riveted steel trusses. Rearranging the kit of parts within this renovated room, the theater's artistic director can create many configurations, including a miniature opera house, an end stage, and a three-quarter thrust stage (below). ■



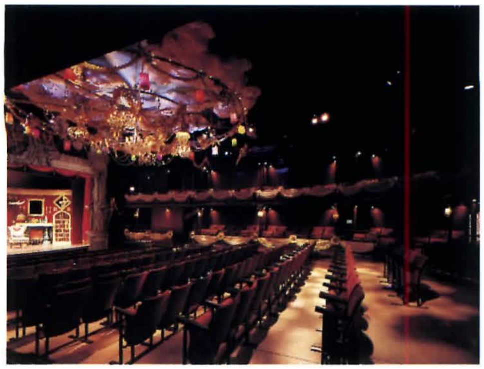
MINIATURE OPERA HOUSE



END STAGE



THREE-QUARTER THRUST STAGE



Gehry Forges New Computer Links

Aerospace-developed software translates curved forms into crafted construction.

LOS ANGELES ARCHITECT FRANK GEHRY IS renowned for his idiosyncratic compositions of discrete, sculptural volumes. But until recently, Gehry has found it difficult to describe those forms with conventional two-dimensional architectural drawings. In the past, ordinary computer graphics and promises of productivity for repetitive designs had not appealed to him. Now, having completed several projects with a sophisticated CAD system designed for the aerospace industry, Gehry is enthusiastic about how computers may change the course of the profession. With the new technology, he can engage in sculptural explorations without being constrained by uncertainties about the methods and costs of building his designs.

"This technology provides a way for me to get closer to the craft," Gehry explains. "In the past, there were many layers between my rough sketch and the final building, and the feeling of the design could get lost before it reached the craftsman. It feels like I've been speaking a foreign language, and now, all of a sudden, the craftsman understands me. In this case, the computer is not dehumanizing; it's an interpreter."

Search for new software

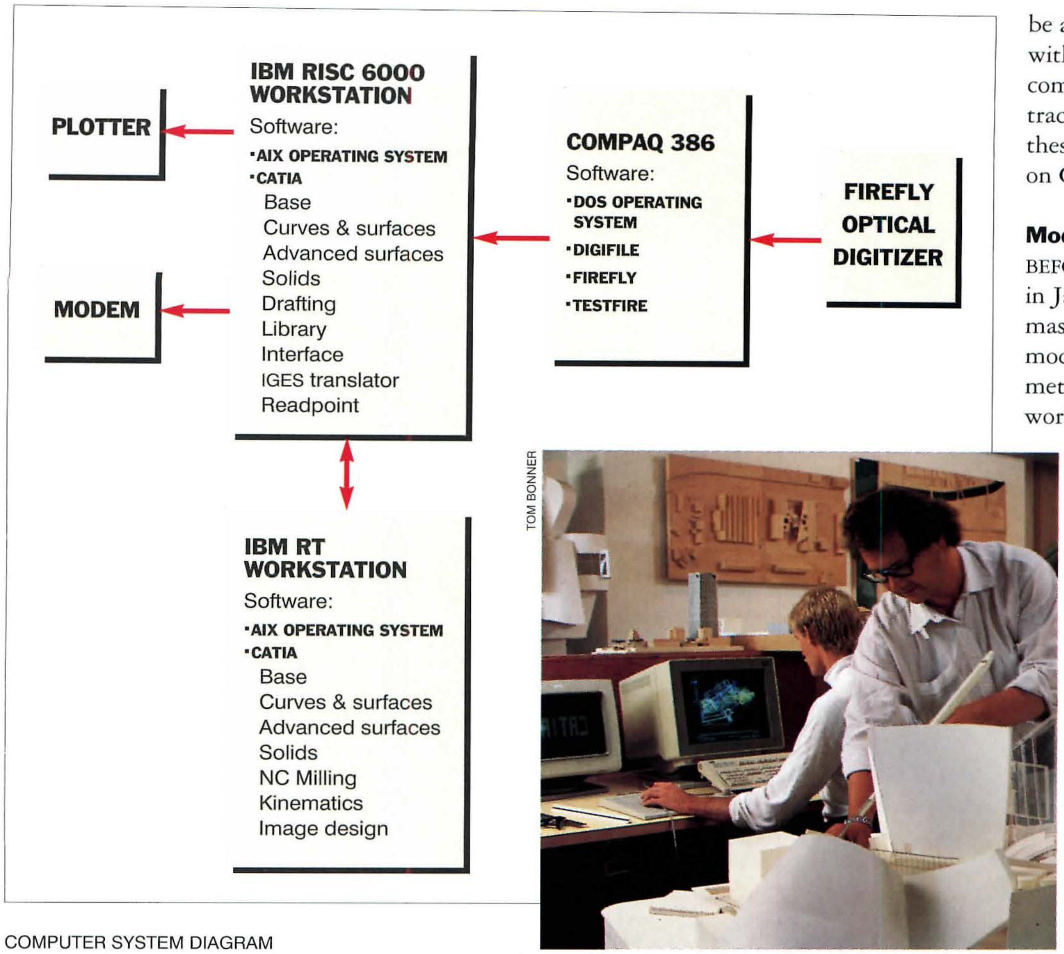
ONE OF THE OBSTACLES BETWEEN GEHRY'S design concepts and their execution was the act of documenting three-dimensional shapes in two-dimensional drawings. Gehry's staff would carefully measure his hand-crafted models, perform lengthy calculations, and prepare multiple sections and plan cuts to try to describe the design. Unfortunately, such drawings were very time-consuming and tended to make the shape seem more complex than it really was. Contractors, uncertain about how the unusual forms could actually be built, would err in their cost estimates. That would lead Gehry, concerned about stayng within the client's budget, to somewhat ompromise his designs' complexities. So in 990, Gehry's staff, under the direction of Principal James Glymph, began seeking computer software that could handle complex D models yet leave intact Gehry's physical-model-based design process.

During this search, the firm tested a variety of architectural software. The architects' first built experiment with computers was a large fish sculpture for the Barcelona waterfront in the 1992 Olympic Village. The sculpture, about 180 feet long and 115 feet tall, is characterized by complex curves that defy traditional two-dimensional documentation. Initially modeled by Gehry in wood and metal, its curvilinear surface is clad in flat, woven, stainless steel panels that float above an exposed steel structure. Facing severe time constraints, the architects explored computer technology as a medium to communicate their design to the builders. William Mitchell, professor of architecture at the Harvard Graduate School of Design, introduced them to a range of architectural software; as a graduate thesis project, Harvard student Evan Smythe produced a surface model of the fish with Alias software. Although this representation was visually accurate, the software proved limited. Like most architectural and rendering software, Alias defines surfaces as a grid of polygons.

By contrast, software with complete numerical control could define surfaces as a set

TOM BONNER

While Frank Gehry and James Glymph (above, right in photo) discuss Disney Concert Hall model, computer consultant Rick Smith locates positions with a digitizing wand, and Catia system coordinator David Reddy works with computer model (left in photo).



TOM BONNER

COMPUTER SYSTEM DIAGRAM

Diagram of equipment in Gehry's office (above) shows flow of information within the firm's computer system. David Reddy and consultant Rick Glenn collect data for modeling the Disney Concert Hall (inset).

of mathematical formulas that could be applied by steel fabricators to build the sculpture. Glymph knew that such software existed, because design and construction in the automotive and aerospace industries were already highly automated.

In his search for software that would solve the problems of documentation and uncertainties in construction, Glymph discovered Catia, a 3D modeler designed for the aerospace industry. Produced by Dassault, a French software company associated with IBM, Catia models curved surfaces with complete numerical control. Thus, an architect or builder can query a Catia model for the precise location of any point on any surface. The architects created a Catia representation of the Barcelona fish, then tested the model's accuracy by constructing a paper model with a three-dimensional laser-cutter. With a few modifications, Gehry verified that this new model matched his original conception.

Within Catia, the architects located the points at which the sculpture's cladding would connect to the steel structure. The electronic model was then converted to the AES software format and shipped to the structural engineering group of Skidmore, Owings & Merrill in Chicago, which further developed the structure. Then the architects translated the AES model back into Catia and studied the juxtaposition of the structure and the steel panels, which float an average of 10 inches above the structure. The next problem was to design a system of steel pipe strakes, like the ribs of a boat, that would be supported by the structure, offset from it by short struts, and that would create a web to support the cladding. The surface curvature varied throughout the sculpture, and the distance between surface and structure ranged from 4 to 18 inches. Therefore, the lengths of the struts holding the steel pipe strakes to the structure had to be different at every connection. The entire construction was so complicated that the cladding's formation over the curved surface, the varying curvature of the strakes, and the connections to the structure could only be accurately measured and documented within Catia. Rick Smith, of the Los Angeles computer consulting firm C-cubed, was contracted to develop the methods for defining these components and training Gehry's staff on Catia.

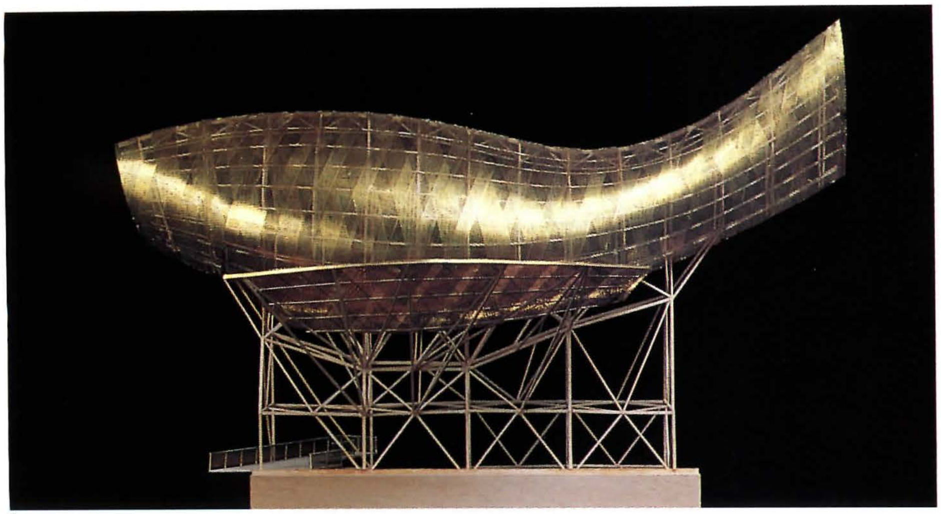
Modeling for construction

BEFORE CONSTRUCTION OF THE FISH BEGAN in January, 1992, the Italian contractor, Permasteelisa, was required to build a full-size mock-up of the sculpture to test construction methods and visual effect. The contractors worked from traditional working drawings, including a series of sections and fully dimensioned structural drawings. Beginning with the structure and working outward to the surface, they tried and failed six times to build the test piece. "At the same time," relates Glymph, "we were working with the computer model and discovered that the deformation of the panels was not rationally understandable." The strakes, for example, looked parallel but were not. Finally, the architects sent the fabricators dimensional data on the components in electronic form. By using the Catia model to determine the length of strut at each connection, working from the outside surface in, and plotting full-size paper templates for bending the steel pipe strakes, the construction firm successfully completed the test.

Permasteelisa immediately understood the advantages of this approach. The company bought Catia, began sharing information with the architects, and became partners in developing the computer model for the fish sculpture. Throughout this modeling process, the contracting firm would develop specific connection designs, which the architects would receive via modem and review on screen.

Barcelona Fish
1992 Olympic Village
Barcelona, Spain

Gehry began modeling the fish sculpture (facing page) in wood and metal (1). With the CAD software Catia, his staff then developed models for the woven steel surface panels (2 and supporting steel strakes (3) of the sculpture. Computer model (4) shows underside of winglike fin, demonstrating separation between surface and structure. A view of the four systems (5) shows the structure in white, the struts red, the strakes blue, and the surface yellow.



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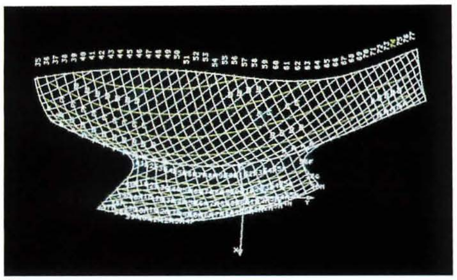
RICHARD BRYANT/ARCAID



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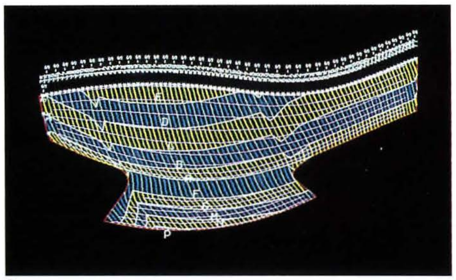

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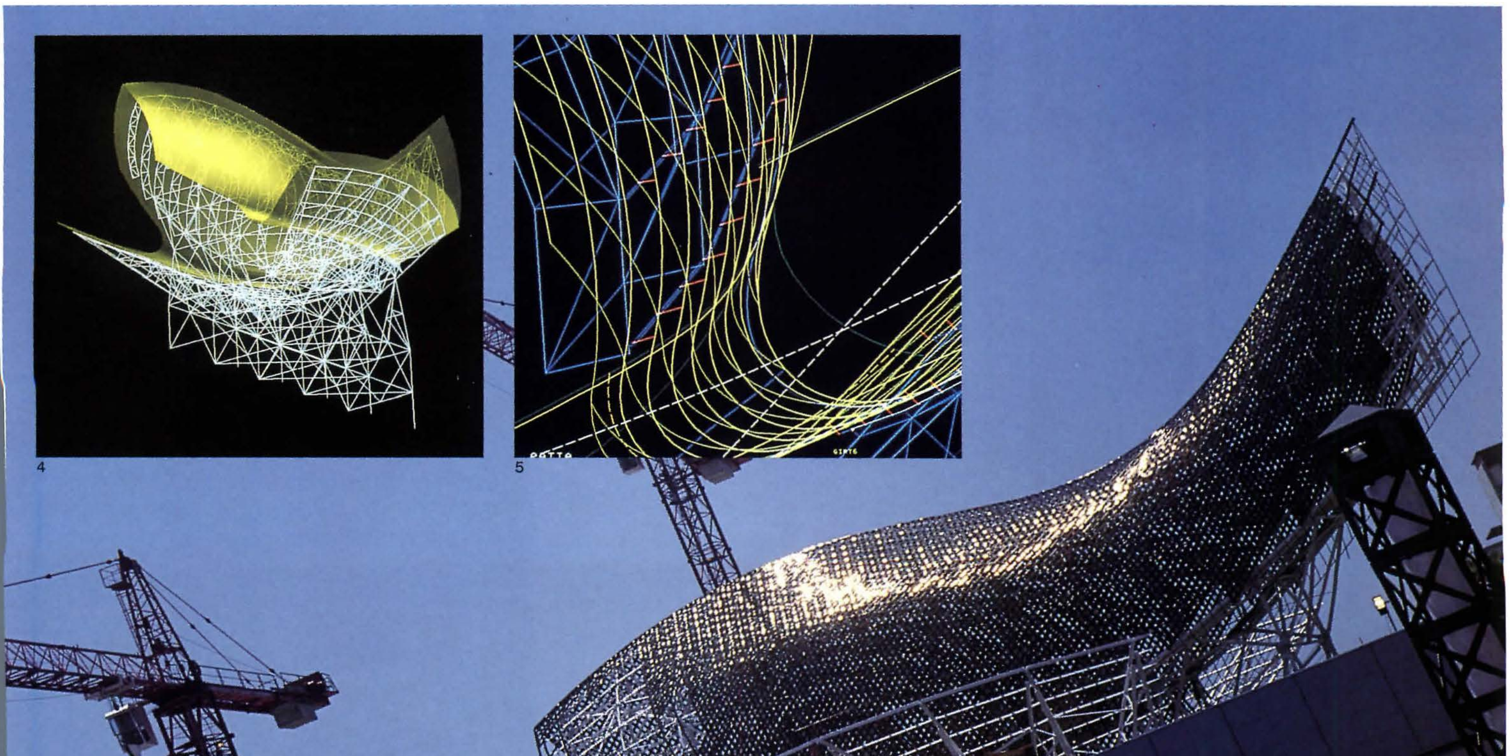

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Construction of the final sculpture followed with what the architects describe as astonishing speed and accuracy. From preliminary design to the completion of construction required only about six months. "Of the thousands of connections," Glymph reports, "two were off by 3 millimeters. The rest were perfect." And there were no drafted construction documents. "Flat drawings of curved surfaces can be beautiful," Gehry admits, "but they are very deceptive. With this system, you can see how to build it."

The fish sculpture convinced Gehry and his associates that computer model data could be invaluable in helping to fabricate complex forms quickly and accurately. A bus stop in Hanover, Germany (below), extends the capabilities developed for the Barcelona fish. The bus stop's shallow arching vault of silver and green stainless steel is supported by a dense grouping of vertical steel "T" shapes. Both canopy and structure were modeled in Catia and used to create design documentation. The architects expect that the computer information will be further developed by the fabricators into shop drawings for each assembly.

Digitizing data into drawings

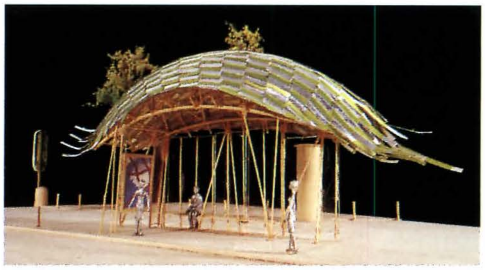
IN FURTHER EXPLORING THE POSSIBILITIES of the technology, the architects' next test was in French limestone for the 200,000-square-foot Disney Concert Hall in Los Angeles. Frank Gehry began design by building a paper model characterized by irregular, flowerlike curves. To convert the model into an electronic format, his staff used a Firefly optical digitizing system from Pixsys, a Colorado company. The digitizer is currently under development, with the Santa Monica office as a test site. Comparable digitizers were rejected because of their cost.

The hardware setup in Gehry's studio includes Firefly's three cameras, which are mounted in the ceiling. The cameras "read" data from a digitizing wand as a staff member touches key points on the physical model. The position in space of the wand tip is translated into x, y, z coordinates by a nearby microcomputer, which then feeds the data into an IBM RISC 6000 engineering workstation that runs Catia. By manipulating the data in Catia, the staff "rationalizes" the complex forms into mathematically definable curves and cylinders that describe the shapes of the limestone panels. Precise cut lines for each stone are manipulated until they satisfy both seismic and esthetic demands, with an effort to minimize the number of unique stones to reduce fabrication costs. Each stone is characterized in the Catia database by shape, thickness, density, and weight, facilitating quantity take-offs and accurate cost estimates.

Computer links to fabrication

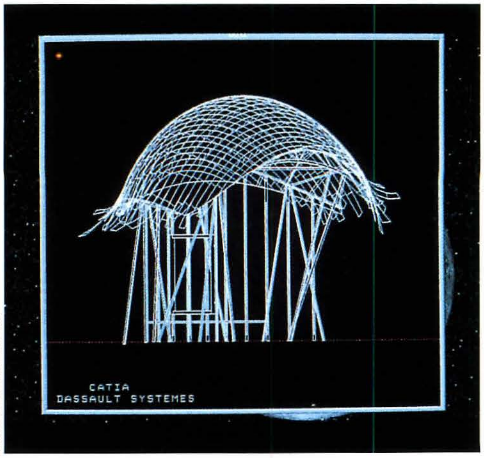
ALTHOUGH THE RESULTING COMPUTER model can be viewed in three dimensions on the computer screen, the architects plan to add another component to its computer setup: a milling machine that receives mathematical information and produces a physical model. Gehry will then be able to examine the result and verify that the incorporation of subsequent technical information did not change the model from his original intention.

To prove the applicability of their computer model to limestone construction, the architects designed a single curved panel, similar to walls of the Disney Concert Hall, for an exhibit for the 1991 Venice Biennale. At first, working with flat drawings on paper, the stonecutters complained they would not be able to fabricate the panel within the two-month time limit. So, with Catia, the architects produced in one week all the necessary shop tickets—fabricators' documents that specify detailed cutting instructions—for each stone. "When the stonecutters saw the shop tickets," Glymph relates, "they were surprised we'd done it so fast. But they realized that the right way to do this in the future would be for us to give them electronic data that they could input directly into their automated cutting machines. Eliminating two human translation steps would make the process faster and less prone to error." Even without that streamlining, the wall was completed with tolerances of 1 millimeter and ahead of schedule. The French software company Dassault is now investigating the possibility of developing links between Catia and stonecutting equipment.



Bus stop
Hanover, Germany

A bus stop designed by Frank Gehry for Hanover's Expo 2000 extends the firm's computer capabilities developed with the Barcelona fish sculpture. A physical model (above) shows the shallow arching vault of silver and green stainless steel, supported by vertical steel "T" shapes. The canopy and structure were modeled in Catia (below) and used to create design documentation.



JOSHUA WHITE PHOTOS

"Curved surfaces in stone are not new," Glymph claims. "They were created thousands of years ago, but with very large budgets. We're trying to do it with a limited budget, and the only way to do that is to eliminate all the intermediate labor steps, including shop drawings." With Catia, the contractor knows every dimension of every surface, and can query the system for any needed information. Glymph adds, "We expect all those factors to drive down the cost of shaping complex curves in stone."

The architects emphasize the importance of working with the right contractor. "When we bring contractors in to see the concert hall," Gehry relates, "they get nervous about how to build it. Then we take them over to the computer setup and show them we've already built a wall this way. The ones who understand are the ones we want to work with."

In extending the use of the computer model for the Disney Concert Hall, the architects will apply the model data to the building's flat, curved, and sculpturally formed metal wall panels. A Catia feature allows them to "fold" and "unfold" metal electronically to help analyze the panels. The metal fabricators will get direct access to Catia to develop their templates.

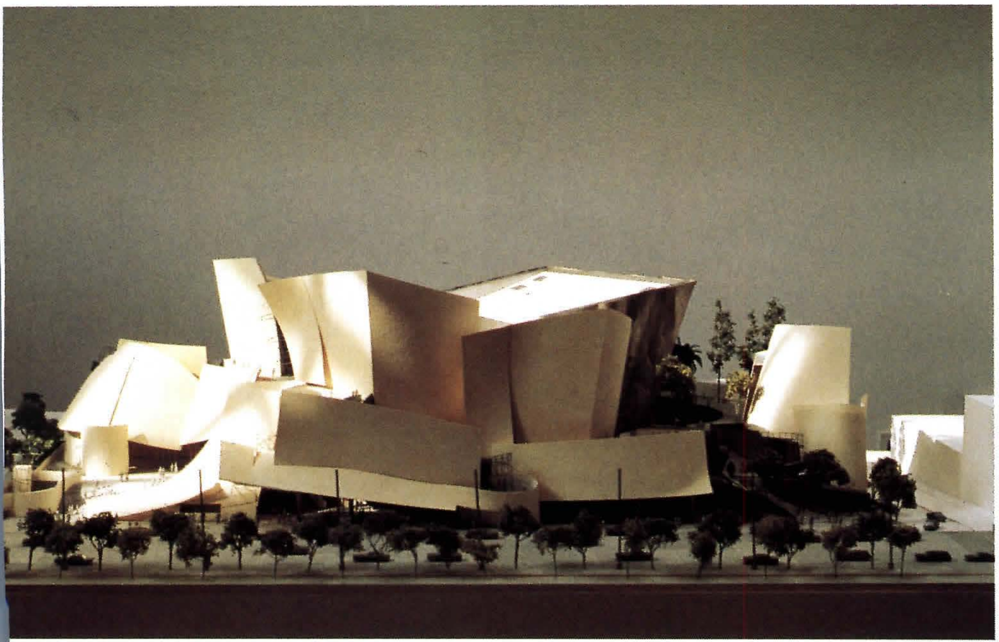
Links from the electronic model are also being forged in other areas of design and construction. The acoustical engineers are using dimensional information from Catia to verify their own measurements. Wind tunnel testing is being conducted with a model created through stereolithography. Even handcrafted construction components will be supported by access to full-size plotted templates.

JOSHUA WHITE

1

Walt Disney Concert Hall
Los Angeles, California

The Disney Concert Hall, future home of the Los Angeles Philharmonic, is currently in the construction documents phase. The design began with Gehry's physical model of metal and heavy paper curves (1, 2). Using the Firefly optical digitizer, key points on each curved surface were entered into the Catia CAD system. A wire-frame view of the resulting solid model (4) shows curved surfaces that will eventually be cut from stone. Designed originally for the aerospace industry, Catia has the capacity to define every surface mathematically and store associated databases of technical information. For example, a milling path (5) determined by the computer from the electronic model may be transmitted directly to the stonecutters' milling machines, bypassing paper documentation. While demystifying the fabrication of such forms, the computer also puts the architect back in control of the craft of building. In addition to stone, some Disney Concert Hall walls will be constructed of curved metal, a 1:10 mock-up (3) of which was constructed to demonstrate methods that may be applied in construction. A Catia feature allowed the architects to "fold" and "unfold" the metal electronically to analyze the panels (6). Glymph reports that the sheet metal industry is now changing, inheriting equipment from the aerospace industry, and exploring potential links between that equipment and Catia. Ground-breaking for the Disney Concert Hall is scheduled next month, and the building is expected to be completed in 1996.



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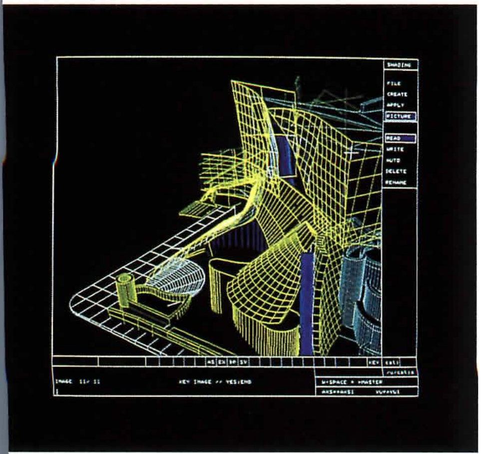

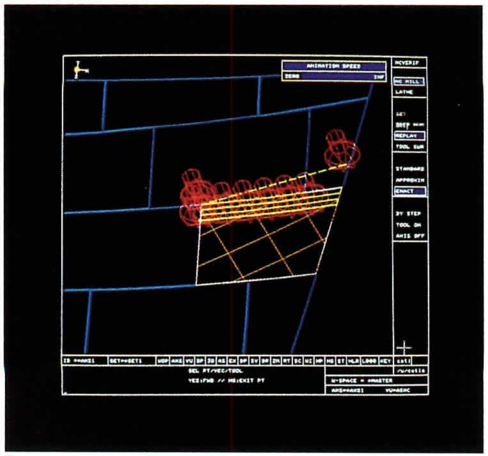

JOSHUA WHITE

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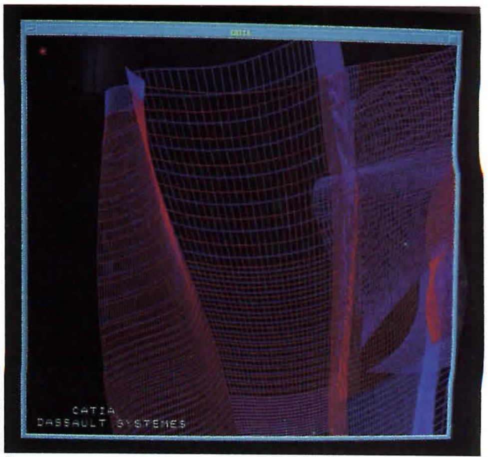

JOSHUA WHITE

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Pushing the limits of technology, the architects are currently working with software developers to modify programs that were designed for aircraft, to make them more suitable for building construction. Glymph contends, "Our approach to computer technology is different from that of most other architects. We see it as a tool for fabrication and design simultaneously, not for producing traditional drawings. We also want to use the technology for free forms, not to standardize repetitive ones."

Glymph believes that complex forms are not the only reason to move toward this technology. He argues, "The same technology is applicable to articulated facades and to highly repetitive buildings." Architects designing simple, rectangular buildings may do well with conventional software, but wherever special milling is needed, the communication between electronic model and fabricator's equipment can be beneficial.

Redefining the architect's role

GEHRY AND HIS ASSOCIATES ARE ALSO CONsidering how the relationships between traditional players in the construction process may need to be redefined. Ideally, architects, engineers, contractors, and fabricators would work from the same computer model, beginning early in design. "We could communicate our design to them through the model," explains Glymph, "and they could communicate their technical requirements and cost information to us, all via modem." Throughout design and construction, both architect and contractor could review the project work electronically, checking design conformity, budget compliance, and work coordination as additional layers of information are added to the model. The back-and-forth flow of electronic data would even continue after the building was completed. Glymph adds, "Contractors could use a theodolite—a 3D laser surveying device—during construction to control dimensions and to feed conditions back into the model. At the end, you'd have a 3D as-built."

These ideas about sharing information raise legal questions. "To limit professional liability under our current system," Glymph asserts, "design architects don't want to share computer data with associate architects, who don't want to share with consultants or contractors." To clarify the boundaries between their legal responsibilities, each participant in the design and construction processes typically starts from scratch. For example, contractors produce shop drawings that are separate from working drawings. In this process, errors are compounded, and the quantity of paper the contractor has to coordinate at the site becomes unwieldy. "Everyone is responsible for a small portion of the project," Glymph goes on, "but no one wants to be responsible for the whole, and the result is confusion and delays." The challenge, he believes, is to unite all the players through one modeling system. "Although you still want to keep the expertise where it belongs," he says, "an electronic dialog blurs the line of responsibility because we all share the same document. Now, legal barriers are standing in the way of technology." Glymph likens his goal to the pre-19th century tradition when architects were master builders working directly with craftsmen.

Gehry hopes to test these legal ideas in current and future projects. For the Disney Concert Hall, each of about 15 consultants, though working primarily with their own software, will be given access to Gehry's Catia model. To facilitate information exchange without changing traditional responsibilities, the owner has contracted the consulting firm C-cubed to provide Catia modeling services to each member of the design and construction team. Each team works with the same model, adding its own expertise and required information, eliminating the need to start over at each stage. For example, the architect's model embodies the design, and the contractor's contribution includes information about how to build a design that might traditionally have been documented on shop drawings. Because C-cubed is a computer service and not a professional architecture firm, it can work under the direction of each team and help them add their contributions without raising legal questions about members encroaching on one another's areas of expertise. In fact, each teams' relationship to the model is similar to conventional relationships within projects. By contrast, if Gehry's staff members coordinated the development of the collective model, they would need to cross the existing lines of professional liability governing other members of the design and construction team.

Throughout design and construction, Catia allows architect and contractor to review projects electronically, checking design conformity and work coordination.

Legal considerations

HOWEVER, THE CATIA COMPUTER TECHNOLogy does not guarantee error-free projects. So, Glymph cautions, a legal umbrella is still required to protect all the players. Lawyers and insurance experts will need to cooperate with the construction industry to redefine the working relationships. "Given the potential benefits," he adds, "if we can make this work, I don't think the legal and insurance systems will have any choice but to change." Although aerospace companies pioneered the software development and associated fabrication hardware, they may not be able to provide the construction industry with a model for the legal transformation. The path taken by the aerospace industry ended with a very few, very large design/build companies. Architects will no doubt prefer to remain independent and decentralized.

A radical restructuring of the construction industry, by realigning communication channels, will be necessary to facilitate what is already technologically possible through computer software such as Catia. But, Gehry argues, if architects don't exert leadership in figuring out how to incorporate the technology at hand, the profession may become irrelevant. Glymph concurs: "With this technology, we can remain in control of the process while tapping others' expertise when we need it. The building industry is going to use these techniques whether architects participate or not. But if we approach this opportunity aggressively, we can return architects to their leadership role. The challenge is to use the computer as one tool among many to turn in that direction."

Fortunately, the technology that may bolster architects' position in the industry promises to encourage creativity. By translating complex designs through sophisticated CAD systems such as Catia, Gehry believes that curved forms in buildings will soon become more feasible. "I'm excited about them because I like the sense of movement. They feel genuine, accessible, joyful. If I do a lot of buildings with curves, and people enjoy them then clients will begin demanding them, and more architects may follow." And if architects follow Frank Gehry and his associates on these new paths of electronic communications, they may succeed in restructuring the profession along the way.

—B.J. NOVITSK

NeoCon Highlights

This year's introductions feature curved lines and granular textures.

1. Jhane Barnes has designed Constructions, Knoll's new collection of textured wallcoverings created with ceramic granules and wood shavings. Circle 401 on information card.

2. Koroseal Wallcoverings introduces Gossamer Steel, a line of synthetic textile wallcoverings. Circle 402 on information card.

3. DesignTex's Nuts and Bolts fabric is made from BASF's Zeftron 200 nylon. Circle 403 on information card.

4. Brueton Industries introduces the Tango chair. Circle 404 on information card.

**5. Charlotte enters the casegoods market with Toria, designed by Glenn Gee. Circle 405 on
nformation card.**

**5. John Hutton
lesigned Donghia's
ine of Vesuvius
ables. Circle 406 on
nformation card.**

**7. The Eiffel tables,
y Hickory Business
urniture designer
evin Stark, are
onstructed from
naple. Circle 407 on
nformation card.**

**. Atelier Interna-
onal introduces the
tackable Swoop
hair. Circle 408 on
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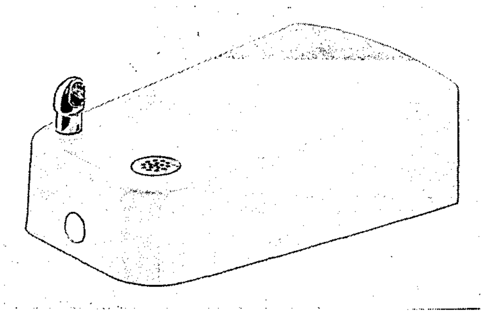

Water Fountains

HAWS DRINKING FAUCET COMPANY MANUFACTURES a line of standard drinking fountains in a synthetic material made from marble chips and polyester resins (above). Appropriate for healthcare facilities, offices, shopping malls, and other public buildings, the fountains feature rounded corners, a chrome-plated, vandal-resistant bubbler, and a front push button. The fountain extends 21 inches from the wall to allow for wheelchair accessibility. The company also manufactures electric water coolers.

Circle 409 on information card.

Flexible Offices

HAWORTH INTRODUCES PREMISE, A LINE OF office furniture designed for workstation flexibility in small- to medium-sized businesses. The system includes freestanding desks, files, and bookcases in addition to wall panels and a cable management system.

Circle 410 on information card.

Office Partitions

TRANSWALL CORPORATION OFFERS A LINE OF partitions for private and open-plan offices. The system can be specified with fabric or baked enamel finishes and a selection of trims. Work surfaces, storage units, electrical wiring, and accessories are integrated into the panel system. *Circle 411 on information card.*

Adaptable Panels

FINE-LINE MOVABLE WALLS BY VIRGINIA Metal Industries are full-height panels that can be reconfigured to suit spatial needs. The panels interconnect to prevent light and dust infiltration and minimize sound transmission.

Circle 412 on information card.

Ceiling Slats

CHICAGO METALLIC CORPORATION OFFERS Innoveil, a baffle-type ceiling system comprising steel blades suspended from the company's $^{15}/_{16}$-inch-wide T-bar grid or existing ceiling grids. Swivel clips are used to attach the blades to the grid. The system is available in two styles and more than 80 colors. Blades are produced in 12-foot-long strips and a range of depths.

Circle 413 on information card.

Cellular Ceiling

ALCAN HAS INTRODUCED LUVR-GRID, AN open cellular ceiling system suspended by a conventional T-bar grid. The system is intended to shield services and utilities within the plenum from view. Suitable for commercial offices and retail settings, the ceiling is a continuous pattern of cells measuring from 8 to 48 square inches. Rectangular cell configurations are also possible. System components, including perimeter trim and wall angles, are available in standard or custom colors. ■

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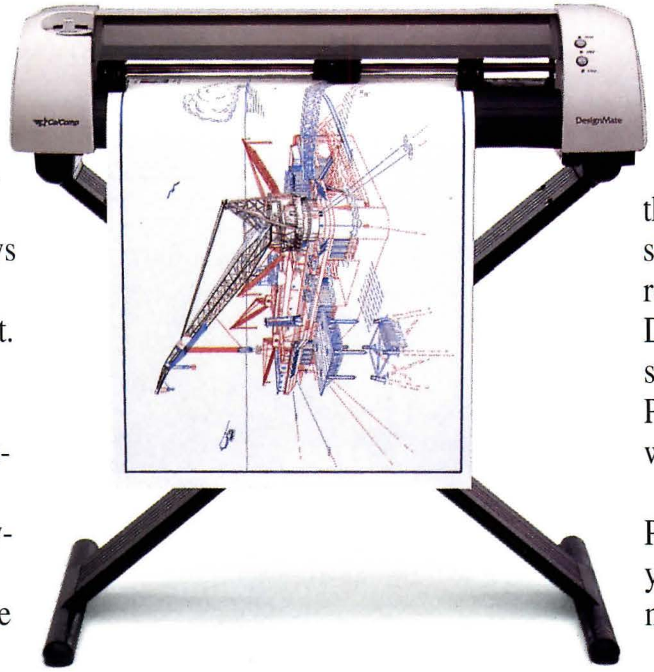

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Neat file

ARCHITECTURE's "No Excuses After This" information exchange

Curtain Walls *CSI Division 08900*

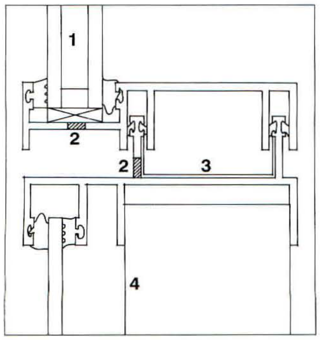
Blind Pockets

When designing a blind pocket—the enclosure for window blinds that is attached to the head of a curtain wall window—architects should be attentive to materials, attachment details, and accommodation of movement in the curtain wall. Steel blind pockets connected to aluminum windows invite galvanic action between the two metals, so pocket and window material should be compatible or isolated from one another. Care should be taken not to locate the pocket below the curtain wall's internal gutter system, which can be punctured and cause leaks if the pocket or blind is fastened with long screws. Horizontal expansion and contraction of the curtain wall will stretch and bend blind pockets of long continuous lengths that bridge expansion joints. Thus, pockets should be constructed of shorter lengths (such as that of curtain wall panels) and allow for movement with sliding sleeves within the pocket.

Kevin Lichten, AIA
Kevin Lichten Architects
Richard Cook, AIA
John Menz-Richard Cook Architects
New York City

Water Leakage Control

In curtain walls, a single line of sealant, gasket, or weatherstripping between a window and its frame should not be relied upon as the sole barrier against water leakage. An internal gutter system (below left) with weep holes to the exterior is needed to capture water that passes the weathering line. Gutters should direct water away from the top edges of the glass, and water must not be allowed to collect against glass edges. Control of water leakage is also critical in brick, precast concrete, and EIFS walls that abut a curtain wall system. A simple hose test is an effective field procedure for detecting leaks during construction. Testing for leaks in pressurized chambers is more rigorous, and best carried out in a materials laboratory.



CURTAIN WALL SECTION

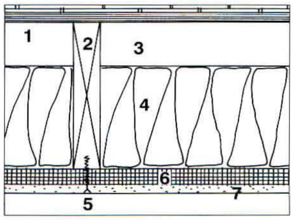
1 GLASS
2 WEEP HOLE
3 GUTTER
4 SPANDREL PANEL

Charles Kliper
Heitmann & Associates
St. Louis, Missouri

Insulation *CSI Division 07200*

Increasing R-value

Achieving an insulation value of R-30 in a cathedral ceiling while maintaining proper ventilation is difficult, given the shallow space found in common 2-by-6 or 2-by-8 roof construction. An alternative is to specify 2-by-10 rafters on 24-inch centers, a system that economizes material without sacrificing structure. Six-and-a-half inches of batt insulation provides R-22; drywall as an interior finish provides R-1; and 1 inch of rigid isocyanurate insulation applied to the underside of the rafters provides R-7 (left). Since it is applied to their underside, the isocyanurate insulates the rafters as well as the space between them, thus reducing thermal "bridging"—the tendency for rafters to conduct heat more rapidly than insulated spaces. This combination of insulation provides a value of R-30, with 2$^{3}/_{4}$ inches for ventilation through continuous eave and ridge vents. For sufficient grip through the rigid insulation, 2$^{1}/_{4}$-inch drywall screws should be used.



ROOF SECTION

1 ROOFING AND SHEATHING
2 2x10 RAFTER
3 VENT SPACE
4 INSULATING BATTS
5 DRYWALL SCREW
6 RIGID INSULATION
7 GYPSUM BOARD

Edward Allen
Edward Allen, Architect
South Natick, Massachusetts

Sound Attenuation

Blocking sound from room to room through glass fiber batts placed in the plenum of a suspended ceiling will only work well if the space is shallow and the insulation creates a lined duct. Sound passes easily through glass fiber, so a plenum deeper than 2 feet will transmit sound, even with a layer of sound-attenuating insulation. Other plenum barrier systems might be more effective, such as extending gypsum board partitions above the suspended ceiling, or positioning a thin sheet of lead over the top of the partition above the acoustical ceiling. Of course, these strategies will also reduce the plenum's effectiveness as a passage for ventilation. Another alternative is to electronically mask the noise with "white sound" that reproduces normal HVAC system sounds.

Carl J. Rosenberg, AI
Acentech Incorporated
Cambridge, Massachusett

Architects are encouraged to contribute their Neat ideas, including drawings, sketches, and photographs, for publication. Send the submissions to: NEAT *File, Michael J. Crosbie, 47 Grandview Terrace, Essex, Connecticut 06426, or by fax (202)828-0825.*

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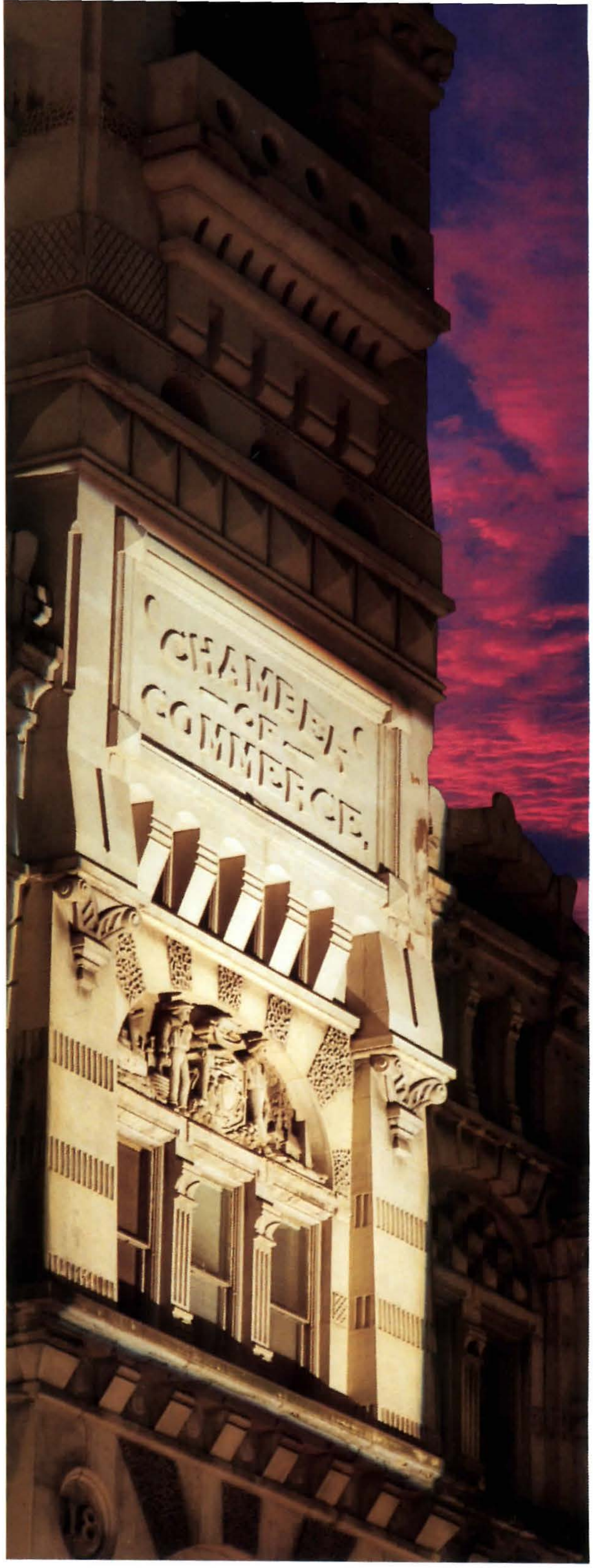

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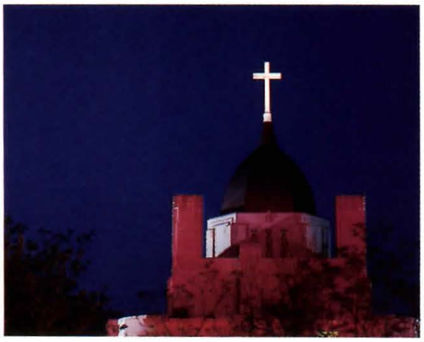

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