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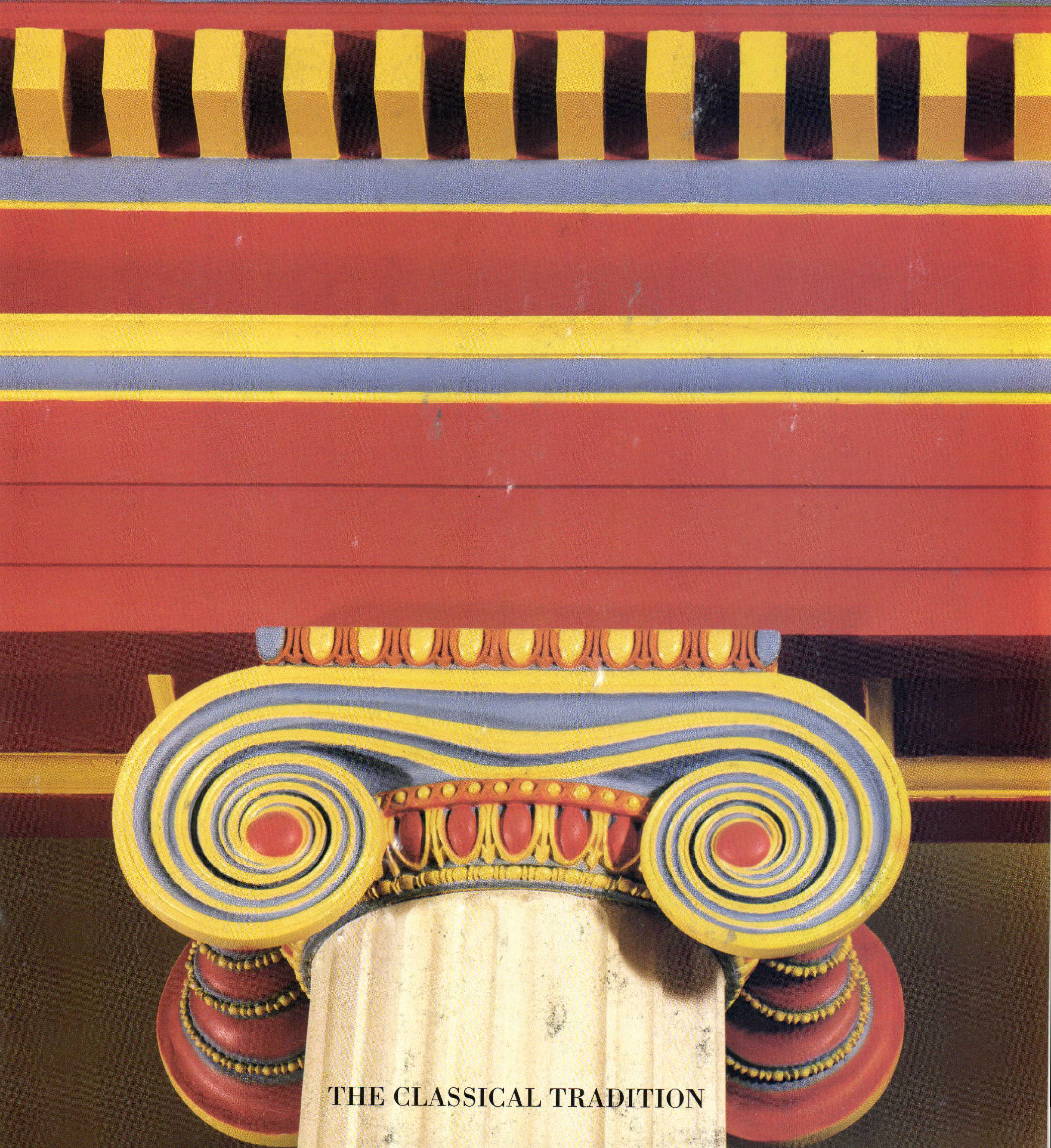
NOVEMBER 1994 INCORPORATING ARCHITECTURAL TECHNOLOGY $6.00 / $7.50 CAN



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Public Safety or Elitism?

NCARB's costly policies for licensing reciprocity limit access to the profession.

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Architects' destinies are being increasingly controlled by the National Council of Architectural Registration Boards (NCARB), the organization of state architectural licensing boards. But many practitioners don't realize the extent of NCARB's reach, especially across state lines.

Most architects know NCARB as the organization that writes the Architectural Registration Exam, which all states now require for a license to practice architecture. For architects who want to practice in states other than their own, NCARB's certificate for licensing reciprocity is now required in 19 states.

However, the standards NCARB sets for its certificate are stricter than many states' licensing standards. The Council requires both a professional degree from an accredited architectural school and, beginning in 1996, completion of the AIA/NCARB Intern Development Program. For an architect with an alternative education and training, obtaining an NCARB certificate is becoming more difficult—and more costly (see chart at left). To be certified, applicants who were registered after 1984 must have a degree from an accredited school or 12 years of experience as a licensed architect—including eight as an NCARB-defined "principal."

Such a policy excludes practitioners with a wealth of knowledge and experience gained from alternative routes to practice. Architects such as Louis Sullivan, Daniel Burnham, and Mies van der Rohe, as well as many talented contemporary architects, would have difficulty being deemed worthy by NCARB. Moreover, NCARB's educational requirement contributes to elitism within the profession by denying equal opportunity to those future architects who can't afford the high cost of attending an accredited, professional degree program. Many states, including New York and California, have refused to require an accredited degree for this very reason.

Now, the Council is promoting the placement of "NCARB" after an architect's name, encouraging all certificate holders to identify themselves as having met NCARB's qualifications. This usage falsely suggests that "NCARB" represents national licensure and implies that it is a membership organization of individual practitioners, not states.

NCARB's decisions are usually made without public comment or review, and few architects are involved in formulating regulations that may severely restrict where they can work. Since each state is represented on NCARB by its licensing board with a single vote, states like New York, Illinois, and California, which are home to most of the country's registered architects, have no more voice than sparsely populated Alaska or Wyoming.

Recognizing NCARB's increasingly expanding role, the AIA is questioning the Council's current policies; discussions between the two organizations' presidents have begun. Architects, too, should begin to ask questions. What do initials added after a name have to do with NCARB's mission to assist the state boards with reciprocity? And why should the standards for reciprocity be higher than the standards for architectural licensing set by state legislatures?

NCARB has existed since 1919, created at an AIA convention to facilitate communication and licensing reciprocity between states. Now, NCARB is overemphasizing uniform standards and limiting access to the profession by failing to recognize alternative education and training. And by urging architects to add "NCARB" to their names, the Council is confusing the profession and the public.

Architects must help the AIA in its efforts to refocus NCARB on its original mission: setting minimum standards for the protection of the public's health, safety, and welfare. Architects must play a more active role in determining their own destiny.

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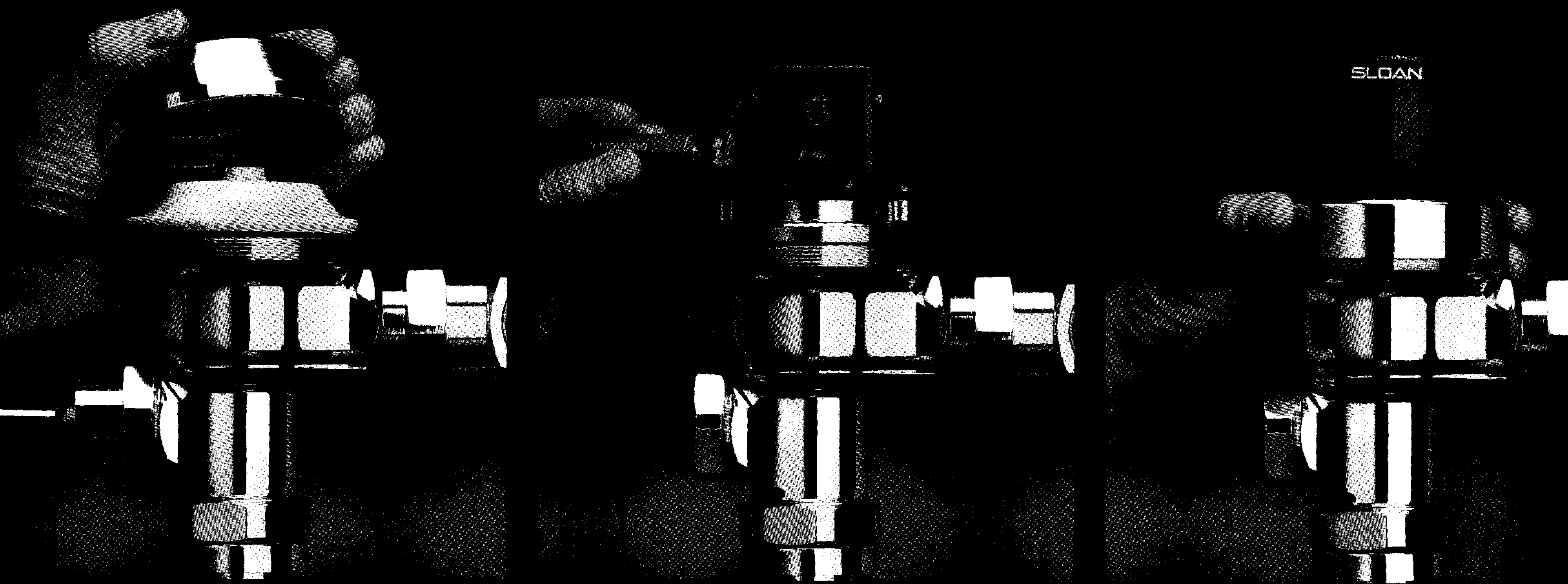

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News

Hadid Wins Opera House Competition

London-based architect Zaha Hadid has won the competition to design the Cardiff Bay Opera House in Wales over an international roster of star architects, including Mario Botta, Norman Foster, Rem Koolhaas, and Rafael Moneo. The selection committee recognized Hadid's design for the simplicity and clarity of its organization as well as its robust, dynamic forms. Public performance rooms comprise the volumes inside the five-story building; support spaces line its perimeter. The curved front embraces a tidal basin, which was proposed as part of Cardiff's master plan for the redevelopment of its waterfront.

Within the U-shaped footprint, angular structures, including an 1,800-seat auditorium, smaller performance areas, and rehearsal rooms, jut into an interior courtyard. Zaha Hadid likens these volumes to "jewels" suspended from a perimeter necklace of support spaces.

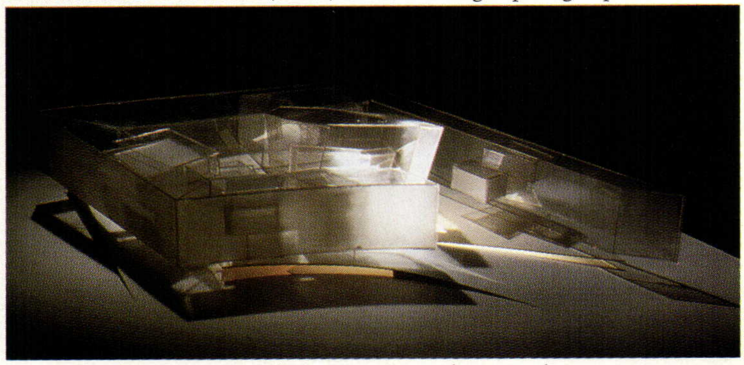
After a period of economic decline in the late 1970s, Cardiff is currently being revitalized, with cultural institutions including St. David's Hall, a 2,000-seat auditorium completed in 1983, and the Courtyard Galleries at the National Museum of Wales, completed last year. As the future home of the Welsh National Opera, Hadid's building will play an integral part in Cardiff's waterfront regeneration and will contribute to the city's blossoming new role as an arts center. Officials anticipate the $30 million facility will host its inaugural performance in the spring of 2000.

Hadid is collaborating on the project with Ove Arup & Partners and Arup Acoustics. The London-based engineering firm, Arup & Partners, also provided acoustics and engineering consultation for seven of the eight finalists' schemes, including those of Norman Foster and Itsuko Hasegawa, which both received official commendations.

The Cardiff Bay Opera House has significantly added to Zaha Hadid's record of successful, high-profile competitions. The Iraqi-born architect's 1983 winning entry for the Hong Kong Peak brought her international recognition; her 1989 winning design for an art and media center in Dusseldorf, Germany (ARCHITECTURE, September 1993, page 43), is now in the working drawings phase.—*Ann C. Sullivan*

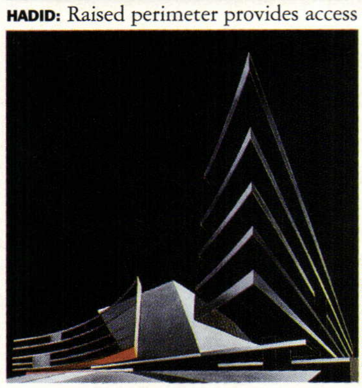
NUNU LUAN

WINNING SCHEME: Auditorium (center) is visible through opening in perimeter.



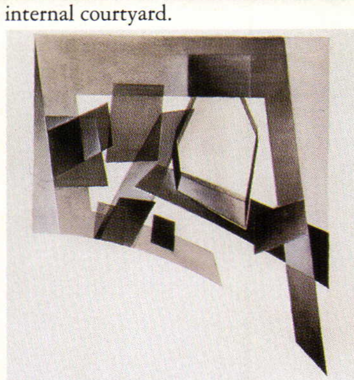
NUNU LUAN

HADID: Raised perimeter provides access to internal courtyard.

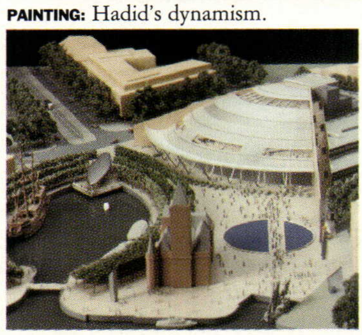


J. BROUGH SCHAMP

PAINTING: Hadid's dynamism.



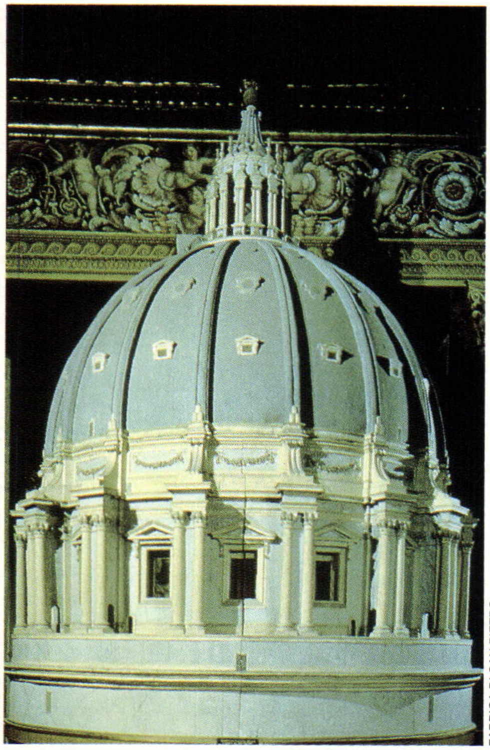
PLAN: Hadid's interior "jewels."



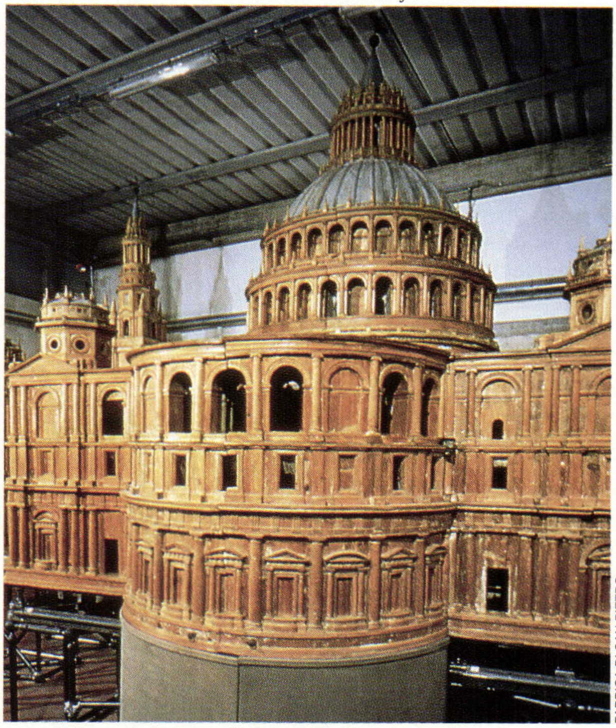
FOSTER: Tiered volume (right).

HASEGAWA: Perforated box.

PAINTING: Peiro di Cosimo's *The Construction of a Palazzo.*



DOME: Michelangelo's model of St. Peter's.



MODEL: Antonio da Sangallo's model of St. Peter's.

ST. PETER'S: Michelangelo presents model to Pope.

Renaissance Models at National Gallery

What may be the most complete exhibition ever realized on the architecture of the Renaissance will travel in an edited form from the Palazzo Grassi in Venice to the National Gallery in Washington, D.C., next month. Although the Washington show, "Italian Renaissance Architecture," which opens December 18, is smaller than its predecessor, its heart is intact—and spectacular.

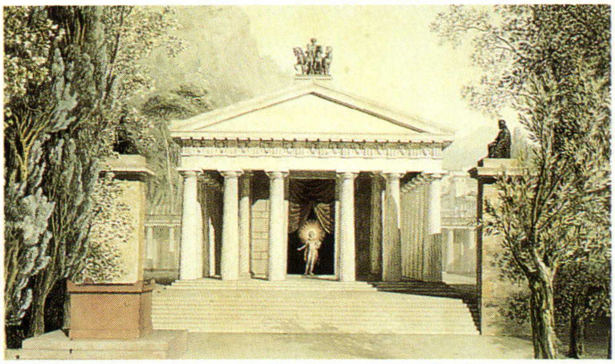
The Venice version originally featured 31 wood models of ecclesiastical structures—nearly all those extant in Italy—and the drawings through which we usually understand the design of Renaissance buildings. The collection of models, gathered for the first time from churches and museums scattered through Italy's many provinces, pivots on two magisterial models that now occupy center stage in the National Gallery: the famous Antonio da Sangallo model (1538-43) for the design of St. Peter's and Michelangelo's model for the basilica's dome (1558-61).

Both models are heroically large: Michelangelo's section shows the drum, dome, and lantern split in half, and Sangallo's reveals the entire church, inside and out, with a hinged apse opening like a door. Together, the two models reconstitute an argument emblematic of the Renaissance, when architects did not always agree: Sangallo's design for St. Peter's superceded Bramante's, and after Sangallo's death, Michelangelo banished his predecessor's model.

At a remove of 500 years, the Renaissance seems a monolithic period. But the show, viewed close up, reveals a Renaissance of different visions. In the sprawling Sangallo model, for example, the architect tries to reconcile the Gothic and the Classical in a deliberately transitional design: Its two towers transform the dominantly horizontal Classical language into a more vertical expression. Michelangelo demolished a large part of the Sangallo design that was executed, and he realigned the rear parts of the church with Bramante's original intentions.

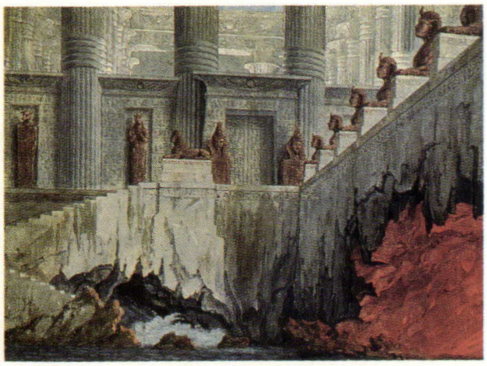
The models are the most spectacular exhibits, but the show's curator, Henry Millon of the Center for Advanced Study in the Visual Arts at the National Gallery, and catalog coeditor Vittorio Lumpugnani, director of the German Architecture Museum, explain the artifacts by tracing the new humanist paradigm from Gothic antecedents. The beautiful models have a commanding presence, but they are intimately tied to, and rooted in, Renaissance drawing and the science of perspective, amply documented by drawings, prints, and theoretical treatises.

FABRICA DI SAN PIETRO



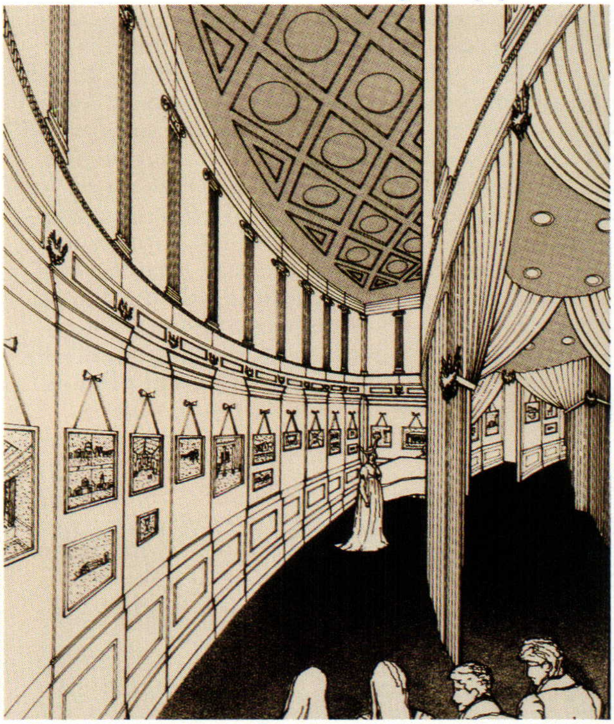
SCHINKEL: Watercolor assumed to be set design for *Olympia*.

MUSEUM OF PRUSSIAN CULTURE, BERLIN



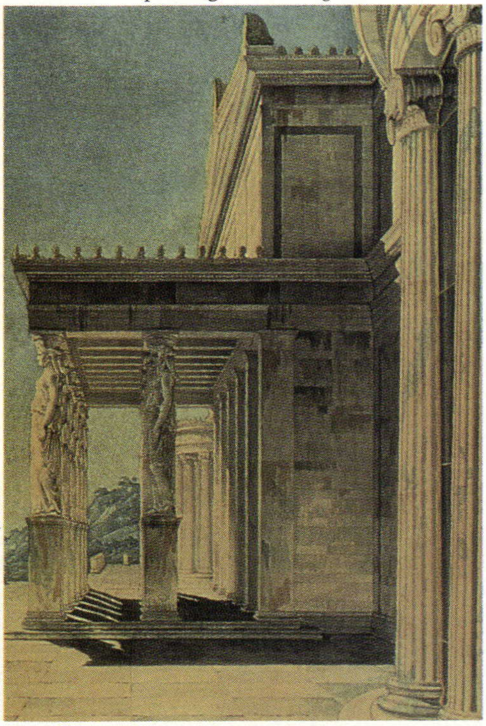
SCHINKEL: 1815 painting for *The Magic Flute*.

TIGERMAN MCCURRY ARCHITECTS



EXHIBITION DESIGN: Tigerman re-creates Schinkel's Schauspielhaus.

MUSEUM OF PRUSSIAN CULTURE, BERLIN



WATERCOLOR: Proposed palace in the Crimea, 1838.

Today it is hard to appreciate Renaissance inventiveness, since so many of its architectural innovations are common practice. After the invention of perspective, virtuosos like Baldassarre Peruzzi combined perspective with orthogonal views that reveal the interior and exterior of buildings simultaneously, as though a figural drawing were crossed with an anatomical study.

In the Venice show, the model for S. Petronio in Bologna hinges along the axis of the nave and opens down the middle like an architectural vivisection. The ways of representing and studying humanist architecture suggest analogies drawn by 16th-century architects from the human body to the architectural body. As in the best exhibits on architecture, "Italian Renaissance Architecture," on view through April 16, 1995, provokes as many questions as it clarifies.—*Joseph Giovannini*

Schinkel Exhibition Focuses on Theater

Architect Stanley Tigerman was the perfect choice to design the installation for "Karl Friedrich Schinkel, 1781-1841: The Drama of Architecture," which opened last month at the Art Institute of Chicago. While Schinkel's Enlightenment-age rationalism exerted a purifying influence on the work of Chicago's greatest German expatriate, Mies van der Rohe, it was Schinkel's theatrical, flattened evocations of the Antique that seduced Tigerman and his contemporaries in their Postmodernist heyday. Tigerman's Art Institute installation, like his 1980s work, is conceived as a stage set, inspired by Schinkel's two most important works: the Schauspielhaus (1821) and Altes Museum (1830) in Berlin.

The apsidal form of the institute's architecture gallery created what Tigerman calls a "perspectival counterpoint" to the planarity of Schinkel's often-imitated Berlin proscenium. Nearly 100 of Schinkel's colored drawings and prints are presented within this space, with an emphasis on theater and set designs; a final display is devoted to Schinkel's posthumous influence on architects.

This range of images, at the institute until January 2, portrays Schinkel as a masterful dramatist. Action appears imminent as much in his drawings of buildings as in his paintings of opera sets: By including figures that turn their backs on the viewer, Schinkel projects humanity into the foreground. Architects will draw varied conclusions from what they see, as the ancient references and pure forms that characterize Schinkel's work bridge the theoretical chasm between Modernism and Classicism.—*M. Lindsay Bierman*

Details

Frank Gehry is the first recipient of the Dorothy and Lillian Gish Prize, an annual $250,000 award for an outstanding contribution to the arts. **Robert A.M. Stern Architects** is designing the 440,000-square-foot world headquarters for The Gap in San Francisco; **William McDonough Architects** is designing a 340,000-square-foot corporate campus for the company in nearby San Bruno. **Moshe Safdie** is designing a new science center and children's museum in Wichita, Kansas. Safdie was selected from a short list that included **Norman Foster**, **Hardy Holzman Pfeiffer**, **Frank O. Gehry**, **James Stewart Polshek**, and **Christian de Portzamparc**. The General Services Administration has selected the architectural team of **Anderson Mason Dale** and **Hellmuth, Obata & Kassabaum** to design a $60 million federal courthouse expansion in Denver, Colorado. **Kevin Roche John Dinkeloo Associates** is renovating the Greek and Roman galleries at New York City's Metropolitan Museum of Art as part of the museum's $300 million construction campaign, announced this October. **Polshek and Partners** is designing a three-story steel, glass, and granite addition as part of the firm's $10 million renovation of Columbia Law School's main building, Jerome L. Greene Hall. **Sasaki Associates** and **Hopkinson & Partners** have been selected to provide planning and design services for Logan International Airport in Boston, Massachusetts, as part of the state's $1.2 billion development program for the airport. **The Hillier Group** of Princeton, New Jersey, has acquired **The Eggers Group**, a New York firm whose origins can be traced to the office of **John Russell Pope**, architect of the National Gallery of Art. **Robert Zwirn**, former chair of the department of architecture at Miami University, has been appointed director of the School of Architecture at Louisiana State University's College of Design. The Cleveland, Ohio, office of **Williams Trebilcock Whitehead** is restoring Cleveland's 1911 Cuyahoga County Courthouse. **The Walt Disney Company** has abandoned plans to develop Disney's America, a theme park proposed outside Haymarket, Virginia. Architect **Norman C. Zimmer**, founding partner of Portland, Oregon-based **Zimmer Gunsul Frasca Partnership**, died on September 28.

News

Modern Japanese Design in Philadelphia

ROGER HANDY

SONY TV: First all-transistor TV, 1959.

Ever since Japan opened its market to Americans and Europeans in 1853, the country has shown an increasingly uncanny ability to learn from outside sources, much to the chagrin of its global trading partners. So it's fitting that "Japanese Design: A Survey Since 1950," an exhibition at the Philadelphia Museum of Art through November 20, is a trade fair of over 250 chairs, lamps, posters, packages, clothes, housewares, and consumer electronics. Rarely does this exhibition provide any new or challenging insights into its subject. For example, a recreated portable-television-on-the-tatami-mat living room, circa 1960, is a clichéd rendition of the innovation-within-tradition paradigm behind Japan's self-proclaimed "national" design ethos.

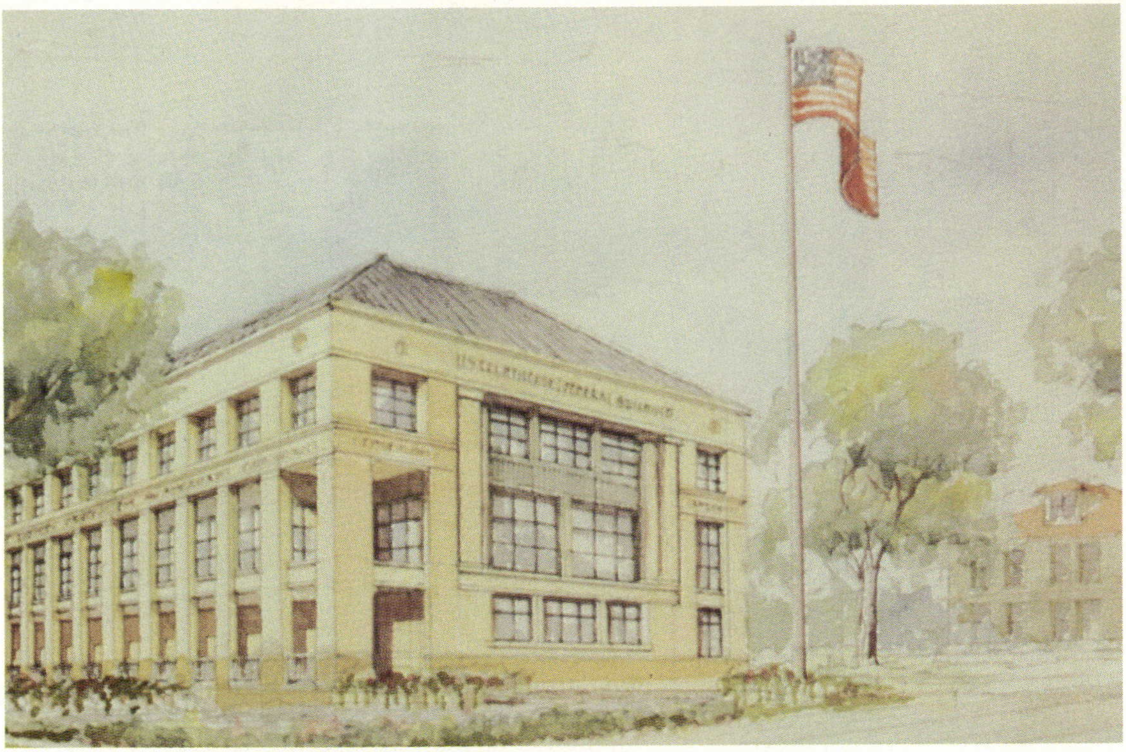
One theme is clear: America has played an important role in influencing postwar Japanese design. In newly democratized Japan, Raymond Loewy designed a cigarette package, George Nelson commented on the suitability of Japanese goods for export, and American imports reached virtually every consumer. Edgar Kaufmann, Jr.'s, book *What Is Modern Design?* was translated into Japanese in 1953. That year, Sony licensed from Western Electric the device that formed the technological basis for Japan's first transistor radio, the TR-55, with a perforated-metal speaker screen borrowed from American automotive design.

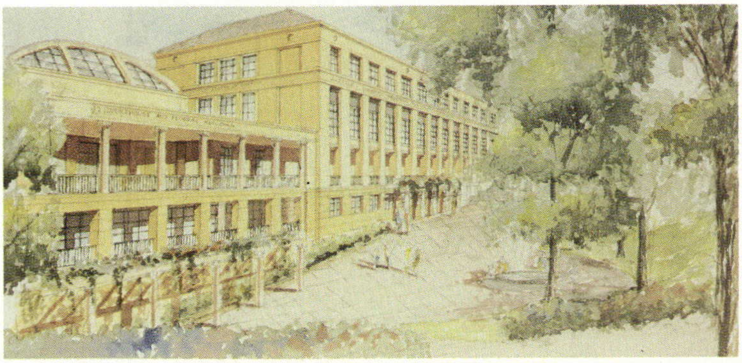
While every innovation of the affluent West was being heralded, younger designers struggled to mold a uniquely Japanese tradition outside Western notions of good design. In an ironic twist of architectural history, they soon discovered what Frank Lloyd Wright had known—that Japan's ancient design esthetic preceded Modernism's stripped-down forms, exposed materials, open spaces, and modularity.

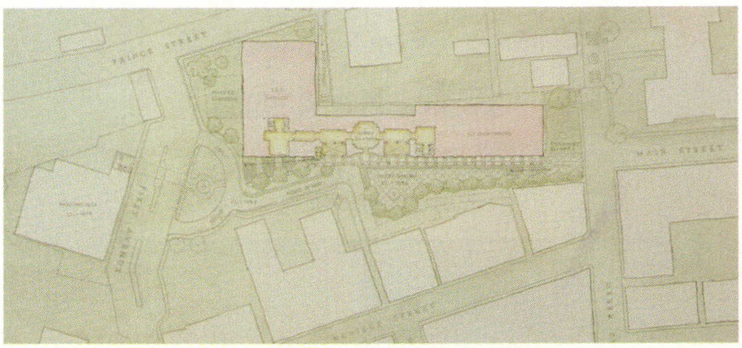
Such cross-cultural intellectual trade characterizes the positive aspects of the "Japanese Design" exhibition. In his installation design, architect Kisho Kurokawa updates the traditional Shoji screen by rendering it in acrylic, and he edges his display platforms in Morris Lapidus-like woggles. Sori Yanagi's 1956 butterfly stool challenges the visual elegance and technical ingenuity of comparable furniture by Charles and Ray Eames. And Charles Rennie Mackintosh confronts Marilyn Monroe in the design of Arata Isozaki's 1972 ladder-backed and curvaceous Marilyn chair.

Architects visiting the exhibition should be especially intrigued to learn that as early as 1983, Japanese couturiere Rei Kawakubo "deconstructed" fashion by loosening a few screws on her weaving machine to produce a "torn" black sweater with irregular moth-eaten holes. Kawakubo creates clothes that are among the best artifacts in the exhibition. They provoke American visitors to realize that in the ever-shifting balance of global trade, Japan's design is no less formidable than its economy.—*Donald Albrecht*

A competition-winning courthouse takes subtle cues from its Classical neighbors.





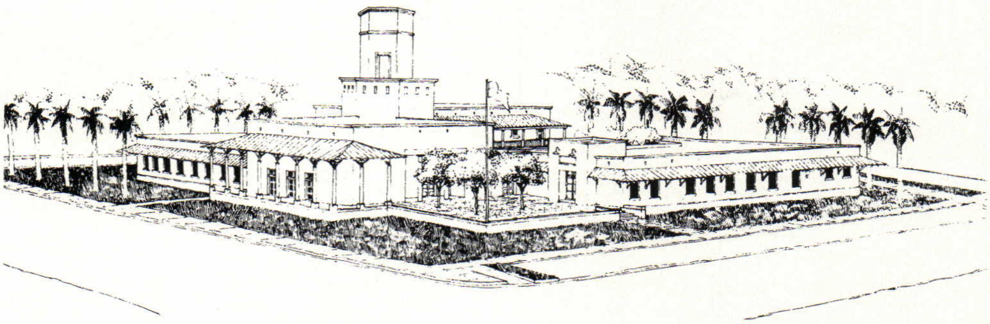


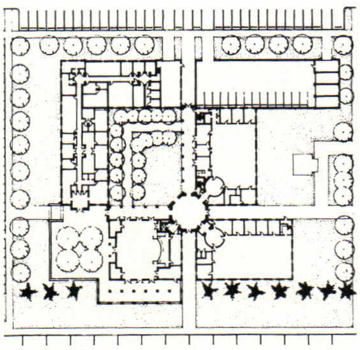
U.S. Courthouse and Federal Complex
Beckley, West Virginia
Robert A.M. Stern Architects
Einhorn Yaffee Prescott

The Classically derived scheme for a courthouse and Internal Revenue Service complex, designed by Robert A.M. Stern and Einhorn Yaffee Prescott (EYP) for Beckley, West Virginia, redeems the presence of the federal government in a civic setting. The General Services Administration selected the scheme in September over proposals by Spillis Candela/Warnecke and Shalom Baranes Associates, both of Washington, D.C., as well as one by Myers Associates Architects of Medina, Ohio.

The Stern/EYP scheme optimizes public space on a difficult L-shaped site, which affords only narrow frontage for a ceremonial entrance facing Main Street to the east. The principal entrance for cars will be on the west side. Both approaches will connect to a daylit central lobby by way of a deep pedestrian arcade extending across the south elevation. A line of trees will define a public garden on the south side of the site.

The 160,000-square-foot building takes its Classical cues from the existing federal courthouse and the county courthouse nearby. It will be clad in limestone, with a slate and tile roof. Construction of the courthouse and IRS complex is scheduled for completion in 1998.—*B.A.M.*

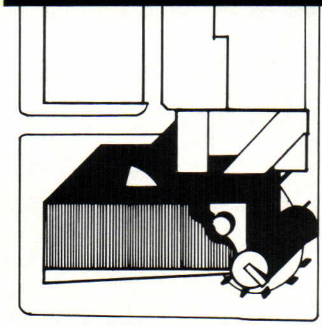




Civic Complex
Florida City, Florida
Duany Plater-Zyberk Architects
A+S Architects
CRA-Clarke Architects

When Hurricane Andrew struck Florida City two years ago, it destroyed not only houses and commercial buildings, but its postwar government buildings as well. After the storm, Miami architects Andres Duany and Elizabeth Plater-Zyberk (DPZ) led more than 30 volunteers in a charette that produced a master plan for rebuilding the town of 6,000. Organizing the city into nine neighborhoods, the plan also called for a new civic complex, including a police station, community center, council chamber, and a city hall.

A year later, DPZ led South Florida firms A+S and CRA-Clarke Architects to win the competition for the civic complex. Arranged as four buildings linked by a tower, the new civic structures will incorporate wood detailing, metal roofs, and a stucco finish. Windows will be screened by *chujjas*—deep overhangs first borrowed from Indian vernacular architecture by Edwin Lutyens in his imperial buildings for New Delhi. Duany believes the shading devices are appropriate for Florida; they will protect windows from sun and wind. The portico of the community center will be constructed of palm tree trunks. The complex is to be completed in 1995.—*H.L.*



Health Sciences Library
University of Maryland
Baltimore, Maryland
Perry Dean Rogers & Partners
Design Collective

The University of Maryland's Health Sciences Library and Information Services Building will be located on its Baltimore campus, populated by future physicians, pharmacists, nurses, and lawyers. The six-story structure will house traditional library components—stacks, catalogs, periodicals, study areas, and administrative offices—as well as the university's central computer and telecommunications system. The combination of these functions will integrate electronic information services with medical education, research, and healthcare services.

Designed by Boston-based Perry Dean Rogers & Partners and Design Collective of Baltimore, the 166,000-square-foot rectangular structure is articulated with a round tower containing study rooms on its northeast corner and a bowed wing that projects from the west facade. These elements create a diagonal circulation axis that bisects the brick, limestone, and granite volume, separating classrooms from open stacks. Library and computer departments will be integrated on each floor, with reading rooms and offices located on the perimeter. The $24 million health sciences library will be completed in 1997.—*A.C.S.*

On the Boards

Regional Government Building
Toulouse, France
Venturi, Scott Brown and Associates
Anderson/Schwartz Architects

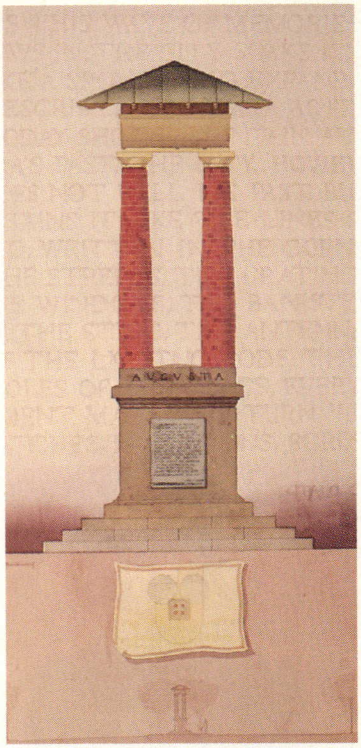
In 1991, Venturi, Scott Brown and Associates and New York-based Anderson/Schwartz Architects won an international competition to design a government complex in Toulouse, France, for the region of Haute-Garonne. The team's winning scheme is designed like a city, with a monumental gateway, main street, and open public space.

An assemblage of solid and void, the design loosely defines a circle dissected by parallel blocks. Linear administration buildings contain the government offices, day-care center, and public exhibition hall. Linked by twin full-height, glass-clad bridges, they create a civic street. The west administration building curves to shape a public courtyard. From the east administration building, the state assembly hall projects to form an identifiable volume. Freestanding columns, echoing 18th-century gates to the city, frame the north-facing courtyard entrance.

The 675,000-square-foot complex will be constructed of poured-in-place and precast concrete with steel and glass curtain wall. Clerestory windows on the north and east facades of the assembly hall will illuminate the 40-foot-high chambers.

Venturi, Scott Brown and Associates and Anderson/Schwartz Architects are designing the building with Hermet, Blanc, Lagausie, Mommens Architects of Toulouse. Construction of the $70 million government complex is expected to begin in mid-1995, with completion scheduled by the end of 1997.—*A.C.S.*

A Classical monument celebrates the history of Augusta, Georgia.



Upper Market Monument
Augusta, Georgia
David Colgan, Architect

David Colgan received his B. Arch. in 1994 from the University of Notre Dame. Currently an intern with Scott Merrill Architect of Vero Beach, Florida, he has won a competition to design a monument dedicated to the history of Augusta, Georgia. Colgan, an Augusta native, conceived the 18-foot-tall Classical structure on the former site of an 1800s market building. The area is billed "Upper Market," recalling the city's historic roots as a trading town in the early 1800s when Augusta linked land routes to cotton-rich Savannah via the Savannah River.

Colgan's Classical design recalls the surrounding buildings in its materials: The monument's base and steps will be constructed of Georgian granite; its four Doric/Tuscan columns will be composed of local brick. The wood-framed roof will be sheathed in copper, and bronze plaques bearing historical information will line the base.

The monument is the result of a competition sponsored by the City of Augusta with the local AIA chapter; Historic Augusta, a nonprofit preservation group; and area businesses. Officials hope it will spur further downtown development, initiated by a 1989 riverwalk along the Savannah. Colgan expects construction to begin in 1995.—*A.C.S.*

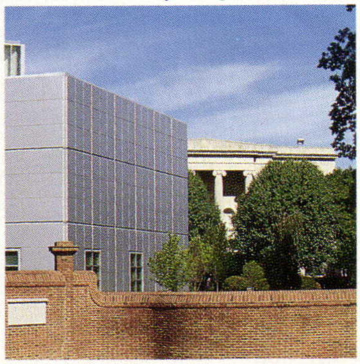
Leslie Armstrong, AIA, is known for her innovative work in interior space, particularly theater environments. She is co-author of the definitive ***Space for Dance—An Architectural Design Guide*** and a specifier of DuPont Antron® nylon.

BALTIMORE MUSEUM OF ART: New Modern art wing (left) is angled to west side of Pope's 1929 building (right).

A new wing of Baltimore art museum disrespects its Neoclassical neighbor.

NEW MEETS OLD: Addition is linked to original by glass and concrete rotunda.

ALUMINUM PANELS: Jarring contrast.



WEST VIEW: Oversized metal mutant.

Museum Addition Clashes with Original

This museum contains a terrific collection of Modern art, and its innovative floor plan of cornerless galleries allows spaces to flow into one another. Its lighting eliminates shadows, and a variety of "green" features conserve energy.

But there's one aspect of the Baltimore Museum of Art's $10 million new wing for Modern art that is less than artful. Instead of continuing the Neoclassical lines and rich materials of John Russell Pope's original 1929 edifice, Bower Lewis Thrower Architects chose to depart from them in a 35,000-square-foot addition that is cocked at an angle to the rest of the museum. Viewed from the north and west, the new wing jams up against the old building like an oversized metal mutant.

The Modernist addition, which John Bower, Jr., describes as a "great new shed for art," features an aluminum skin rather than Tennessee limestone cladding, a zigzagging south wall, and a three-story concrete rotunda with spiral stairs leading to the new galleries.

Museum directors wanted galleries to conform to 25-by-25-foot modules or multiples thereof. But the city museum did not own enough property to provide the desired footprint and still align the addition with the museum's orthogonal grid. By cranking the wing at a 30 degree angle and abutting the western property line, the architects were able to comply with the staff's desired configuration.

On the inside, at least, this pragmatism paid off. The galleries' strong internal logic enhances a visitor's understanding of Modern art. But outside, the addition relates poorly to the rest of the museum.

The architects contend that their addition respects Pope's building because it does not obscure it. If the addition were set off by itself, or if it were next to a less important building, its imagery might not have been as much of an issue. But as an annex to a civic landmark, it had an obligation to harmonize with it. The new wing may give visitors an initial jolt of modernity, but it comes across as disrespectful.

By supporting such a penny-wise, pound-foolish design, the museum is stuck with an appendage that is dislocated in time and space, oblivious to its historical context. Baltimore can take immense pride in the museum's Modern art collection and its display, but this is one commission that should have been a masterpiece inside and out.—*Edward Gunts*

Opinion

Why Classical Architecture Is Modern

Allan Greenberg maintains that the language of Classicism best conveys our ethical and political ideals.

DRAWING BY FRANCIS TERRY

ABOVE RIGHT: Greenberg's modern design for the Church of the Immaculate Conception, under construction in Clinton, New Jersey, evokes a Renaissance cathedral.

Classical architecture is the cutting edge of architecture for the 21st century because it is the most comprehensive and the most challenging approach to architectural design and city planning. Because it is rooted in the physiology and psychology of the individual human being, the Classical language of architecture is always modern. To be truly modern means more than responding to some unique circumstances of the moment; it means finding the optimal balance between eternal human values on the one hand and the particular demands of the present on the other. Classical architecture has a proven track record, covering nearly 3,000 years, illustrating its ability to achieve this balance. It remains the most comprehensive language of architecture for serving the diverse needs of human beings and the societies they create. This position is at variance with the views of most practitioners and critics, who erroneously believe that there is no reason to design a Classical building today. They claim that Classical architecture is old-fashioned and that limited budgets and a shortage of competent craftspersons preclude realizing this type of architecture. However, Classical buildings have been continuously designed and constructed from ancient Greece up to the present. The best of these buildings develop the great canon of Classical architecture in new ways and fulfill one definition of the word "modern" in *Webster's New Collegiate Dictionary*: "of, relating to, or characteristic of a period extending from a relevant remote past to the present time."

However, "modernistic" is characterized by *Webster's* as "certain contemporary tenden-

cies and schools." So-called Modernist architecture is not a homogeneous output but a series of design fashions, starting with the International Style and followed by numerous idioms, such as Brutalism, the New Sensualism, and Deconstructionism. What is common to most of these "schools" is that they often look outside of architecture to disciplines that have little to do with architecture for sources of inspiration.

Modernist architects deny the value of precedent, characterizing it as an obsolete set of irrelevant preconceptions. The result of this methodological approach is that architectural design has become a medium for architects to express a personal style. Design of public buildings ceased to be an objective process based on considered evaluation of architectural precedent through case studies. Rather, it is an attempt to synthesize the personal views of architect and client about the nature of the public realm. This point of view assumes that there is no common *themis* (the Ancient Greek word describing the numerous bonds that hold societies together) today in the United States and, therefore, no common ideals to express in the architecture of our public buildings. This view also suggests that there are no standards to assess why a building is a success or a failure.

Value of precedent

Today's architects and schools of architecture eschew the case-study method. They rarely analyze precedent or accumulate and coordinate research data based on the experience of inhabiting and using buildings over extended periods of time. Modern architecture's ideology has ignored the procedures of rigorous research. Tomes have been written about the noble architectural goals to which Modern architecture aspires, but there are very few cogent analyses of why these ideals are so seldom realized in buildings—whether functionally or esthetically.

Simplistic analytic techniques allow a contemporary designer to rely on intuition and esthetic preference rather than rise to the more difficult challenge of rigorous analysis to determine the needs of the institution and the people who are served by the work in a building. In this way, a self-serving process of "estheticization" is set in motion. Architects now oscillate between the extremes of dynamic design expression, which few are able to achieve, and the mediocrity that has become a hallmark of the buildings commissioned by most federal, state, and local government agencies since the late 1940s. Sadly, we have come to accept this failure of imagination as more or less inevitable.

Classicism's communication

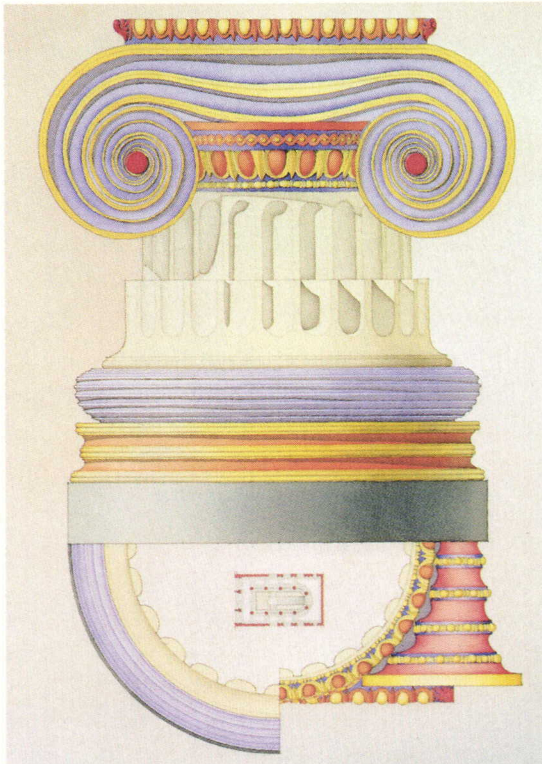
A Classical approach to design fulfills architecture's most basic responsibility: to communicate to citizens the mission of our civic, religious, and educational institutions. Classical architecture is based on a language of form capable of communicating these ethical and political ideals. This is particularly important in the United States, where our system of government is based not on ideals of blood, tribe, or land, but on the natural rights that the Declaration of Independence tells us belong to all human beings. Our government is the people.

Classical architecture, which developed in Ancient Greece simultaneously with the ideal of democratic government, is particularly suited to expressing democratic ideals because it is based on the belief that human beings are the measure of all things. These ideals are most eloquently expressed in L'Enfant's plan of Washington, D.C. (1791) and in the Academical Village (1815) at the University of Virginia designed by Thomas Jefferson. The symbolism of the dome as an expression of the cosmos, used at the ancient Roman Pantheon to express the cosmos of the Roman Empire, is deftly transformed by Jefferson to express the library as the cosmos of knowledge. The plan of the campus also suggests the human body, with the library set at the head and the colonnades framing the lawn in a welcoming gesture of outstretched arms. Similar ideals may be seen in Seaview Terrace (1917) by R. Clipston Sturgis in Bridgeport, Connecticut, one of the first and most successful public housing projects, and the National Gallery of Art (1937) by John Russell Pope. Unlike Modernist forms that, lacking symbolism, constitute a system of communication rather than a language capable of subtle expression, Classical architecture is ideal for articulating buildings through its organized system of moldings, columns, and conventional elements.

Human-based elements

Because Classicism is founded on anthropomorphism, human form and personality may be attributed to Classical buildings, parts of buildings, and even to groups of buildings. Even the transitions among the parts of a Classical building are modeled on human joints like knees and ankles. The tripartite division of the human form—legs, torso, head—parallels the differentiation of walls,

ARCHITECTURE



DETAIL OF ATHENS NEWS BUILDING BY ALLAN GREENBERG

THE CLASSICAL TRADITION

Self-proclaimed design revolutionaries within the current architectural establishment dismiss Classicism as meaningless to our postindustrial age. Yet the popular appeal of traditional buildings suggests that the Classical language of architecture still speaks to a wide audience.

In the United States and Europe, a growing group of architects is adapting Greek and Roman canons to local conventions and materials. Our issue features a diverse portfolio of buildings by the most inventive of these Classicists. England's Quinlan Terry and America's Allan Greenberg draw from Greek Classical orders; native Italians Giorgio Grassi and Aldo Rossi are influenced by the rationalism of ancient Rome; and Robert A.M. Stern synthesizes local vernacular with the rigor of Classical form. These examples require not only a broad knowledge of architectural precedent, but also formal skills that transcend mere imitation. As a result, new programs in architecture schools are educating an emerging generation to the rigors—and rewards—of the Classical tradition.

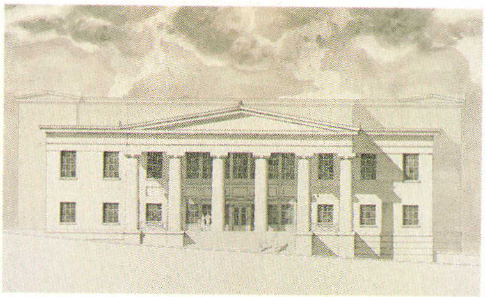
The News Building
Athens, Georgia
Allan Greenberg, Architect

FIT TO PRINT

Comparing Postmodern Classicism to the orthodox Classicism of architect Allan Greenberg is like comparing the 1970s disco version of Beethoven's Fifth Symphony to the original score. Unlike the work of his contemporaries, who throughout the 1980s reduced traditional forms to wallpaper, Greenberg's architectural evocation of ancient sources cannot be dismissed as scenography or pastiche. Although trained as a Modernist and once determined to work for Le Corbusier, Greenberg embraces Classical conventions to mitigate the dehumanizing effects of machine-based esthetics, arguing that his approach is not only Modern, but also the most humane way to design buildings and cities (pages 57-63, this issue).

Greenberg's design for the Athens News Building, completed last year in Athens, Georgia, represents the gravity of his mature work. The building is a canonic, if sober, synthesis of a Greek temple, a modern office building, and a newspaper printing plant. Its Doric portico conveys to Athens the inexorable power of ink, which, nearly 75 years ago, New York City architect Raymond Hood wrought in stone for Chicago's *Tribune*.

Greenberg was commissioned by media tycoon William Morris III, who owns nearly 30 newspapers across the country. Morris sought, as he puts it, "the best Classical architect in America" to collaborate with local architects Moss/Kuhar on the design of a new editorial and production headquarters for the *Athens Banner-Herald*, *Athens Daily News*, and *Athens Star*. A native of Augusta, Georgia, and an alumnus of the University of Georgia in Athens, Morris wanted the building to emulate the historic architecture of both his hometown and alma mater. "I couldn't build a glass palace in one of Georgia's great Classical cities," he explains.



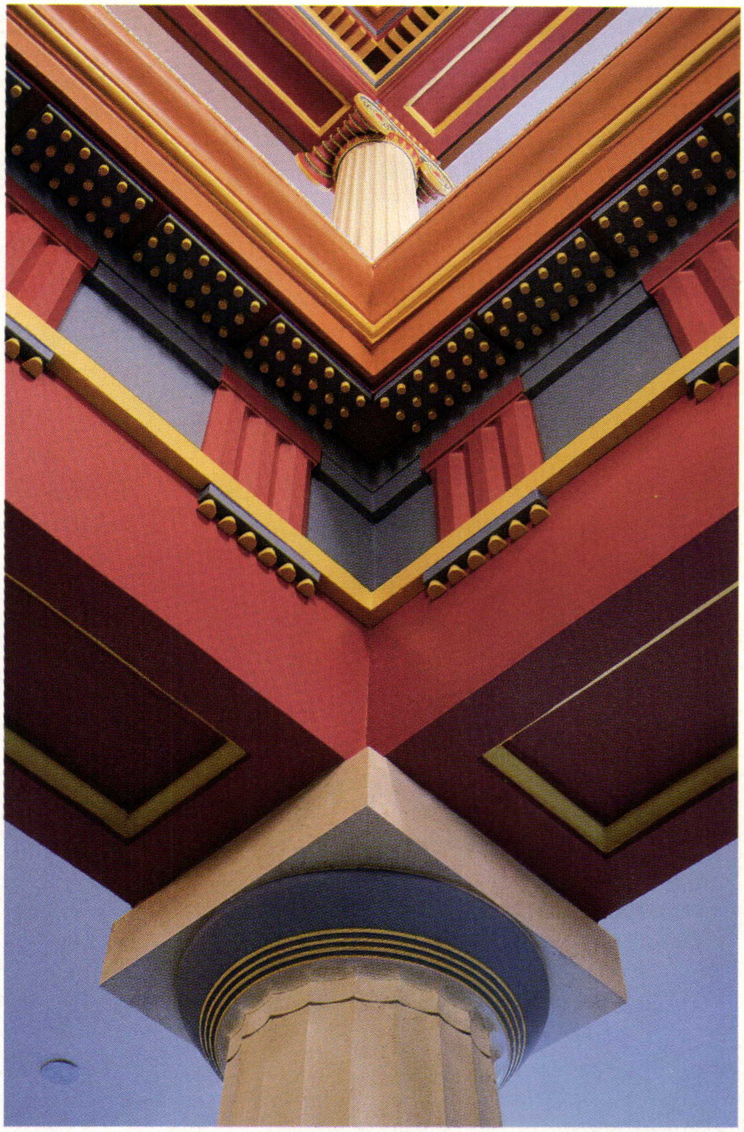
ABOVE: Greenberg envisioned the editorial offices as a monumental, temple-like frontispiece to the printing plant. **FACING PAGE:** Public garden separates News Building from street. Portico screens west-facing main entrance.

Morris admits that he considered moving his papers' offices to a remote suburban site, saving money not only on land, but on design as well. His commitment to the responsible development of downtown Athens transformed what could have been a drab, concrete-framed box into an urban landmark.

The News Building is clearly distinguished from most new traditional architecture because, without apology, Greenberg conceals the realities of modern construction. For him, the image of a building's stability and permanence is more important than the expression of its structural frame. Like Renaissance architects who scored stucco veneer to look like stone blocks, or like John Russell Pope, who concealed a structural-steel frame with limestone facing at the National Gallery of Art in Washington, D.C., Greenberg detailed the News Building's brick cladding to look loadbearing: Expansion joints are hidden where pilasters meet the wall; jack arches above windows are self-supporting; and the massive, cast-concrete columns and entablatures resemble quarried stone.

The News Building's straight-faced wrapper of virtual structure is rooted in the Greek Classical orders and may excite only the most

BELOW: Greenberg chose colors for column bases and capitals to evoke coloration of temples in ancient Greece. Doric and Ionic capitals were hand-carved in wood. Triglyphs and guttae were cast in plaster.
FACING PAGE: Walls are painted to resemble stone blocks. Wood door surrounds frame entrances to newspapers' executive editorial offices.



THE NEWS BUILDING
ATHENS, GEORGIA

DESIGN ARCHITECT: Allan Greenberg, Architect, Washington, D.C.—Allan Greenberg (principal-in-charge of design); Daniel E. Lee, Robert Shatler (project architects); Morgan Conolly, Michael Imber, Debra Johnson, Michael Mesko, Thomas Noble, Duncan Stroik (project team)
ARCHITECT OF RECORD: Moss/Kuhar Architects, Augusta, Georgia—Ronald Moss, Robert Kuhar (principals-in-charge); Ronald Moss (project architect); Marilyn Adams, Donald Donaudy, Michael Green (project team)
LANDSCAPE ARCHITECT: Ashley, Hughes, Good and Associates
ENGINEERS: Johnson, Laschober & Associates (structural); Adams Davis & Partners (mechanical/electrical); W.L. Thompson Consulting Engineers (civil)
GENERAL CONTRACTOR: Batson Cook Company
COST: $16 million; $154/square foot
PHOTOGRAPHER: Tim Buchman

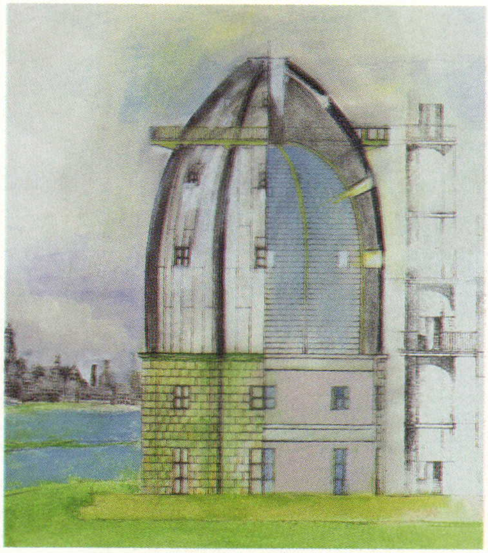
Bonnefantenmuseum
Maastricht, the Netherlands
Aldo Rossi, Architect

RATIONALIST REVERIE

Maastricht, with its Roman bridge across the Maas River and Romanesque churches, is located in the tail of the Netherlands that extends southward between Germany and Belgium. Some inhabitants like to think that this Catholic province, with its Belgian influence, stretches so far south that they are almost Latin compared to those in the Protestant north. This character, along with the town's Roman past, make Aldo Rossi an apt choice as architect for Maastricht's new provincial museum of art and archaeology, especially since its presence is also intended to help generate a new urban quarter between the museum and Maastricht's historic center.

The museum site is upriver and south of the city center in an area once occupied by potteries. Local architect Jo Coenen's master plan proposes a broad, tree-lined boulevard flanked by large blocks, most of which have been designed by such architects as Mario Botta, Alvaro Siza, and Barcelona-based Martorell Bohigas Mackay. The south end was occupied by an historic monument: a 1912 factory that was a virtuoso exercise in concrete construction by Jan Gerko Wiebenga, who was later the engineer for the famous works of Johannes Duiker. The factory was to have been converted and extended to become the new home of the Bonnefantenmuseum, which had outgrown its premises.

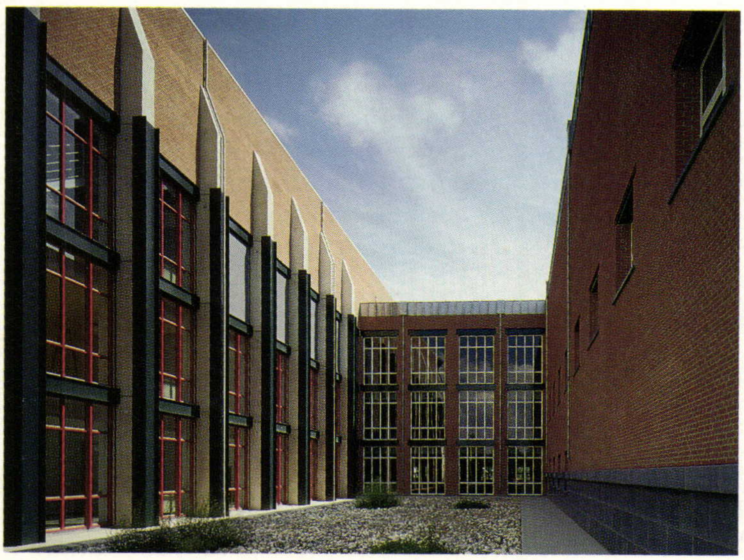
However, because the factory could not be upgraded to standards compatible with conserving artworks without destroying its character, Rossi advocated its demolition. The eventual compromise saved part of the old building for sculpture installations and set the new museum toward the river, beyond a little square framed by the two buildings. In plan, the museum forms an E. The three-story enclosing U houses the museum functions; and the four-story axial center block contains public spaces, circulation, and, at its extremities, the museum's two most introverted elements: One of these, a conical volume lit from the top, is unexpressed outside; the other, an elongated cupola, is the museum's most distinctive external feature.

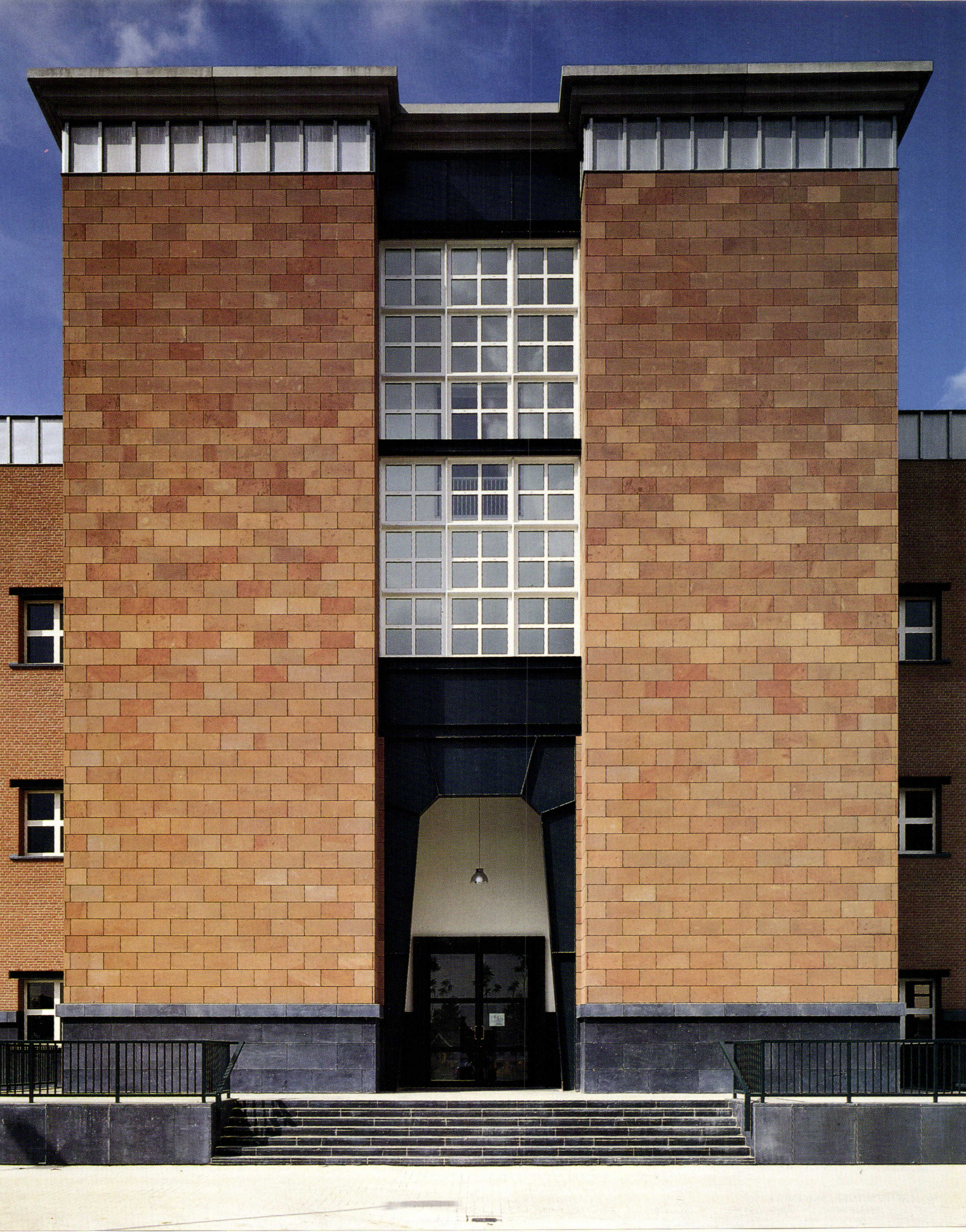


ABOVE: Rossi's sectional sketch depicts cupola, which was originally to have been clad in copper above a green stone drum. The interior of the cupola will house temporary installations. **FACING PAGE:** Zinc-clad cupola is supported by steel structure and crowned by a widow's walk. Twin towers contain elevator and stair.

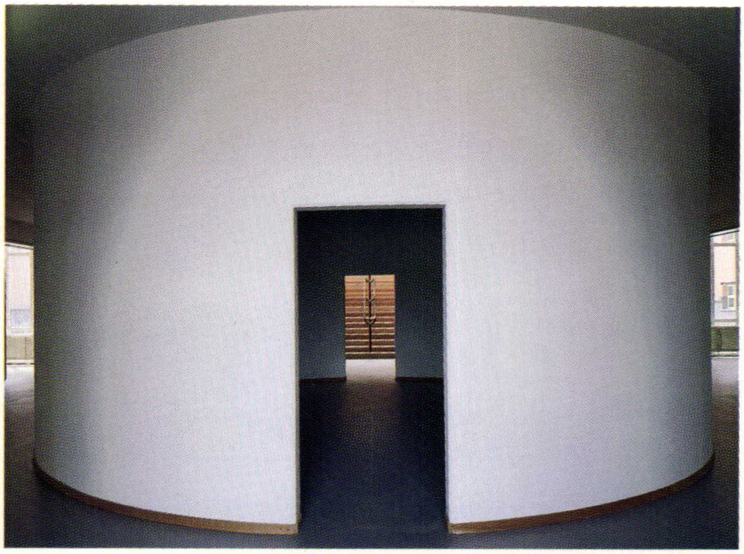
Projecting upward like a rocket ship out of Jules Verne, the dramatic, zinc-clad cupola sits on a stucco- and stone-clad drum and is supported by an external steel structure. Between it and the rest of the building, a pair of cylindrical steel towers, containing a spiral stair and an elevator, rise to a widow's walk that crowns the dome. This belvedere, to which the police refuse public access for reasons of safety, would have offered splendid views south to Belgium and north over the Netherlands. Its presence is a vestige of Rossi's original idea that the cupola be a glazed conservatory overlooking the river and town. Rossi's sketches make clear also that he intended the cupola to reflect the towers of the old city across the river, and the twin towers of a Romanesque church on the opposite bank. From the distance of the Roman bridge, the cupola looks like some sort of silo, and the whole museum resembles an indus-

BELOW LEFT: View from east reveals square framed by historic Wiebenga-designed ceramics factory and museum's entrance elevation.
BELOW RIGHT: View past entrance elevation reveals south end of factory.
BOTTOM LEFT: South court will be shaded by four large trees.
BOTTOM RIGHT: West elevation of factory shows exposed concrete frame.
FACING PAGE: Central pavilion of museum's east facade is faced in stone and capped with zinc cornice.





BELOW LEFT: Top of main stair leads to stair up to graphics gallery (left).
BELOW RIGHT: Windows at end of stairwell reinforce impression of an external stairway between two buildings.
BOTTOM LEFT: From the entrance hall, a visitor looks past cylindrical volume (right) into ticket area and bookshop.
BOTTOM RIGHT: Exhibit space in drum leads to main stair beyond.
FACING PAGE: Rough timber main stair climbs skylit well between brick walls.



BONNEFANTENMUSEUM
MAASTRICHT, THE NETHERLANDS

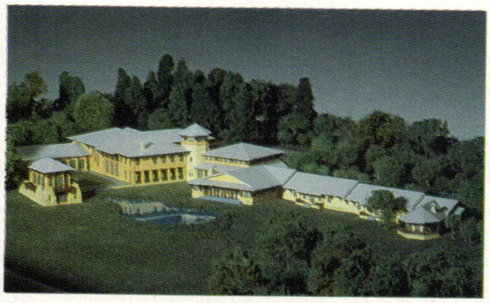
ARCHITECT: Aldo Rossi, Studio di Architettura, Milan—Aldo Rossi (principal-in-charge); S. Umberto Barbieri (project architect); Giovanni da Pozzo (project designer)
ENGINEERS: Grabowsky & Poort (structural/civil); Coman Consulting Engineers (mechanical/electrical)
CONSULTANTS: Central Laboratory for Research of Objects of Art and Science; Caubergh-Huygen Consulting Engineers
GENERAL CONTRACTORS: Buildingcombination Bonnefanten VOF: HBM-Hollandse Beton Maatschappij; BCM-Building Combination Maastricht
COST: $17.5 million
PHOTOGRAPHER: Christian Richters

Roger Tory Peterson Institute
Jamestown, New York
Robert A.M. Stern Architects

RUSTIC TRADITIONS

Robert A.M. Stern, for whom the world's architectural past is a great, rich, cornucopia of ideas, often works within the Classical tradition. Stern's Classicism, however, is not exactly pure, because he frequently mingles it with other styles. His recently completed design for the Roger Tory Peterson Institute in Jamestown, New York, is an example of the kind of eclectic mix he delights and excels in.

The sole objective of the Peterson Institute, founded by and named for the world-famous American naturalist, painter of birds, and creator of field guides, is nature education for children, their parents, and teachers, in the hope that the young will grow up to love and protect the natural world. Stern chose to design a building that would celebrate nature, drawing on 19th- and early 20th-century Rustic national park lodges and Adirondack camps as models. He subordinated these Romantic references, however, to humanity's first buildings to elegantly inhabit nature—Classical Greek temples. The elements of the Peterson Institute that visitors first encounter are the most straightforwardly Classical, beginning with the hipped roof reading as a pediment above a Beaux-Arts stone and timber porch leading to a great hall with a log peristyle. Within, the principal spaces are centered and axial.



ABOVE: Model shows how octagonal tower connects library, office, and exhibition spaces with a row of small, yet-to-be-built, linked structures extending eastward (right).
BELOW: Romantic tower and Classical porch are inspired in part by Adirondack camps and several grand national park lodges, as well as upstate New York vernacular buildings.
FACING PAGE: Loggia borders the building on the east facade. To the north (right) is the two-story great hall.

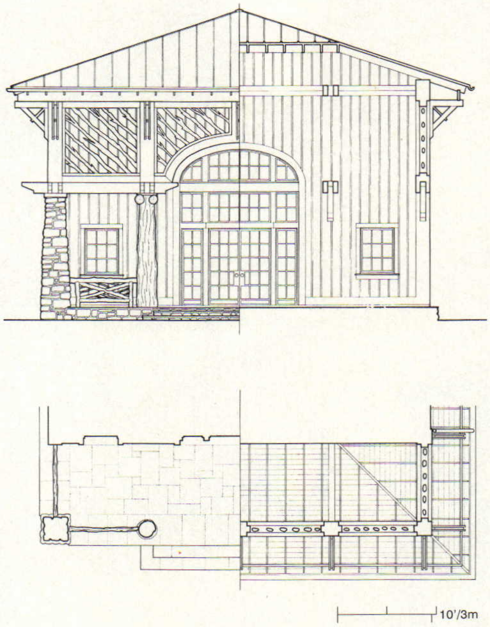
The octagonal tower, the loggia, and the brackets supporting the extensive projecting roofs are by contrast dramatically Romantic and are derived from the Picturesque houses of John Nash in early 19th-century England, a style represented in America by the work of Andrew Jackson Downing. These details also reveal the influence of the Ahwahnee Hotel in Yosemite, a majestic, superbly crafted stone and timber lodge designed and built in the 1920s by Gilbert Stanley Underwood.

Stern has also drawn upon the fine craftsmanship traditions of local upstate New York culture. The Jamestown region was settled by Swedes who set up furniture factories

FACING PAGE: Loggia incorporates Chinese Chippendale twig railings. Tower clerestory, under projecting roof, lights upper study; French doors surround lower reading room.
BELOW: Drawings reveal board and batten siding, granite veneer, spruce columns with primitive Ionic caps, and a standing-seam metal roof.
BOTTOM: Porch is straightforwardly Classical in proportion, although its structure, materials, and methods of joinery allude to Swedish sources.

that became a core industry. Swedish architectural influence is acknowledged by the building's vertical board and batten siding, its cream colors, and complex wood joinery. Other regional references include the wooden Victorian houses at nearby Chautauqua.

Stern also considered the architecture and furniture design of the Arts and Crafts movement founded in the latter half of the 19th century in England by William Morris and John Ruskin. His interest, however, was its American expression in the work of Gustav Stickley, the leading American furniture maker of the movement, who had his factory in Syracuse, New York, and the similar furniture produced at Elbert Hubbard's Roycroft Community workshops in East Aurora, New York. The Arts and Crafts movement, in all its manifestations—architecture, furniture, and the decorative arts—displayed a deep feeling for nature, as did the Adirondack camps and the best of the national park lodges. Stern's search for an image that



would best serve and express the mission of the institute is evident in his selective appropriation and transformation of these sources.

Despite the stylistic virtuosity his work denotes, Stern believes that no building, including the institute, should be discussed exclusively in terms of style. "The design is not a flag waver for any particular style; it is a flag waver for the Roger Tory Peterson Institute and its goal," Stern admonishes. "My idea was to make a wooden building at a public scale—that was the challenge." He tried to create a kind of rustic Classicism, not for the sake of some Classical polemic, but to relate the building to the inherited culture of many generations of local people, and to impart a very clear and very simple expression.

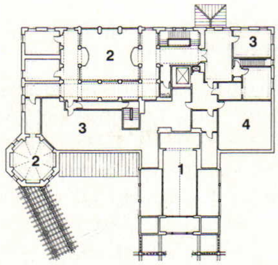
Only a third of the building as designed has yet been built; the rest, it is hoped, will be constructed as funds are raised. The composition of the whole is made up of several small, independent volumes. These elements are arranged to define outdoor public squares

FACING PAGE: Wood-truss-framed main hall, lit by clerestories augmented by chandeliers, incorporates peristyle of scraped, unpeeled logs, playfully capped with paired smaller logs to evoke Ionic orders.
BOTTOM LEFT: Passageway leads from main hall to a conference room at base of octagonal tower.
BOTTOM RIGHT: Small library on tower's second floor is two stories high and lit by a clerestory. Furniture consists of contemporary Stickley reproductions.

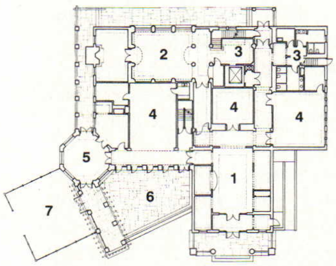
and gardens. A genuine wooden building would have been impractical, in part because of the cost of meeting various safety codes. The structural frame is steel, and the walls are concrete block surfaced in board and batten or 8-inch-thick rough granite imported from central Pennsylvania. The stone has been so carefully selected, shaped, and laid in place that it does not read as veneer.

Only the steel windows give the building a contemporary edge, but these have been carefully scaled to be consistent with the historicist architecture. The windows read as openings in the mass of wall rather than as insertions of curtain wall. For design partner Roger Seifter, the building is a "dialogue between the structure and materials of 100 years ago and the best of what is available today. We worked the details over and over. It is exceedingly well built."

The high level of craftsmanship is particularly evident in the institute's great hall and the libraries. The Engelmann spruce columns



SECOND FLOOR PLAN



FIRST FLOOR PLAN

1 GREAT HALL
2 LIBRARY
3 OFFICE
4 MULTIPURPOSE
5 CONFERENCE
6 GARDEN
7 MECHANICAL

in the hall, like those that frame the entrance to the Classical porch, come from Boise, Idaho. They were shipped with their bark on, then scraped, but left unpeeled at the building site. Exaggerating Classical proportions, the diameter at the neck of each column is roughly 3/4 the diameter of the base, gradually widening downward to form an entasis. Small paired logs cap each column to suggest a primitive Ionic. The trim throughout the interiors is white quarter-sawn oak with a smooth finish in effective contrast to the rough surfaces of the log columns. The plasterboard used throughout is painted to simulate natural plaster. All the lighting fixtures, including the hammered-copper chandeliers in the library, were designed by Stern based upon Arts and Crafts models.

The public has access to the institute's great hall and adjoining exhibition area, but the libraries and offices are accessible only to scholars and those enrolled in the organization's various educational programs. All

BOTTOM LEFT: Circular balconies, framed in oak, are placed at opposite ends of main reading room.
BOTTOM RIGHT: Dark-green carpeting throughout the wood-framed and paneled library suggests a forest floor.
FACING PAGE: Two-story reading room, with mezzanine offices, is lit by steel windows facing south. Doorway under balcony leads to a special collections room with a fireplace. Chandeliers are adapted from Arts and Crafts models.

spaces, however, whether public or private, have been constructed and furnished with great care. Paul A. Benke, director of the institute, is very happy with the place. "We are about the natural world and its beauty. We wanted a beautiful building made of natural materials that would be an esthetic response to nature. I believe that our architecture offers a transcendent experience for all the people who come here."

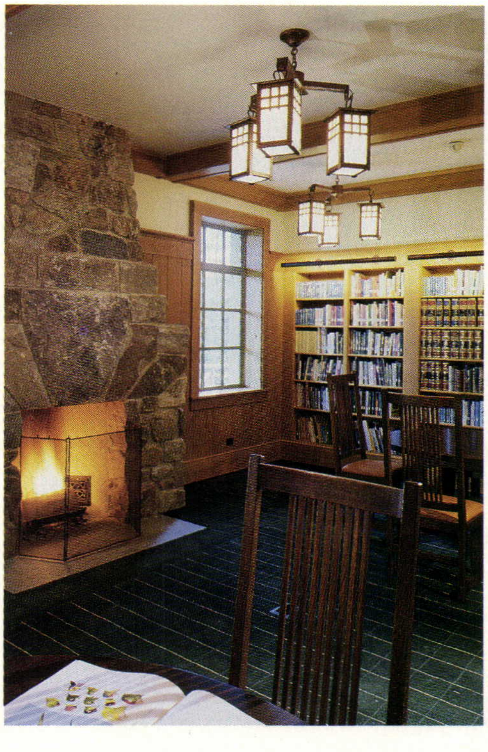
The Peterson Institute may offer such an experience for some, but not for others. Stern, the historicist architect, has carried out his self-imposed eclectic assignment with great love of historic style, enthusiasm, and panache. Rarely does an architect put together such an agglomeration of styles with so much skill. The trouble, however, is that neither the Picturesque bits nor the roughhewn Classical parts look right for the almost flat, rural, lightly wooded site. Log, rough stone, and twig Adirondack construction looks fine set in a dark forest at the edge of a lake, but not in the tame setting chosen for the institute. The ruggedness of the Ahwahnee Hotel was designed for Yosemite. It doesn't import very well to Jamestown.

Stern had another choice. He might have subordinated the building to its natural woodland and meadow surroundings, enhancing them by its relative invisibility. An imaginatively and carefully designed High Tech, glass-enclosed, steel-framed structure, transparent, translucent, and well sited would have served the institute just as well or perhaps better. The design could have been Classical in its proportions and arrangement and signaled its roots in the Classical language by some abstract vestigial allusion to antique pedestals, columns, and entablatures.

Such a building might not have appealed so strongly to the imagination and memories of the people who use it, nor would it necessarily have been better architecture. But it would take less time to get used to in such a quiet setting.—*Mildred F. Schmertz*

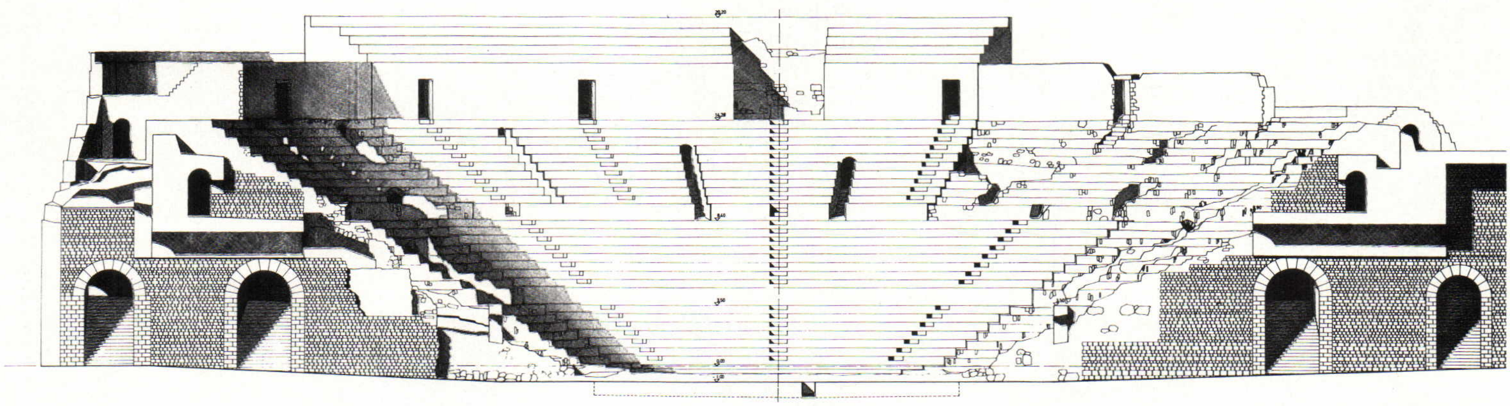
ROGER TORY PETERSON INSTITUTE
JAMESTOWN, NEW YORK

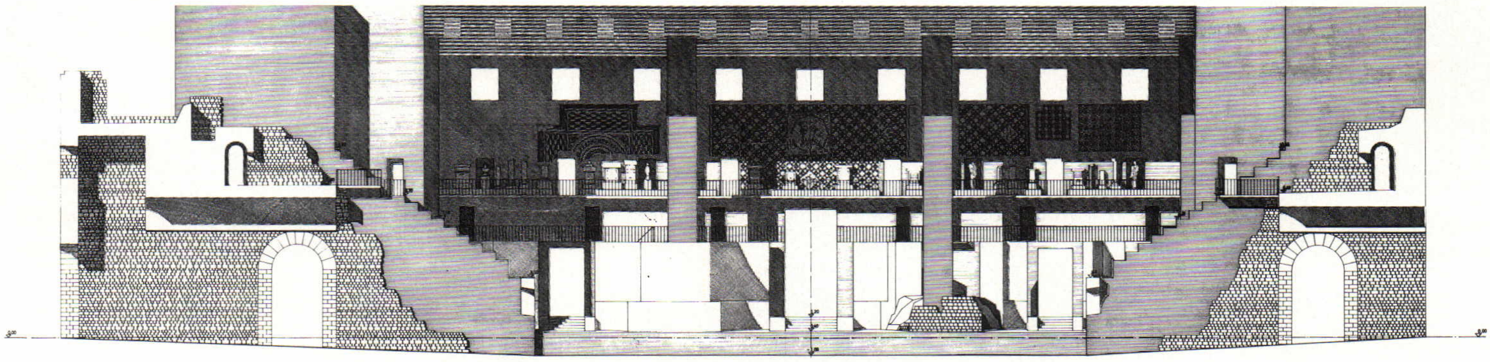
ARCHITECT: Robert A.M. Stern Architects, New York City—Robert A.M. Stern (principal); Roger H. Seifter (architect-in-charge, construction phase); William T. Georgis (architect-in-charge, design and construction documents phases); Laurie D. Kerr, Lynn Wang (project team); Ferenc Annus, Augusta Barone, Yvonne Galindo, Silvina Geofron, Abigail M. Huffman, Arthur Platt, Paul Thompson, Elizabeth A. Valella (assistants)
ENGINEERS: Robert Silman Associates (structural); John L. Altieri (mechanical); Buffalo Drilling Company (geotechnical)
CONSULTANTS: Cerami and Associates (acoustics); Rolf Jensen & Associates (codes); Associated Construction Consultants (construction); Nina J. Root (library); Cline, Bettridge, Bernstein Lighting Design (lighting)
COST: $5 million
PHOTOGRAPHER: Peter Aaron/Esto

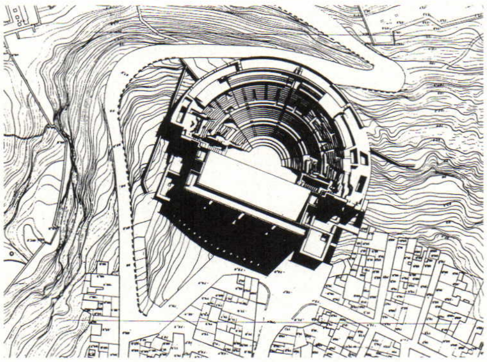


Roman Theater of Sagunto
Sagunto, Spain
Giorgio Grassi, Architect

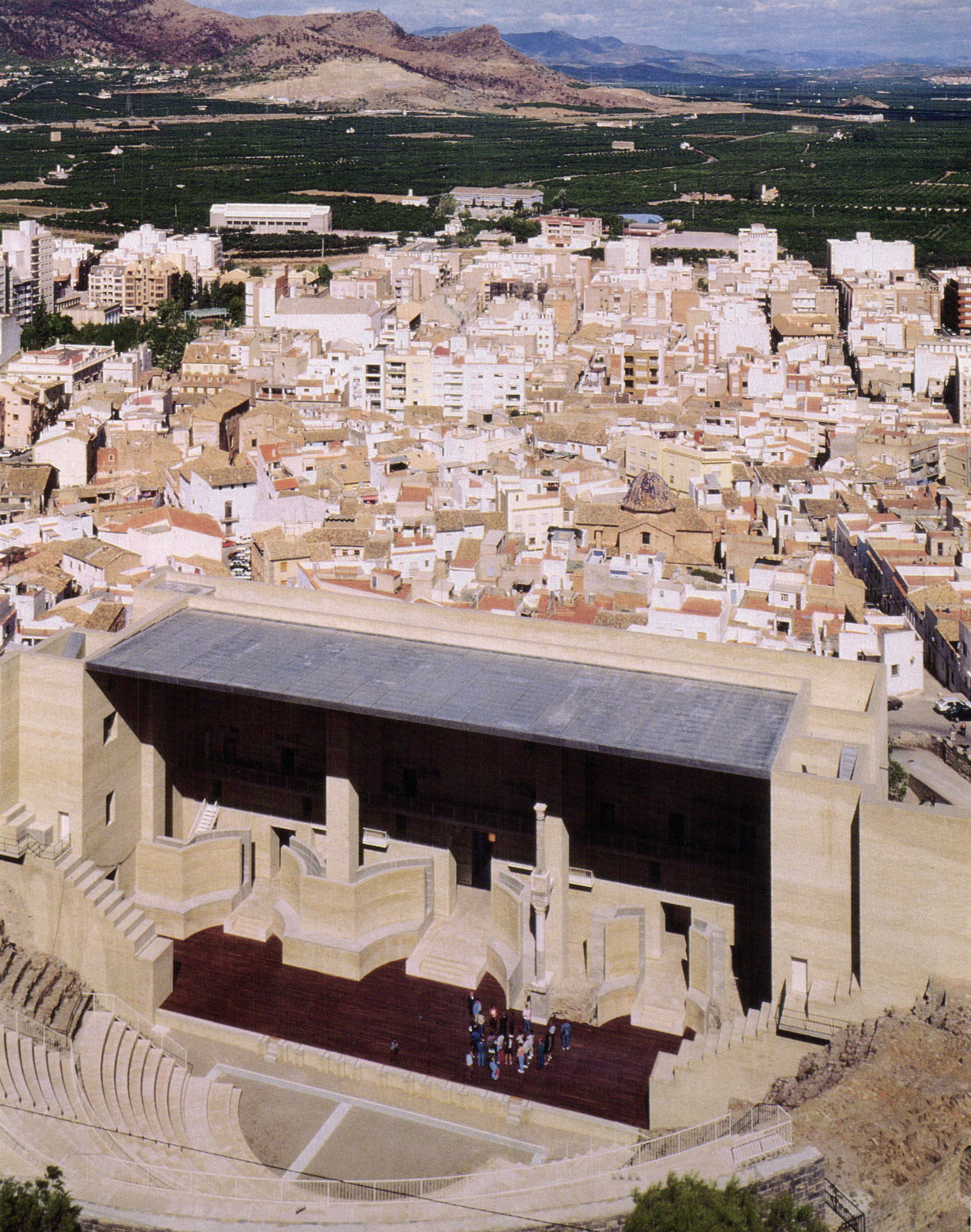
MODERN DRAMA







SECTIONS: Grassi built new seating and proscenium atop preserved ruins of Roman amphitheater.
SITE PLAN: Seating is contoured to hill at the edge of Sagunto.
FACING PAGE: Existing Roman amphitheater was oriented toward city and mountains to provide a living backdrop to drama on stage.



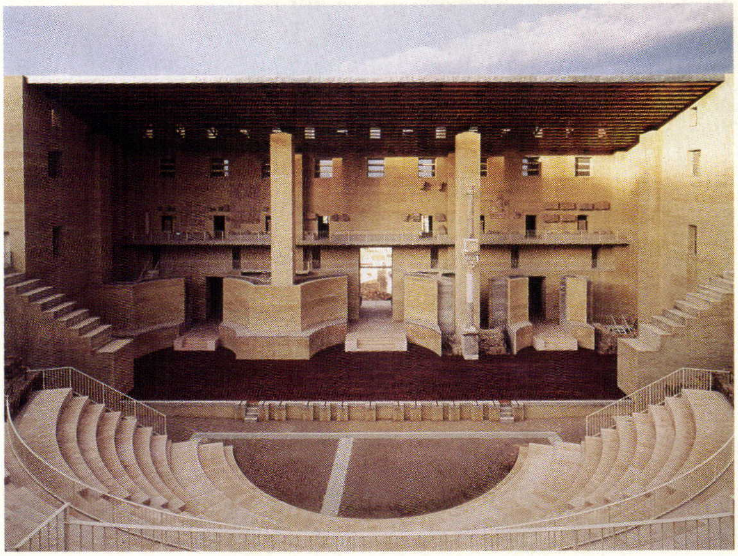
Giorgio Grassi pursues an architecture that lies outside time. However massive or solidly constructed, his works appear as tectonic mirages that float before us as reminders of what we have lost. To this end, Grassi has partially restored and extensively rebuilt the Roman amphitheater in Sagunto, Spain, in such a way as to permit its reuse as a contemporary stage. In doing so, he has avoided the trap of creating one more touristic ruin, which all too frequently is the inadvertent consequence of restoration.

As in Rafael Moneo's Roman Archaeological Museum in Mérida, the archaeological site of the Sagunto Theater has been simultaneously respected and violated. This stance was initiated by Grassi's decision to demolish the existing archaeological museum and to reinstall its collection within the undercroft of a massive, Piranesian, brick-faced *scaena* erected on the foundations of the original stage. Thus, column fragments are now suspended before new, freestanding brick piers, while the brick backdrop of the stage is faced with sections of Roman mosaics that now decorate a wall instead of a floor.

The audacity of this reconstruction derives from Grassi's decision to rebuild, but not simulate, the Roman scenic backdrop to its full architectonic height and depth, thereby restoring the spatial presence of the original arena. This reframing is the key to the enigmatic quality of the result, for, as Grassi explains, it was the permanent palatial scenery that gave to the Roman stage its civic presence, the metaphoric suggestion that beyond the backdrop lay the city itself.

With this bold gesture, Grassi sets up a dialogue between the present urban fabric of Sagunto, which descends into the Palencia River valley, and the all too palpable profile of a Roman institution, which once again asserts itself upon the skyline, or, alternately, merges with the slope when approached from above. At the same time, the brick mass of the theater, when seen from the city, is given

FACING PAGE: New proscenium rises from existing stone walls. Steel catwalks, leading to support facilities, emerge from walls at back of stage. **ABOVE:** Grassi treated rear of theater as a monumental facade onto the city.

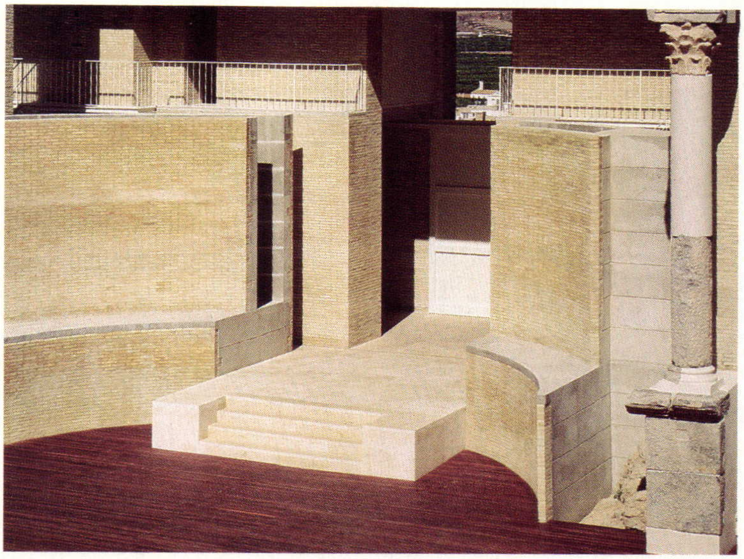


an Iberian inflection by four empty "miradores" cut out of the wall 8 meters above the stage. Medieval tubular-steel gargoyles drain the flat roof over the backstage.

While the shadow of Schinkel's dematerialized Classicism invariably haunts Grassi's work, for him, as for Mies and Kahn, the act of construction is the essential *poesis* of architecture, without which nothing of durable value can be achieved. This laconic commitment to the discipline of construction as an end in itself sets the work of Grassi in a class apart. The Milanese architect expressed the critical character of this stance most effectively in 1986 when he wrote of Sagunto as posing a choice between restoring a ruin to the artificiality of its "original state" or, alternatively, rebuilding it anew "without being haughtily up-to-date." As he wrote of the latter, "What would be the sense of such a solution? What real change could it represent?" Leaving this rhetorical question unanswered, he continued: "In architecture, the response must always contain the problem. A good solution in architecture always throws light on the problem out of which it emerges ... a good response will contain, no matter what, ... the ruin out of which it comes. ... And it will also always contain the mark of its own technical and expressive impossibility."

Thus, Grassi evokes the original monumental proportions of the Roman theater: double-skin brick walls with cavities of varying thickness, including two freestanding brick piers that carry the tripartite subdivision of the proscenium for its full height and provide bearing for the metal trusswork that supports the roof. These points of bearing are deliberately obscured by wooden slats that are fixed to the underside of the purlins, in order to provide a perceptual soffit for the stage. Such a construction is disconcertingly atectonic, in that this pseudo-pergola glides over the top of the massive brick piers, without apparently depositing any load on them. The missing top floor that reveals the full

FACING PAGE: Grassi integrated existing stone wall into design of stage and new staircase to seating.
ABOVE: Central door in rear of theater frames view of Sagunto as well as landscape beyond stage.



height of the brick backdrop announces its absence as unglazed window openings, adding a peculiar sense of emptiness to the already oneiric quality of the arena.

It is a fitting destiny that Giorgio Grassi should end up building his finest work to date upon the archaeological remains of a Roman amphitheater in his beloved Spain, a culture that has, in its own way, extended him greater patronage than his own. Although he assisted in the critical recasting of the magazine *Casabella* in the 1960s and has in the ensuing years assumed his due place as a titular professor at the Milan Polytechnic, Grassi remains an extremely severe and didactic figure. He insists that the ethical task of architecture today is to express the contradictions out of which it arises. This view is most poignantly expressed in the thick wall of the Sagunto Theater's permanent set that, aside from accommodating the changing rooms and other backstage support facilities, projects into the forestage a metal catwalk elevated 3.3 meters above the surface of the wooden podium. This passerelle, affording actors access to the stage, is echoed by another above that serves the thick wall of the theater's storage volume. Both metal-railed gangways impart to the dematerialized proscenium a paradoxical sense of being backstage, as though one has wandered into a Hollywood film set, where the passerelles confirm the utilitarian character of the space.

Thus, we are presented with a *mise en scène* that is at the same time a backstage, just as the new stone seating of the arena simultaneously reveals the old eroded seating of the original amphitheater. For Grassi, the only permanent reality is the reality of change; he expresses the Heraclitean maxim, now written in stone, that one cannot step into the same stream twice.—*Kenneth Frampton*

Kenneth Frampton is the Ware Professor of Architecture at Columbia University and author of Modern Architecture: A Critical History.

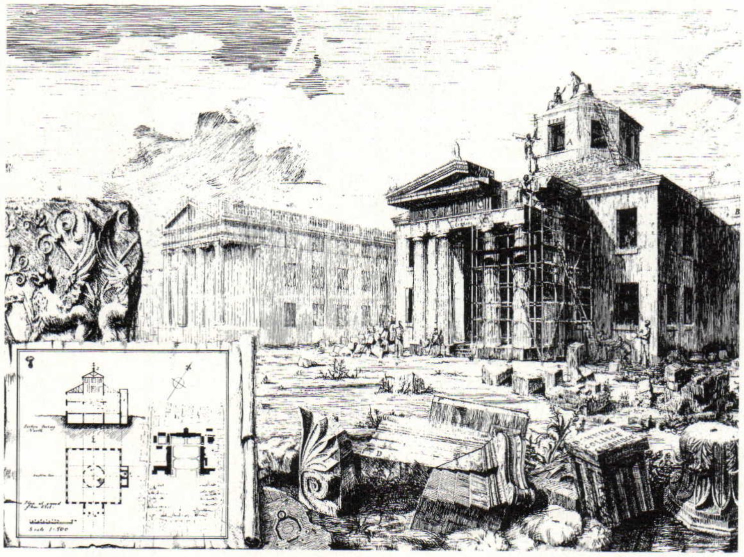
ABOVE: Actors enter stage from concrete staircase located between freestanding brick-clad piers.
FACING PAGE: Existing Corinthian columns and fragments are displayed as ornaments in front of stage (right).

ROMAN THEATER OF SAGUNTO
SAGUNTO, SPAIN

ARCHITECT: Giorgio Grassi, Milan, and Manuel Portaceli, Valencia, Spain—Giorgio Grassi and Manuel Portaceli (principals-in-charge); Jean Louis Dujardin, Lukas Meyer (project team); Juan José Estellés (director)
ENGINEERS: Technical University of Valencia—Carlos Martínez (engineer); Eugenio Abdilla, Agustín Pérez, José Monfort, Enrique Gil (architects)
ARCHAEOLOGISTS: Carmen Aranegui (director); Emilia Hernández Hervás; Montserrat López, Amelia Mantilla (research/excavation team)
GENERAL CONTRACTOR: Dragados y Construcciones
PHOTOGRAPHER: Duccio Malagamba

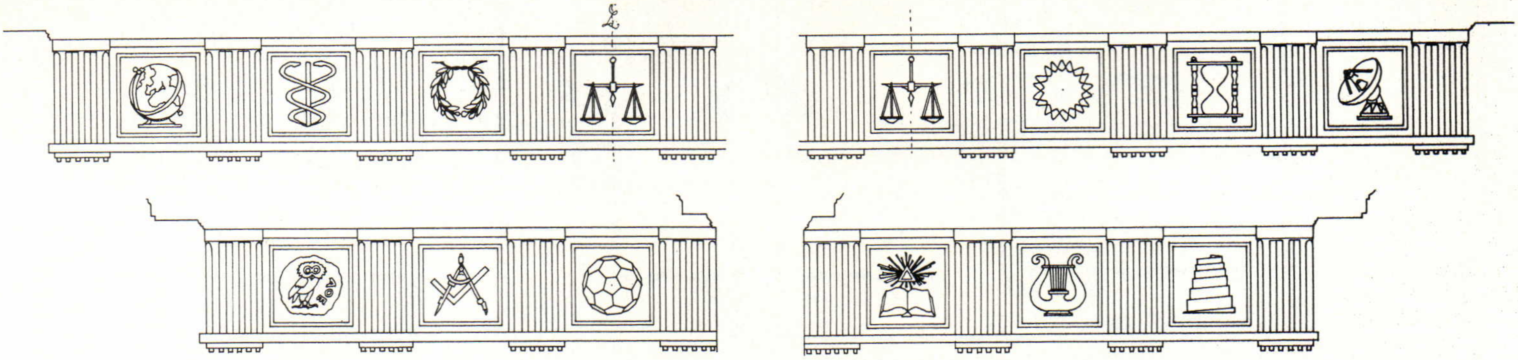
Maitland Robinson Library
Downing College
Cambridge, England
Erith & Terry Architects

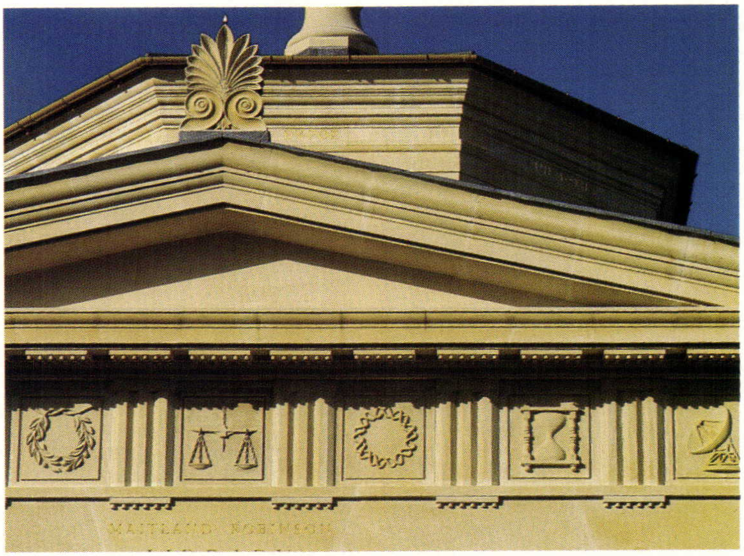
GREEK TRANSLATION



NICK CARTER

TOP: Quinlan Terry's son Francis drew the Piranesian view of the new Maitland Robinson Library at Downing College. The drawing emphasizes the romantic vision behind the architect's Greek Doric orders.
ABOVE: East elevation reveals portico and service wing (right) projecting from central square volume.
FACING PAGE: The language of the Robinson Library combines Ancient Greece, the Italian Renaissance, and English Regency architecture.





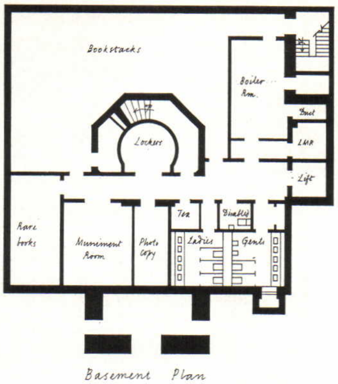
FACING PAGE: Doric portico is based on Greek model in Athens.
TOP: Metopes represent disciplines taught at Downing College: geography, medicine, English, law, biology, history, and astronomy. Lower row of drawings depicts classics, architecture, chemistry and math, theology, music, and modern languages.
ABOVE: Double helix of DNA, seen in central metope, is an undoubted first for Classical architecture. Symbols were chosen by college fellows.

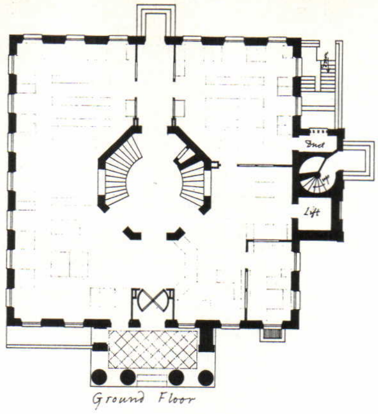
In 1987, when English architect Quinlan Terry completed the Howard Building, his first in a succession of new buildings for Downing College at Cambridge University, many Classicists greeted the result with a disapproval that verged on outrage. Some criticized the excessive complexity of the facades of the building, which houses a students' bar and a lecture hall; others complained that the lavishness of the exteriors contrasted sharply with the village-hall simplicity of the lecture room inside. But the real reason for their disapproval lay in Terry's choice of the Classical orders—Roman in a college that has always been an icon of the Greek Revival. It is not a mistake that Terry wanted to repeat. With his new library at Downing, Terry has turned away for the first time from his beloved Roman orders and experimented with the Greek. As a result, disapproval has been more muted and praise more vocal, but at heart, this is a building that remains rooted in the Renaissance.

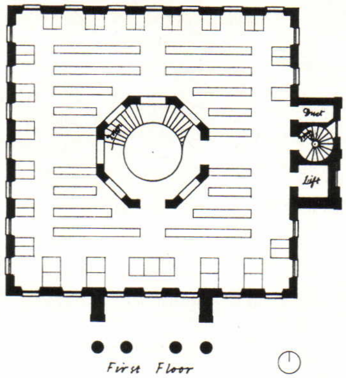
Downing College, founded at Cambridge in 1800, is a seminal example of the Greek Revival. Unfortunately, architect William Wilkins' scheme was never completed because money ran out. Only two sides of his proposed quadrangle were constructed. As a result, the college never built a proper chapel or library, nor a fitting entrance. Thus, in 1988, the college authorities jumped at the offer from an alumnus to fund a new library.

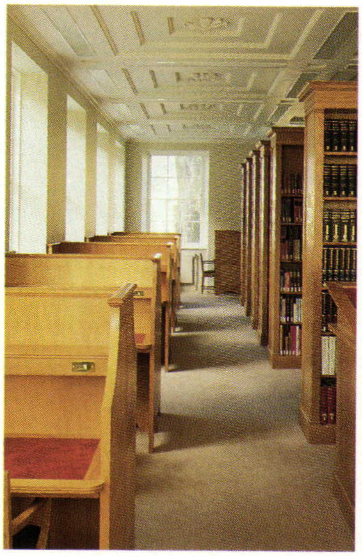
The site chosen was at the northeast corner of the college, adjacent to the entrance. A competition was held among four architects, and Quinlan Terry was chosen again. Terry based his design on a program prepared by the international library specialist Harry Faulkner-Brown, who came up with the basic scheme of a square library with room for 30,000 to 40,000 books in open stacks.

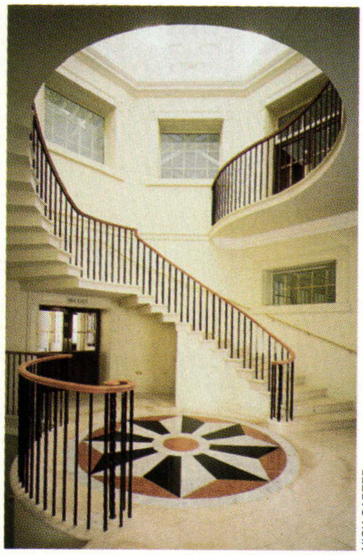
The most striking feature of Terry's design is its Greek Doric portico, based on the portico of Augustus in Athens. Its numerous metopes illustrate the symbols of all the dif-











NICK CARTER

ferent disciplines taught by the college—including the double helix of DNA for biology and genetics, an undoubted first in Classical architecture. The east portico, containing essential services such as stairs, an elevator, and ducts, is taken from the Choragic Monument of Thrasyllus in Athens, while the detailing of the octagonal cupola is derived from the Tower of the Wind in Athens.

For all the Greek language of the exterior, Terry has not escaped the traditions of the Renaissance. The Downing Library finds its place in the tradition of porticoed buildings with a central, toplit rotunda, of which the most renowned is Andrea Palladio's Villa Rotonda; Downing can be most closely compared to Vincenzo Scamozzi's Rocca Pisani, a villa near Lonigo in the Veneto.

This model works well for a square library, with the center occupied by a handsome, toplit staircase, around which run bookcases and desks at the perimeter. Some might question the need for such an impressive staircase taking up such a proportion of the ground plan, but the plan is logical and the result is a very attractive place to study. Slightly harder to justify are the decorative plaques above the stairs, which are taken from the Ara Pacis in Rome, an ornate building at odds with the Greek austerity of Terry's exterior or the implied Renaissance simplicity of his plan.

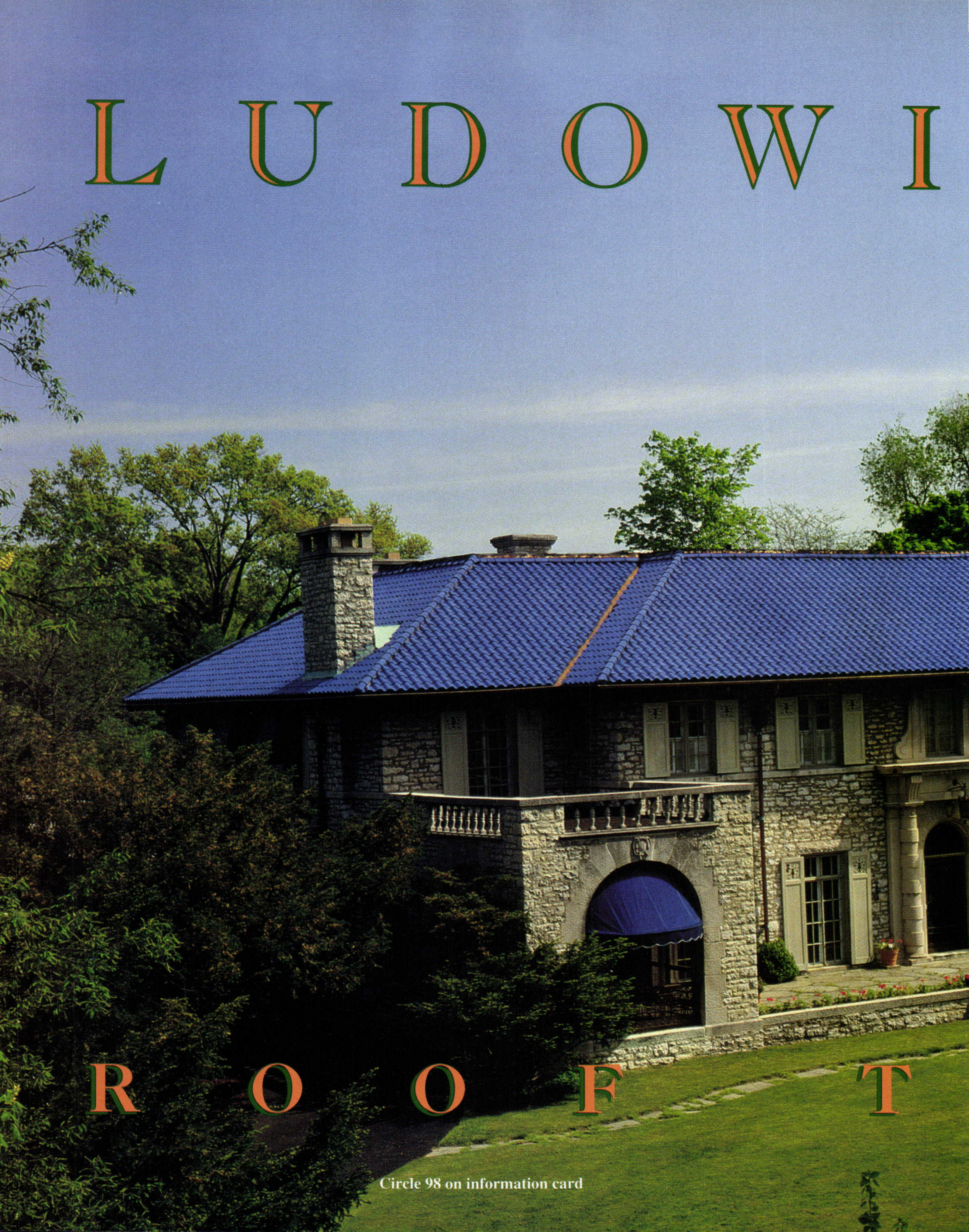
Quinlan Terry has subsequently designed a large house in Germany that owes much to the German architect Karl Friedrich Schinkel and to Greek precedent. When the house is completed this fall, it will be interesting to see whether Terry, now experienced in the Greek tradition, will be able to break free from the trammels of Rome, which clearly still beguile him.—*Giles Worsley*

Giles Worsley is the editor of Perspectives on Architecture, *the magazine launched earlier this year in association with The Prince of Wales's Institute of Architecture in London.*

PLANS: Library is simply organized around toplit staircase. East portico provides space for a secondary staircase, elevator, and ducts.
ABOVE LEFT: Bookcases and reading desks occupy the library's perimeter.
ABOVE RIGHT: Circular staircase is illuminated by octagonal cupola.
FACING PAGE: Cupola's plaster reliefs, taken from Ara Pacis in Rome, contrast with Greek detail.

MAITLAND ROBINSON LIBRARY
DOWNING COLLEGE, CAMBRIDGE

ARCHITECT: Erith & Terry Architects, Colchester, England
ENGINEERS: The Morton Partnership
CONSULTANTS: WSP Kenchington Ford North (electrical); Davis, Langdon & Everest (cost estimator); Faulkner-Brown Associates (library)
GENERAL CONTRACTOR: R.G. Carter
COST: $3 million
PHOTOGRAPHER: Dennis Gilbert/Arcaid, except as noted



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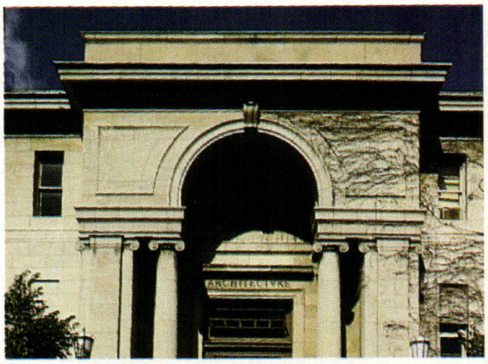
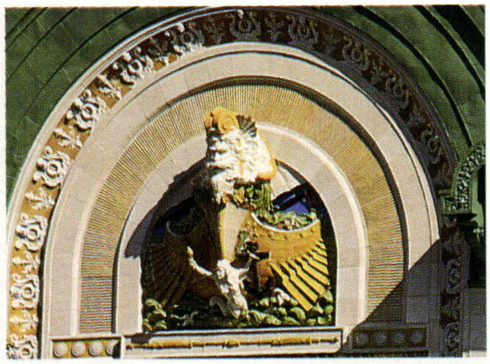
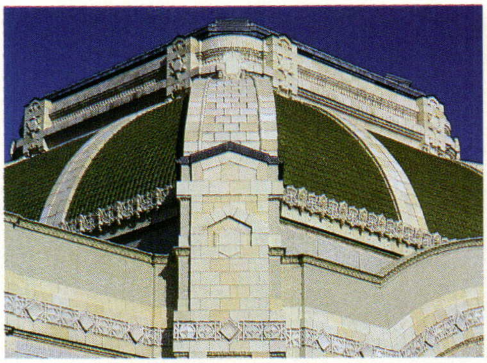




MICHAEL MORAN



LOCKWOOD HOEHL

DON LEE

Our focus on the Classical tradition continues in this month's Technology & Practice section with a feature on **Classical education**. Schools of architecture at the University of Miami, University of Notre Dame, and the new Prince of Wales's Institute for Architecture in London are challenging the Modern underpinnings of existing curriculums through updated Beaux-Arts studios.

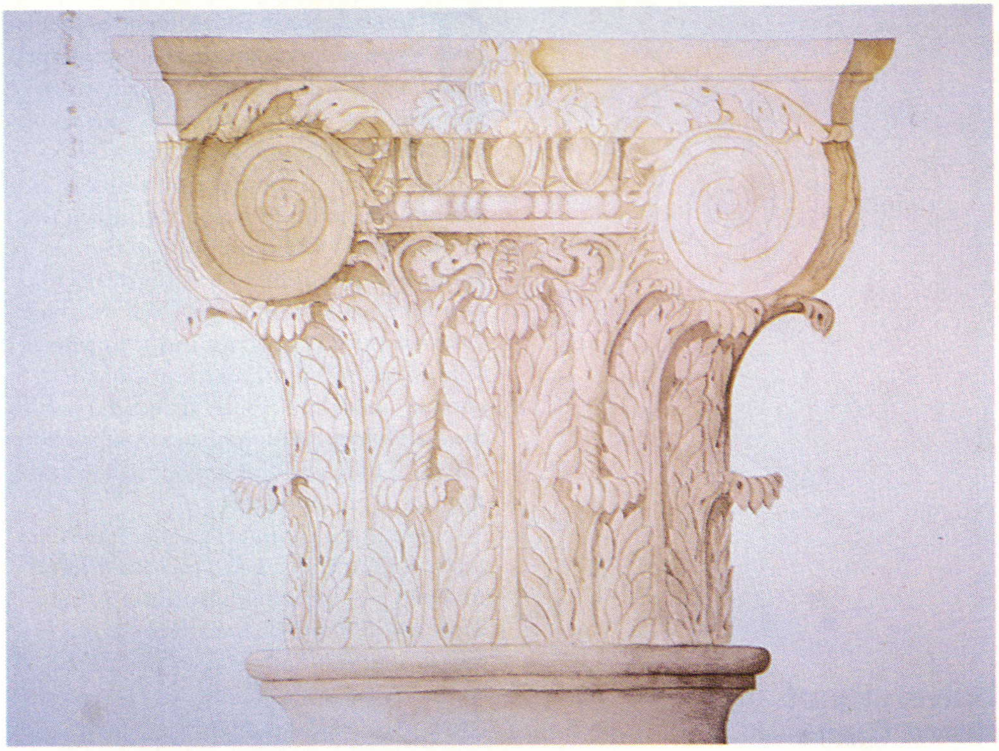
In the late 19th and early 20th centuries, many Classically inspired buildings were clad in lightweight terra-cotta. Our technology feature discusses some of the latest techniques architects are employing in **restoring terra-cotta** domes, walls, and ornamental details with newly fabricated units or substitute materials.

Controlling preservation costs of such projects is not an easy task. Ehrenkrantz & Eckstut Architects tells how the firm achieves accurate bids for restoration work by distinguishing costlier repairs from routine work and supplying contractors with specific repair quantities and prices.

A computer feature on the **new microprocessors** reveals the huge advantages offered by small computer chips, which promise to more than double the speed of existing CAD software. With these chips, architects can convert personal computers into graphic workstations with video and animation capabilities. Our article tells how to select software that maximizes the power of these new tools.

Classical Education

Teaching the Classical tradition is now part of three major architecture schools.



ABOVE RIGHT: Watercolor of a composite capital by foundation course student Jean Philippe Colas at the Prince of Wales's Institute of Architecture.

Classical architecture has demonstrated a constant aptitude for renewal and reform, and, according to many scholars, shares common roots with traditional building practices worldwide. From the founding of the Academie Royale in 1671—the ancestor of the Ecole des Beaux-Arts—to the Prince of Wales's Institute in 1992, the modern face of the Classical tradition has generally been academic.

Yet, since the 1930s, pedagogic interest in the Classical tradition has been suspended in the U.S. by the ideology of Modernism. Then in the 1970s, Postmodern practice awakened genuine interest in architectural precedent; moreover, the preservation movement spawned a grass-roots effort to sustain the traditional built environment.

These influences conferred a new legitimacy on Classicism as a subject of university study. In the mid-1980s, Jaquelin Robertson elevated Classicism at the University of Virginia during his four-year tenure as dean of the architecture school. Professor François Gabriel has held Classical design studios at Syracuse University since 1986.

Other courses in Classical architecture are offered by highly successful educational programs outside universities. Classical America, founded in New York in 1968 by author Henry Hope Reed and architect Alvin Holm, for example, has grown into a nationwide organization known for its conferences, lectures, and publications. The San Francisco Architecture Club has offered drawing courses in Classical architecture since 1982. And since 1990, the Institute for the Study of Classical Architecture at the New York Academy of Art in Manhattan has offered continuing-education classes in the elements of architecture, rendering, and proportion, as well as a summer school in Classical practice for architects and related professionals.

Three degree-granting architecture schools have recently tailored their programs to meet the increasing demand for education in Classical and traditional architecture: University of Notre Dame has transformed its Bachelor of Architecture and Master of Architecture programs into a Classicism-oriented curriculum; University of Miami, Coral Gables, boasts a faculty with extraordinary accomplishments in traditional architecture and urbanism, that has taken the lead in shaping graduate and undergraduate degree programs; and the Prince of Wales's Institute of Architecture in London aims to implement Prince Charles's anti-Modernist stance by restoring traditional practice in all its forms, from crafts to community planning.

While it is too soon to say these schools represent the universal reestablishment of the Classical tradition, their success, as indicated by their growing enrollments, is bound to have a lasting effect on the profession of architecture.—*Stephen Falatko*

Stephen Falatko, AIA, is a practicing architect in New York City and assistant dean of the Institute for the Study of Classical Architecture.

University of Miami

The University of Miami's School of Architecture was originally founded by the architects of visionary developer George Merrick's planned community of Coral Gables in the 1920s. After the Depression and postwar years, the architecture curriculum strayed into the university's School of Engineering, not to reemerge again until 1983. Meanwhile, the 1960s witnessed the first arrivals of refugees from Castro's Cuba; not only did these emigrés transform Miami into a dynamic, multicultural metropolis of 5 million inhabitants, but they brought a fresh perspective to the University of Miami's School of Architecture.

It was during the 1970s that a young practicing couple, Andres Duany and Elizabeth Plater-Zyberk, began a reassessment of the traditional architectural and planning principles underlying the original plan of Coral Gables. Their investigation influenced hundreds of architecture students and created a methodology superbly equipped to undertake projects ranging from individual buildings to regional rehabilitation.

Today, the School of Architecture at the University of Miami boasts an internationally diverse faculty and student body. The school offers a five-year, professional Bachelor of Architecture program with 350 students; a professional Master of Architecture program with 28 students that ranges from two to three and one-half years, depending on a candidates' prior preparation; a one-and-one-half-year postprofessional Master of Architecture program with a concentration in suburb and town design, averaging 12 students; and a newly created paraprofessional Center for Urban and Community Design. The new center is the brainchild of Dean Roger Schluntz, who sees it as a vehicle for offering design and planning expertise to the local community and for exposing students to the implementation of design.

Design methodology

The school has developed a collaborative design methodology that is utilized both in design charettes and studio projects. This effort, often involving professional architects as critics, guides students in a process of collective research that provides a powerful tool for design. "First, we prepare documental drawings," explains Jorge Hernandez, director of the Master of Architecture program, "in order to record the most important characteristics of a locality, ranging from fauna and flora to buildings. Second, we prepare composite drawings, which select, combine, and arrange the documental material in analytical and expressive ways." In the last stage of the process, which may take from two to six weeks, the composite material is used as a basis for a building design. The School of Architecture relied on this process when it constructed emergency housing and studied development patterns of South Florida as part of a community effort to restore the region after Hurricane Andrew in 1992.

This approach succeeded brilliantly in the vivid setting of Miami, but does it transplant? To find out, the school has undertaken studio projects for design problems in such diverse locations as New London, Connecticut (1990); Mérida, Mexico (1991); Antigua, Guatemala (1992); Cartagena, Colombia (1993); the Everglades and Key West in Florida (1994); and Cuzco and Lima, Peru (1994). Each has been valuable, not just for students, but for the community for which the project provides a mirror as well as a guide. Observes faculty adjunct Charles Barrett, "Students come to understand human interactions, place, and public space. Once they become familiar with the city, they can back off to architecture."

Tailoring traditional techniques

The genius of the University of Miami program is the application of traditional techniques to a particular geographic setting, which results in applications utterly authentic to the New World. "When we propose the Tuscan Order for a place like Florida," notes Hernandez, "we can do so because its features make it a good climatic fit" that still evoke the powerful connections of precedents such as Cosa, an Etruscan archaeological site.

But the bias of the school lies not in specific formal issues as much as it does with the approach to design based in the creation of identity for communities of any size. "Miami's philosophy of design is fresh and new, even though the school teaches traditional architecture," maintains 1994 B. Arch. graduate Robert Pilla. "The program was diverse; we could develop our own issues." Jean-François Lejeune, co-director of the graduate program in suburb and town design as well as editor of the school's annual publication *The New City*, adds, "If Miami is a Classical school, it is because of urban research and the use of drawing as a means of analysis and increasing knowledge. We may be more 'vernacular' than 'Classical' here." Distinguished Visiting Professor Vincent Scully, who joined the faculty in 1991, maintains that these are one and the same tradition.

CARLOS DOMENECH PHOTOGRAPHY

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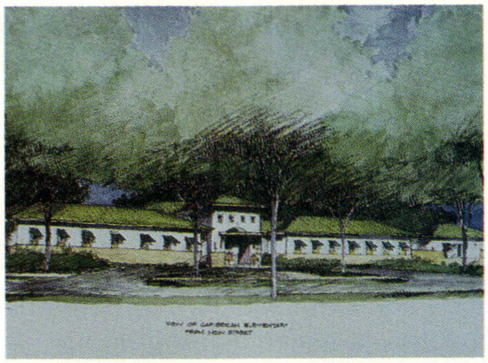

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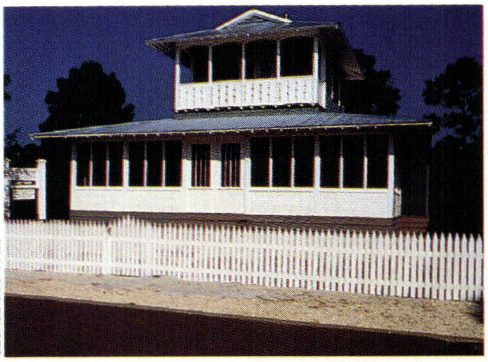
GEORGE GOUNARES



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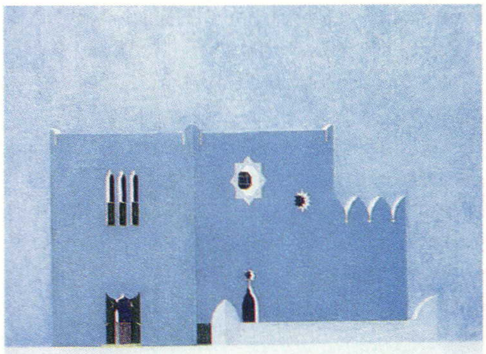

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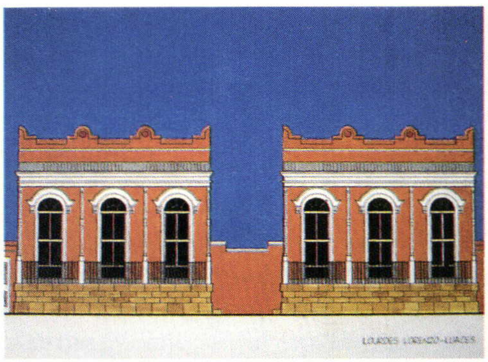

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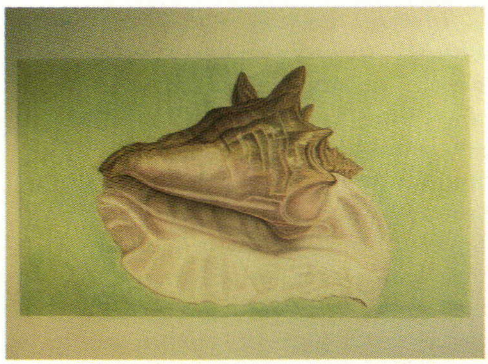

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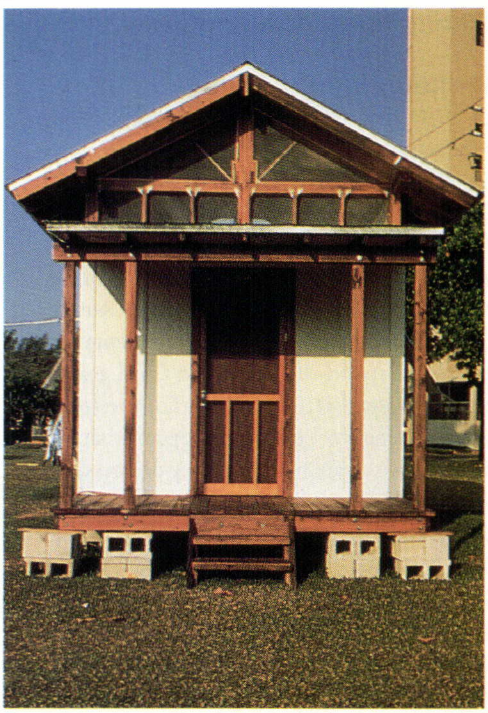

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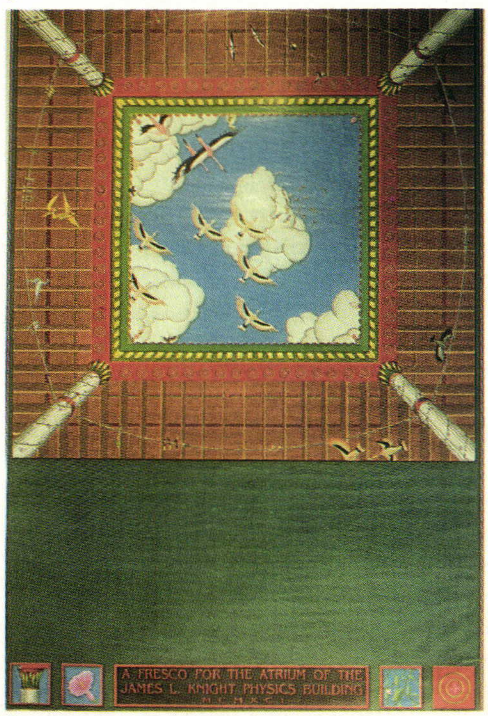

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1 Tennis court pavilion, Windsor New Town, Florida, by Associate Professors Jorge Hernandez and Joanna Lombard and Assistant Professor Denis Hector.
2 Caribbean elementary school, South Miami Heights, Florida, by Professor Elizabeth Plater-Zyberk.
3 House, Tannin New Town, Alabama, by Lecturer Frank Martinez.
4 House, Coral Gables, Florida, by Associate Professor Teofilo Victoria.
5 Survey of traditional Caribbean housing using digital documentation, by student Lourdes Lorenzo-Luaces; Assistant Professor Erick Valle, critic.
6 Conch shell by student Graciela Torres; Teofilo Victoria, critic.
7 Emergency shelter for homeless, designed and built by fourth- and fifth-year students; Gary Greenan, critic.
8 Fresco for atrium of Knight Physics Building, by fifth-year student Robert Pilla; Teofilo Victoria, critic.

Prince of Wales's Institute of Architecture

BARBARA CHANGO

Housed in a John Nash-designed villa overlooking London's Regent's Park, the Prince of Wales's Institute of Architecture has embarked on a course of educational reform in England and Europe. Indeed, if the international backgrounds of its 47 students give any indication, the school's eventual influence will be felt worldwide. Students range from a college-age Botswanan woman who was thwarted from studying architecture, to a 40ish English building contractor cum Sufi mystic. Professionals and artisans from around the world are drawn to the school's search for enduring values inherent in traditional and Classical practice—a mission suggested by Prince Charles in 1984, when he stunned the Royal Institute of British Architecture (RIBA) with his architectural agenda: "At last, people are beginning to see that it is possible and important in human terms to respect old buildings, street plans, and traditional scale. The architect must produce something that is visually beautiful as well as socially useful."

To realize this goal, Prince Charles formed a board of trustees to initiate an independent school of architecture. The institute grew out of a royally sponsored, Oxford-based summer program taught for the first time in 1990. Students traveled to Italy and France for tutorials with such well-known practitioners as Leon Krier and Christopher Alexander. Although its content proved far too rich for the limitations of a six-week time span, the course was recognized by teachers and students alike as a significant contribution to the practice of architecture.

Accordingly, the original program was revamped in 1992 into three architectural divisions—a six-week European summer school; a 36-week foundation course in architecture and the building arts; and a three-year graduate course—under the newly formed Prince of Wales's Institute of Architecture. These were joined by an interdisciplinary program known as the Visual Islamic and Traditional Arts Department, which previously had been based at the Royal College of Art for 8 years.

Foundation course

The pedagogical centerpiece of the institute is the foundation course, offered annually to a group of 20 students of diverse backgrounds, some with professional training but many without. They are admitted to the nondegree course based on prior experience and capacity to both contribute to and benefit from the program. "Its whole agenda is extremely radical," asserts senior tutor Hugh Petter. "The fusion of theory and practice links the diverse activities of the course." The teaching staff are practicing professionals in architecture, crafts, and fine arts. Students are required to study ornament; drawing and painting from life; technical drawing, including measured drawings of existing buildings; photography; sculpture; and stone- and metalwork.

The foundation course is not limited to details, but embraces urban design as well. This exploration begins even before registration day: Each incoming student is required to document a planning proposal back home, evaluate it, and prepare a counterproposal to be reviewed over the first days of class. This year's spirited discussion ranged from the pedestrianization of English streets and introduction of cars in Islamic cities, to the character of communities and building typologies.

European summer school

The current summer school admits about 25 students in a nondegree program designed for those who have a first degree in architecture or related subjects. Led by Brian Hanson, the institute's director of projects, the curriculum includes on-site planning charettes in various European towns and cities. Visiting tutors such as Liam O'Connor, special advisor to Britain's Secretary of State for the Environment, and Maurice Culot, founder of the tradition-oriented research group Archives d'Architecture Moderne in Brussels, work with students on "interventions"—specific designs that preserve and enhance the traditional spirit of places such as Viterbo, Italy, and Chinon, France.

Graduate course

In 1993, the institute began a graduate program that confers a Master of Arts in architecture through the University of Wales. Demitri Porphyrios, Julian Bicknell, and John Simpson are among the well-known practitioners who serve as visiting tutors in the three-year program, directed by senior tutor Adam Hardy. About 10 students in each class spend their first and third years in classroom instruction and studio; the second year is spent working in an approved architect's office, craft workshop, or design firm.

The graduate program has introduced professional requirements into the curriculum, but such preparation for practice is not the overriding aim of the institute. Explains Petter, "We are trying to produce a collection of intelligent, informed, and sensible people who will have a beneficial effect on the built environment in the next century."

LEIGH SIMPSON

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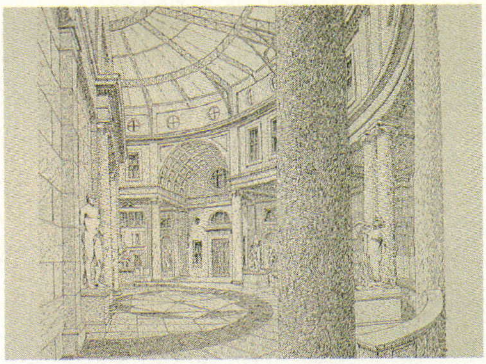

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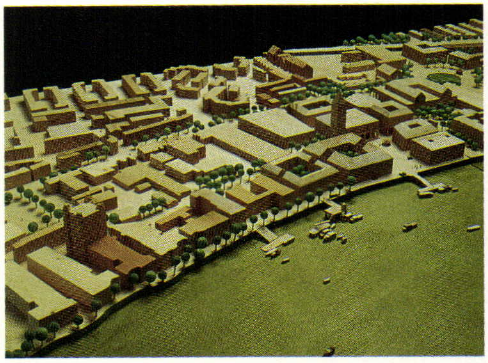

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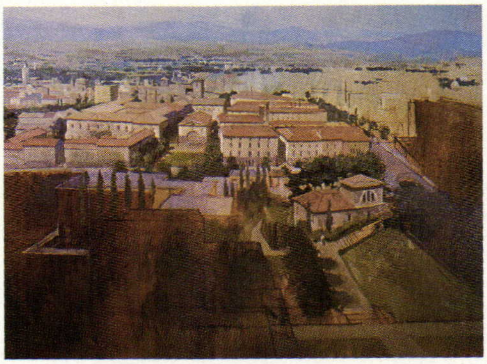

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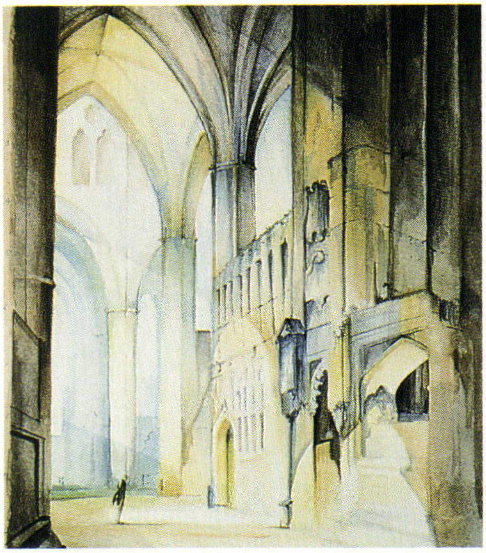

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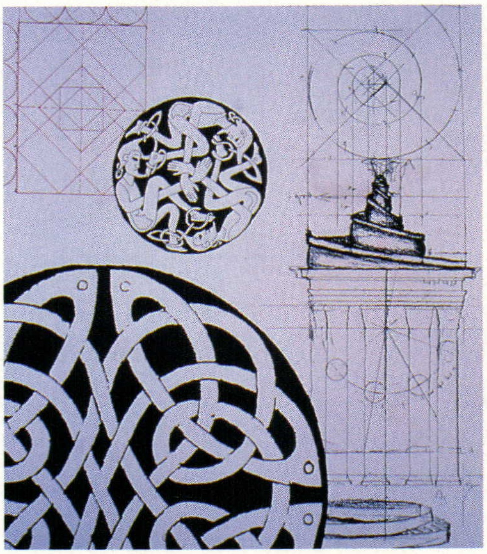

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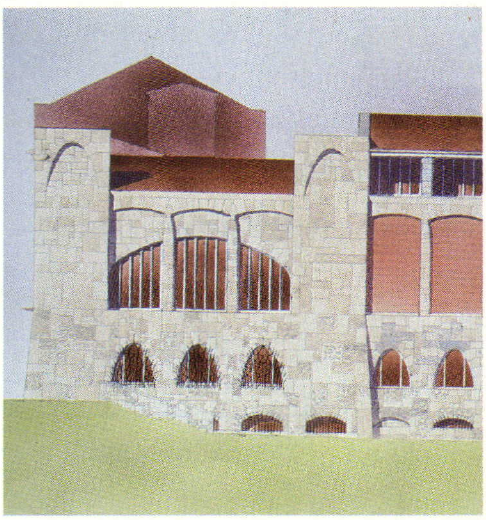

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1 View of stables at Belvedere Village in Ascot, England, by visiting tutor Demitri Porphyrios.
2 Interior view of Ashmolean Museum Extension in Oxford, England, by visiting tutor Robert Adam.
3 Model of Wandsworth master plan in London by foundation course students; Director of Projects Brian Hanson and Liam O'Connor, critics.
4 Panoramic oil painting of Viterbo with proposed urban interventions by summer school student James Hart Dyke; Liam O'Connor, critic.
5 Watercolor study after Turner by foundation course student Christopher Draper; Alexander Creswell, critic.
6 Studies for Celtic ornament by foundation course student Deborah Fennell; senior tutor Paul Marchant, critic.
7 Library project for Bloomsbury district in London, by graduate student Darko Jazvic; visiting tutors Julian Bicknell and Dick Reid, critics.
8 Erection of Spitalfields City Farm Shelter in London, designed by foundation course student Jim Gomez; visiting tutor Salamin Ferenc, critic.

Restoring Terra-Cotta

New techniques and materials revitalize turn-of-the-century, clay-based cladding.

MICHAEL MORAN

ABOVE RIGHT: Detail of Harlem's Audubon Theater, restored by Davis, Brody & Associates, reveals terra-cotta's color and sculptural variety.

Terra-cotta—composed of a kiln-baked clay known as bisque, finished with a protective glaze—is one of the oldest, most versatile masonry materials: It offers a lightweight alternative to traditional stone cladding, allows architects unlimited sculptural expression, and even has structural applications. As architects look to restoring the ornate roofs, cornices, and entablatures of historic buildings, they are developing new ways to repair terra-cotta and replace missing elements with substitute materials.

Terra-cotta gained prominence in the United States in the late 19th century, particularly as a substitute for stone. With terra-cotta, which weighs roughly one tenth as much as stone, architects could simulate limestone or brownstone, for example, at a much lower cost than quarried masonry. The material became more popular in the early 20th century, as architects such as Louis Sullivan, Henry Hobson Richardson, and Cass Gilbert capitalized on its range of form-making possibilities; Frank Lloyd Wright even remarked that "terra-cotta is in the architect's hand what wax is in the sculptor's hand."

Architects were also attracted to terra-cotta's almost limitless color palette. New York City's 1927 Fred F. French Building, for example, was designed to incorporate polychromed terra-cotta murals on the parapets of the structure's numerous setbacks. According to architect Diane S. Kaese of Wiss, Janney, Elstner Associates, the French Building's recent restoration required crafting over 3,500 new pieces of terra-cotta in roughly 14 different colors.

In response to new building codes mandating fire-resistant construction following the 1871 fire in Chicago and disasters in other large cities, practitioners began specifying hollow structural clay blocks for cladding and infill walls. Architects also recognized the structural capabilities of flat-arched terra-cotta in floor framing systems, which allowed the construction of relatively lightweight

Substitute materials are not always a viable alternative in terra-cotta restoration projects.

floor plates. Hollow, trapezoid-shaped terra-cotta blocks were framed between steel I-beams, functioning like masonry arches.

Moisture control

One common problem of terra-cotta restoration is remedying damage from water penetration between the bisque and the finish glaze. Delamination of the glaze from the clay unit happens when the thermal coefficients of expansion between the glaze and clay body are not properly matched, thus causing cracks to form in the glaze. Moisture, unable to evaporate, accumulates behind the glaze. Pressure exerted during freeze-thaw cycles by this trapped moisture causes the glaze to separate from the clay or to spall. Water that seeps in through the cracked glazing can also migrate into the highly porous clay body, causing it to disintegrate.

New impermeable coatings are being developed to repair glazing spalls and prevent additional water infiltration to existing terra-cotta. But these water-and-silicone-based coatings also "breathe," allowing any moisture that does reach the clay block to evaporate.

Substitute materials

Where terra-cotta is missing or must be replaced, glass-fiber-reinforced concrete (GFRC), precast concrete, and other materials can be substituted; in many cases, these substitute units can be manufactured much more quickly and economically than terra-cotta. According to Wilbert R. Hasbrouck, a Chicago-based preservation architect who incorporated GFRC in the terra-cotta columns and entablatures of Daniel Burnham's Refectory Building in Chicago, GFRC elements can be cast in just a few days, while terra-cotta can take up to nine months to fabricate. And if there are errors in the casting, a new GFRC component can be easily remolded.

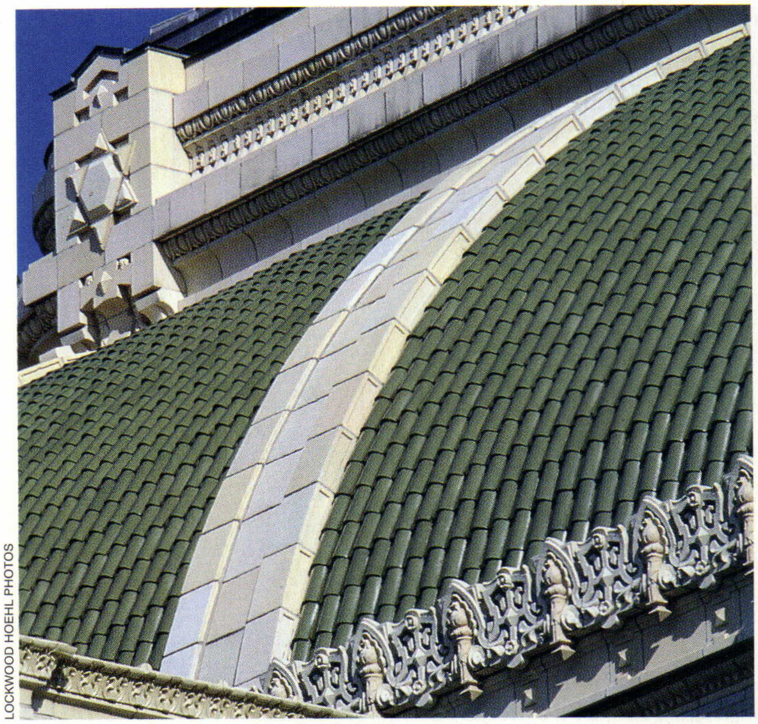
But substitute materials are not always a viable alternative for terra-cotta restoration. Hasbrouck notes that building elements cast in concrete appear different—often glossier—from the terra-cotta originals, especially when compared side by side. As it weathers, GFRC eventually becomes more similar in appearance to terra-cotta. "GFRC has only really been popular for about 10 years," adds Hasbrouck, "so we don't really know how it will look in the long term."

Precast concrete can also be specified in recrafting missing terra-cotta elements; but because concrete darkens when wet, it stands out from adjoining terra-cotta. A polymer-based concrete called Micro-cotta enjoyed some popularity in the mid-1980s and was substituted in renovations of the Santa Fe and Wrigley buildings in Chicago. Architects report, however, that the biggest drawbacks of the material—which is even lighter than terra-cotta and is finished with a glazed texture—are its tendency to fade and turn yellowish in sunlight and excessively craze. Micro-cotta is now manufactured by America's Best Building Products and has been reformulated to improve its performance.

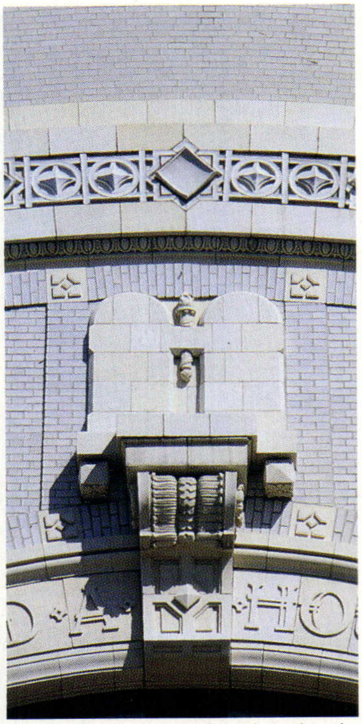
Loadbearing terra-cotta is more difficult to substitute than ornamental or exterior applications since its structural strength can't be compromised. "If you do decide to replace loadbearing terra-cotta," explains Kaese, "you have to design a whole new structural system. But you could select GFRC, concrete block, or precast concrete."

Terra-cotta revival

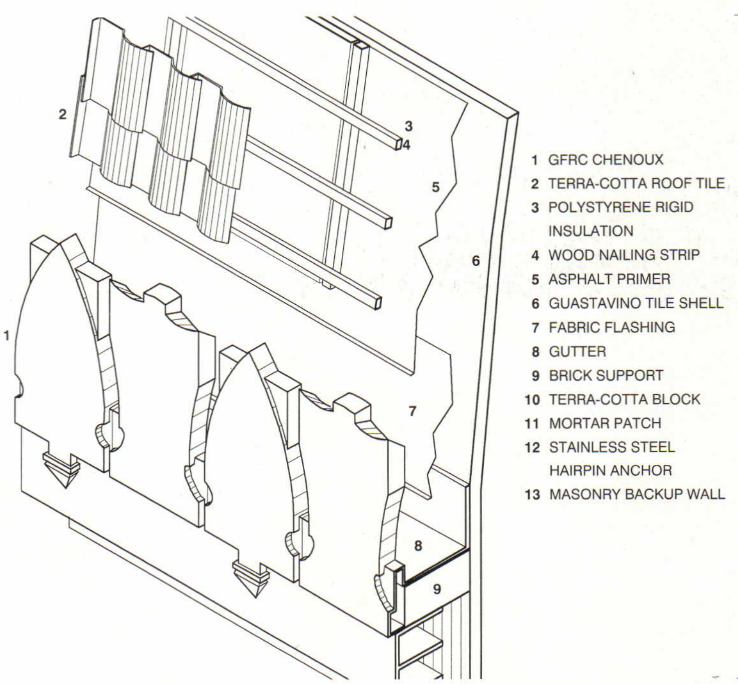
A century ago there were roughly 100 terra-cotta manufacturers in the United States; by the late 1970s there were fewer than a dozen. The growing preservation movement has spurred new fabricators to set up shop, but architects seeking terra-cotta replacements still have only a few companies from which to choose. One of the oldest and largest manufacturers is Gladding McBean, founded in 1875, which operates in Lincoln, California. Smaller manufacturers include Boston Valley Terra-Cotta of Orchard Valley, New York, and Uhrichsville, Ohio-based Superior Clay Products.—*Raul A. Barreneche*



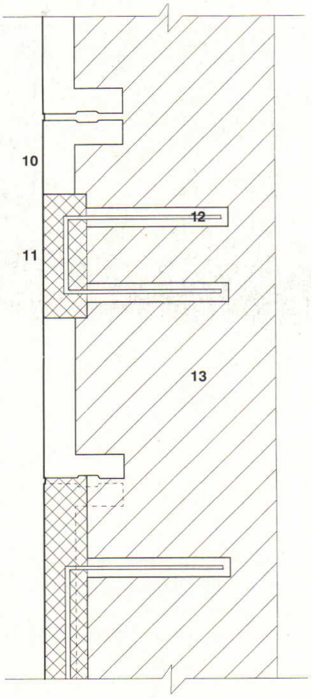
TEMPLE DOME: Deteriorated roof and rib tiles restored.



DETAIL: Terra-cotta and brick replaced.



PARAPET DETAIL



TERRA-COTTA REPAIR SECTION

Temple Rodef Shalom
Pittsburgh, Pennsylvania
Ehrenkrantz & Eckstut Architects

Henry Hornbostel's 1907 Rodef Shalom synagogue is clad in yellow brick and terra-cotta, which are attached to a rough brick infill wall with mortar. In 1987, Ehrenkrantz & Eckstut found the building's exterior in poor condition, following years of water penetration, pollution, and harsh cleanings with sulfuric acid and other corrosive materials. The face brick and exterior terra-cotta ornament and roof tiles were severely cracked, and the glazed finishes were spalled and faded.

"Because the temple was in such bad shape, it was easiest to dismantle the entire temple exterior," explains partner Denis Kuhn. "We examined the brick and terra-cotta to see how much original material could be salvaged, because we didn't want to create a new building."

The temple's brick and terra-cotta elements were then inventoried and stored on site. Some pieces were beyond repair and had to be recrafted. Kearny, New Jersey-based manufacturer MJM Studios created new terra-cotta elements by molding details similar to the originals. Many of the chipped and broken blocks could be patched with epoxy and pinned to the supporting brick infill wall; other pieces simply required a new glaze to patch damaged finishes.

The temple's large central dome—composed of a Guastavino tile shell buttressed by structural ribs—had leaked since its original construction. Its terra-cotta cladding was designed as a waterproofing element, but didn't prevent significant leaking. The architects elected to remove the terra-cotta and install a 3/8-inch-thick waterproof membrane, which was heat-welded to the Guastavino shell as an integral protective layer. A new gutter system was installed behind an ornamental parapet.

Audubon Ballroom Building
New York City
Davis, Brody & Associates

Harlem's historic 1912 Audubon Ballroom and Theater witnessed the birth of William Fox's 20th Century-Fox empire, as well as the 1965 assassination of Malcolm X. Now its terra-cotta facade is being rejuvenated by Davis, Brody & Associates as part of a renovation and addition to the original building. The firm was commissioned by the New York City government to replace missing ornaments, restore and clean existing polychromed details, and repoint the entire facade.

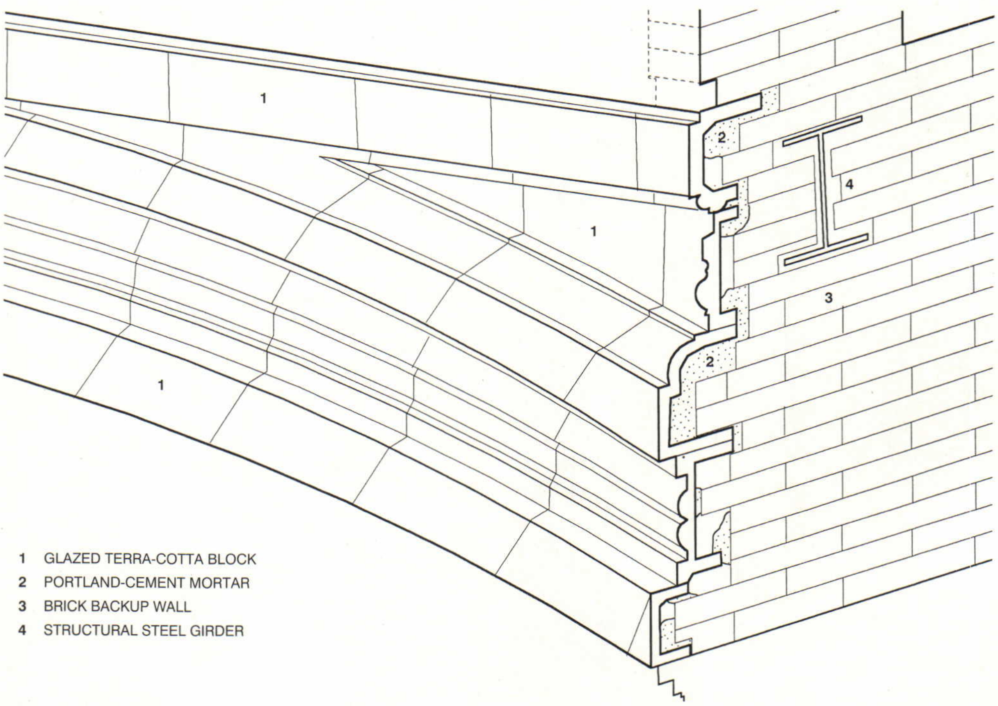
According to preservation consultant Jan Hird Pokorny Architects, the ballroom's terra-cotta exterior was in generally good condition. In some areas of the main facade, however, water had penetrated through deteriorated masonry joints, corroding iron anchors joining terra-cotta panels to the brick infill wall and causing the clay to crack.

The architect repaired small, cracked or chipped areas of the glaze by applying a clear, water-resistant coating. Loose terra-cotta pieces were reattached to the brick infill wall with new stainless steel anchors, which were bonded to the terra-cotta blocks with cement or non-shrinking grout. Where possible, the architect reapplied terra-cotta elements salvaged from adjoining facades—which were demolished to accommodate the new addition—to replace missing or severely damaged pieces. But where existing sections couldn't be used, new units were molded by manufacturer Boston Valley Terra-Cotta.

After the repairs, the contractor cleaned the building exterior with a combination of high-pressure water jets and peroxide- and acid-based solutions. Following the cleaning, the entire facade was repointed with a cement-based mortar carefully formulated to match the original.


MICHAEL MORAN

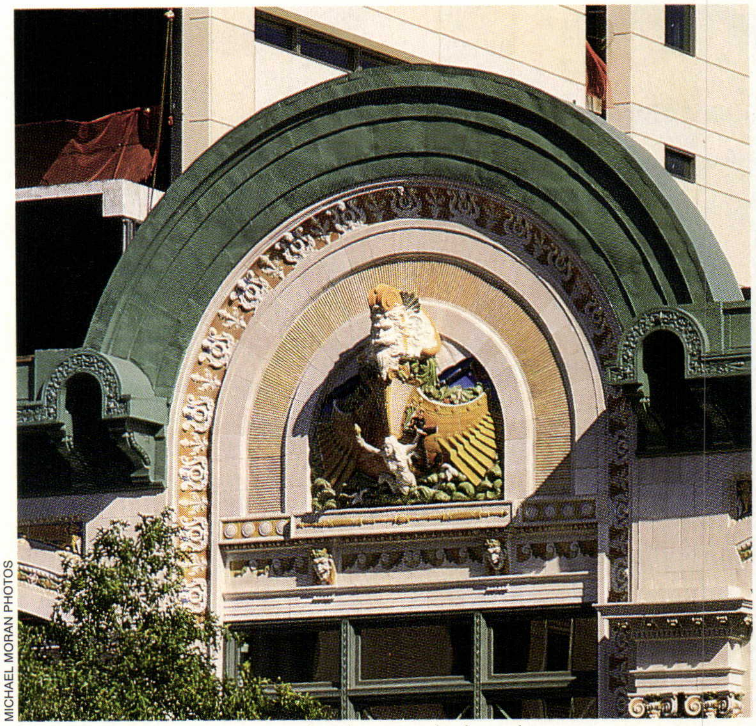
AUDUBON BALLROOM: Polychromed terra-cotta facade restored as part of renovation and addition.



1 GLAZED TERRA-COTTA BLOCK
2 PORTLAND-CEMENT MORTAR
3 BRICK BACKUP WALL
4 STRUCTURAL STEEL GIRDER

WINDOW ARCH DETAIL

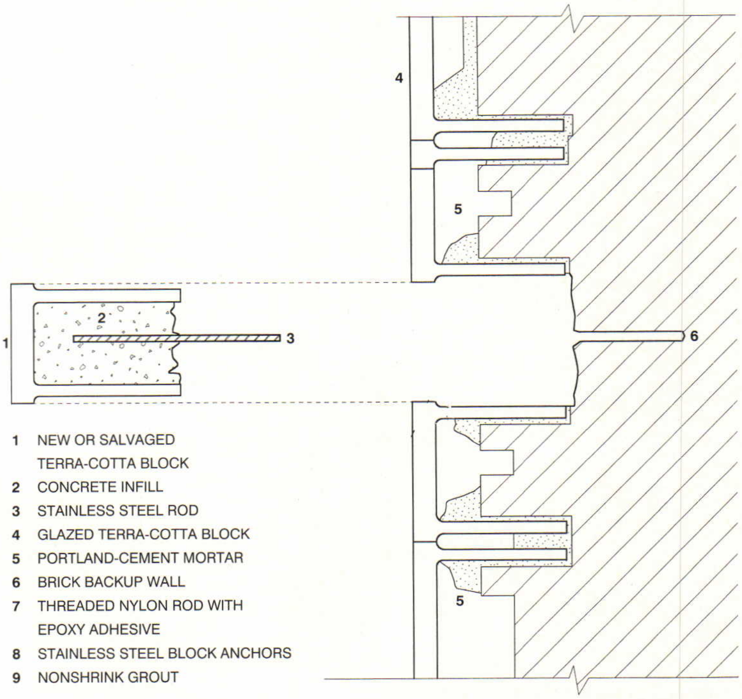
MICHAEL MORAN PHOTOS



ENTRY DETAIL: Ornament restored with new and salvaged terra-cotta.

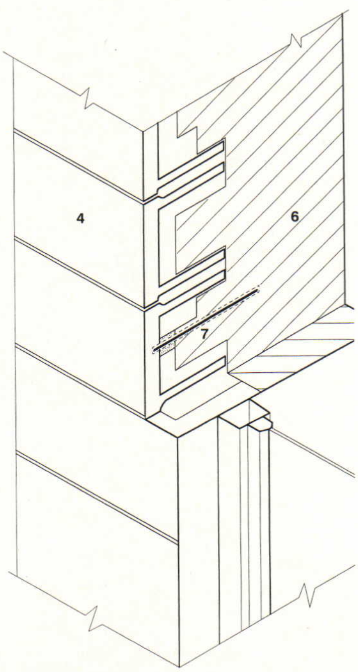
FACADE DETAIL: Blocks repointed.

DETAIL: Polychromed foxheads repaired.

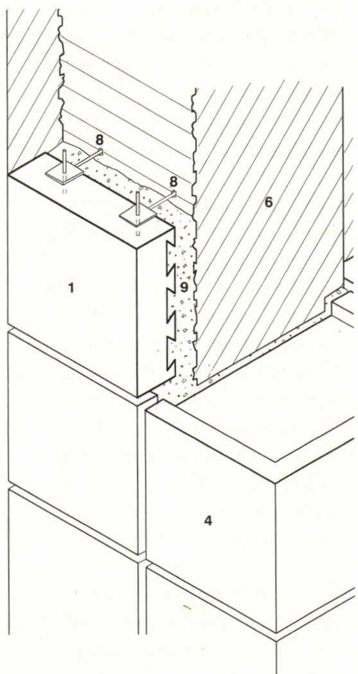


1 NEW OR SALVAGED TERRA-COTTA BLOCK
2 CONCRETE INFILL
3 STAINLESS STEEL ROD
4 GLAZED TERRA-COTTA BLOCK
5 PORTLAND-CEMENT MORTAR
6 BRICK BACKUP WALL
7 THREADED NYLON ROD WITH EPOXY ADHESIVE
8 STAINLESS STEEL BLOCK ANCHORS
9 NONSHRINK GROUT

EXTERIOR WALL REPAIR DETAIL



TERRA-COTTA REPAIR DETAIL



TERRA-COTTA REPAIR DETAIL

Alcazar Theater
San Francisco, California
Wiss, Janney, Elstner Associates, Architect

The Moorish-inspired Alcazar Theater in downtown San Francisco was built in 1917 as a Shriners' Temple. By 1990, water penetration had damaged the facade's ornate, terra-cotta arches and decorative Arabic tracery. Wiss, Janney, Elstner Associates (WJE) was retained to repair the terra-cotta and seismically reinforce the facade.

According to project engineer Paul Cox, the building's deteriorated roof was never properly maintained, causing excess water to damage the facade's terra-cotta panels. As water became trapped beneath the finish glaze, it deteriorated the terra-cotta's highly porous bisque. It also corroded the steel tie bars and shelf angles that tie the terra-cotta blocks to the steel structure's poured-in-place concrete infill wall.

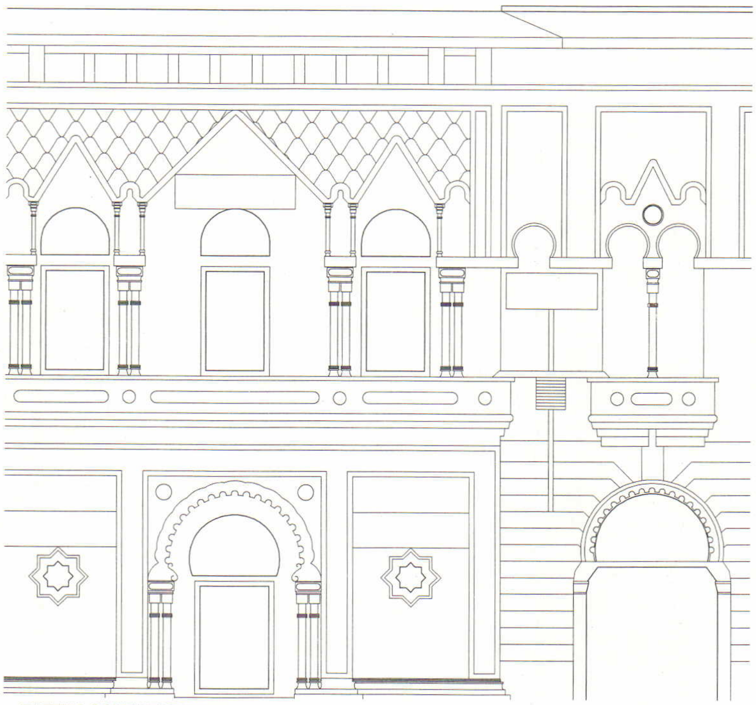
Before remedying the damaged areas, WJE crafted scaled mock-up panels to test the materials and techniques to be applied to the facade. The firm employed patching mortar to repair cracks in both the clay and finish glaze. They also repaired shallow bisque spalls with mortar and filled deeper spalls with polymer concrete. In areas where the glaze had spalled, WJE applied a "breathable" masonry coating. Careful attention to the makeup of the coatings and patching glaze ensured that repaired areas properly matched the original terra-cotta finish.

WJE seismically strengthened terra-cotta columns along the main facade and balcony. Two pillars flanking the entrance were secured to the concrete infill structure with threaded steel rods fastened with epoxy. And 2-inch-diameter steel pipes were embedded in the balcony's clustered columns and attached to an overhead steel beam.

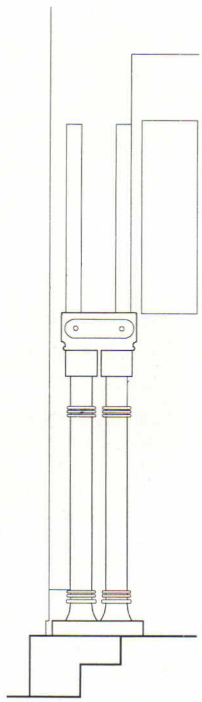
THEATER FACADE: Roof leaks caused terra-cotta damage.

PAUL COX/WJE PHOTOS

TRACERY DETAIL: Glaze colors restored.



PARTIAL SOUTH ELEVATION

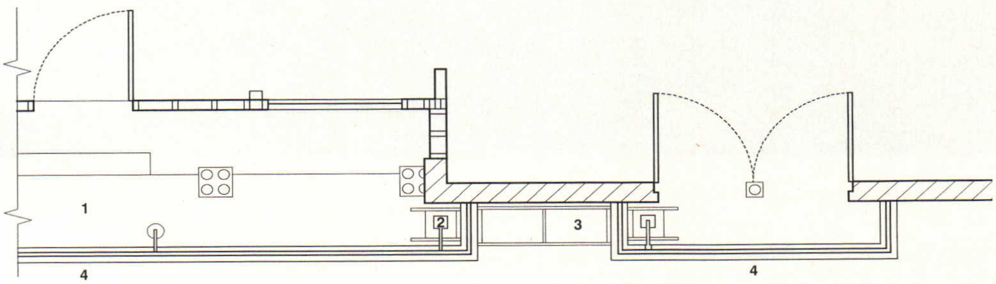


ARCH SECTION

CAROLYN L. SEARLS/WJE PHOTOS

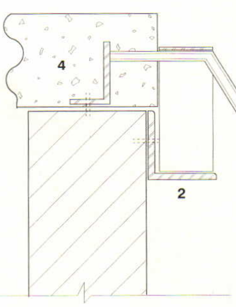
BALCONY RAILING: Terra-cotta restored and seismically strengthened.

ARCH DETAIL: Columns reinforced with steel pipe.



BALCONY PLAN

1 RAIL BRACE
2 HORIZONTAL RAIL SUPPORT
3 FIRE ESCAPE
4 COPING BLOCK
5 EPOXY ANCHOR
6 TERRA-COTTA BLOCK
7 CONCRETE BACKUP WALL
8 CONCRETE BEAM
9 STEEL BRACE
10 PIPE COLUMN



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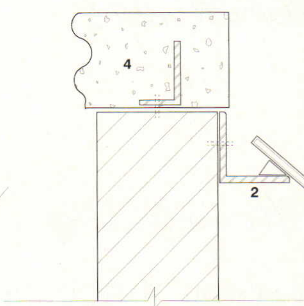

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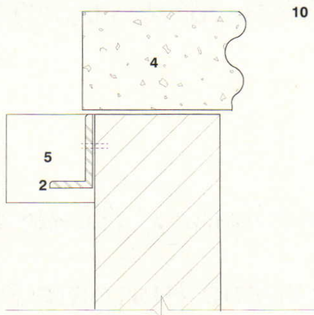

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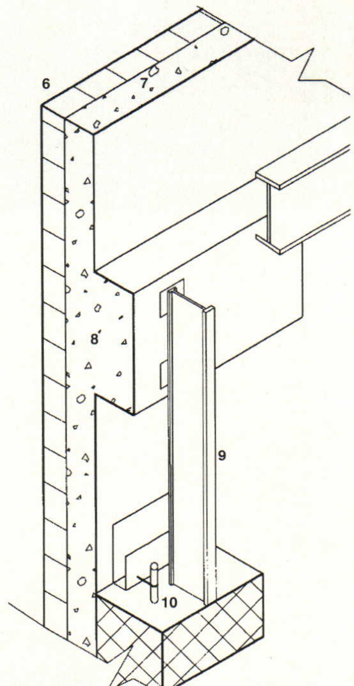

COLUMN BRACING DETAIL

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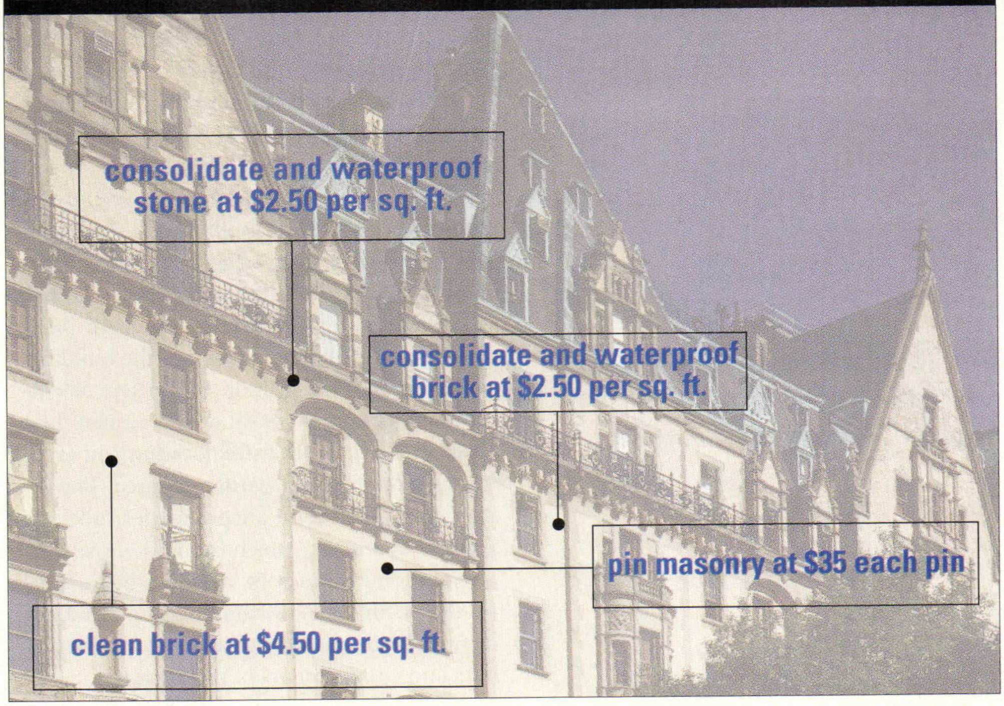
Controlling the Cost of Preservation

A "brick-by-brick" method of pricing building repairs improves the restoration process.

SAMPLE UNIT PRICES FOR THE RESTORATION OF THE DAKOTA IN NEW YORK CITY



WALTER DUFRESNE

Since 1976, our firm, Ehrenkrantz & Eckstut Architects, has pioneered a "unit pricing" approach to design and contract documents for preservation projects that allows us to control the quality and cost of restoration. According to this method, the architect inventories the quantity and quality of necessary repairs, obtains competitive bids on these repairs, and administers the construction contract. Our inventory comprises surveying representative areas of the building and determining the type and degree of each repair. Building elements—or units—that display a similar degree of damage are counted (in large projects, by extrapolation), and detailed descriptions of each item are developed for a more accurate determination of the scope of the project.

This procedure allows contractors to distinguish between different degrees of work when bidding. For example, brick that simply requires repointing by removing loose mortar would constitute one unit description, whereas brick that also requires saw-cutting every joint would constitute another unit item. By distinguishing costlier repairs from more routine work, architects can achieve more accurate estimates of restoration.

Unit pricing offers several advantages over typical lump-sum price contracts. The architect supplies the contractor with the actual quantities of units to be priced; the contractor then offers the owner a price per unit and, once selected, commits in the contract to complete the work for that price. During the construction phase, it is the architect's job to continually redefine the scope of work within the contract, keeping the bottom-line costs the same. The cost of any additional repairs discovered as work proceeds can be adjusted by savings discovered elsewhere.

Unit pricing is now an essential methodology for our large-scale restoration projects, applied to both interior and exterior work. For the restoration of the Equitable Building (1915) in lower Manhattan, for example, it was impossible to survey and document every surface and detail of the tower. Because the entire building could not be rigged or scaffolded to reach every area before construction, prototypical areas were surveyed, and conditions were recorded and documented. The scope of the restoration work was then defined, and typical restoration items were identified on drawings of specific bays of the building. The contractor then developed unit prices for restoring particular materials, based on the kinds of work we delineated: removing worn brick and installing new brick, cutting out areas of existing mortar and repointing, removing damaged window sills and installing new sills of precast concrete. By extrapolating from prototypical areas, the unit prices for these areas were used to determine the cost of the entire project.

To accomplish this task, firms need long-term dedication from staff who are willing to ride a hanging scaffolding rig 30 stories in the air, or climb a 90-foot-high dome. Clients should be prepared to pay for full-time, on-

Unit pricing creates a climate for competitive bidding. It allows clients to see the real costs of restoration.

site personnel from the architect's office to keep accurate records of work to be done and work completed. Our 1978 restoration of the Woolworth Building's facade required four architects to survey the building; identify where materials would be removed, repaired, or replaced; and inspect completed work.

In our projects from 1976 to 1986, overall project budgets were established through negotiations with a restoration contractor, and unit prices were applied only to specific areas surveyed in the field. We now prepare documents illustrating all aspects of the building in plan, elevation, section, and detail. We illustrate restoration work with 1/4 inch:1 foot scale drawings so that the location and extent of the work can be clearly measured. Photographs illustrating areas like roof valleys or backs of parapets, which cannot be easily seen by the contractors, may also be included in the documents. Where building elements cannot be reached physically, we use binoculars and enlargements of photographs.

Drawing notes

Because descriptions can be lengthy for a given unit, keynotes are assigned to specific types of restoration on the drawings. For example, a keynote has a prefix such as "M" for "masonry" or "W" for "window." A note designated as M-1 might read: "Cut out all deteriorated brickwork within area. Install new brick that matches existing in color, size, and surface texture." Rather than repeat this note, the M-1 symbol appears on the drawings wherever this work is required.

These symbols are then used to identify a specific item of work for unit pricing. We have taken this one step further on our most recent projects by actually quantifying the number of units of each item of work. The quantity is calculated in linear feet for a roof ridge, pointing, or caulking; in square feet for cleaning or brick replacement or repair; and on a per-item basis for individual elements such as a wrought-iron bracket. To derive their bids, contractors are asked to fill in unit prices multiplied by the number of units. This procedure encourages competitive bidding for large, complicated restoration projects and eliminates guesswork about the quantity of materials and extent of restoration.

Field adjustments

During the course of the restoration process, quantities of units whose repair cost is already determined may be adjusted to reflect actual field conditions. In other words, if 3,000 bricks require replacement instead of the 1,500 originally identified by the architect, the additional brick replacement is purchased at the unit price furnished by the contractor. If a unit of repair is discovered for which no price has been determined, the architect and contractor will need to negotiate a new unit price for this one-of-a-kind repair.

Competitive unit price bidding is complicated by the need to include the costs of field and office administration, cleaning of areas to be repaired, shop drawings, and, especially, scaffolding and rigging. Frequently, the difference between two equally qualified restoration contractors is their approach to scaffolding and rigging, which can amount to hundreds of thousands of dollars.

Determining real cost

Unit pricing creates a climate for competitive bidding in restoration work, where the uncertainty of typical lump-sum estimates can produce a wide range in prices. Clients can see where the real costs of the restoration are and play an active and informed role in deciding what work should receive priority. Scope can be adjusted in the field as actual conditions are identified, and the cost of the project can be kept within budget by deferring certain work to later phases of repair.

The project's schedule should reflect which portions of the building are to be restored and in what period of time, so that unit prices can be projected over a two- or three-year period. Architects should be sure to keep track of work that is under way and should not let work proceed unchecked. To eliminate the possibility of disputes with the contractor about the scope of work accomplished, no work should proceed without authorization from the architect. Be sure to clearly delineate work areas by keeping field logs and drawings up to date.

Plan to inspect work progress after materials have been removed and before repaired units are installed so that restoration and repair proceed smoothly. Check to see that adequate materials have been ordered and are available. The unavailability of certain sizes and colors of brick and terra-cotta greatly complicates large restoration project schedules. After work is completed, plan on a punch list inspection and then a final inspection and sign off. Resetting a rig once it has been moved can cost as much as $6,000, so be certain the restoration is fully completed before the contractor is paid.—*Denis G. Kuhn*

Denis G. Kuhn is a principal of New York-based *Ehrenkrantz & Eckstut Architects.*

WALTER DUFRESNE

DAKOTA EXTERIOR: Repair quantities determined by surveys from a distance.

WALTER DUFRESNE

WINDOWS: Sashes and moldings.

UNIT DESCRIPTION	ESTIMATED QUANTITY	UNIT PRICE	ESTIMATED COST
Provide power-driven pinning of masonry	300 pins	$35 each pin	$10,500
Provide dutchman patching and replacement, 36-square-inch patches	30 patches	$300 each patch	$ 9,000
Remove existing face brick	966 sq. ft.	$45 per sq. ft.	$43,470
Remove existing face brick and salvage brick	200 sq. ft.	$55 per sq. ft.	$11,000
Provide new face brick to match original	800 sq. ft.	$50 per sq. ft.	$40,000
Consolidate and waterproof brick	21,500 sq. ft.	$2.50 per sq. ft.	$53,750
Consolidate and waterproof stone	8,750 sq. ft.	$2.50 per sq. ft.	$21,875
Clean stone	8,750 sq. ft.	$4.50 per sq. ft.	$39,375
Clean brick	21,500 sq. ft.	$4.50 per sq. ft.	$96,750

The Dakota
New York City

The Dakota, designed by Henry Janeway Hardenbergh and completed in 1882, is one of New York's earliest apartment buildings. Its restoration, undertaken by Ehrenkrantz & Eckstut, began with a survey of the 160-foot-high facade and peaked roof, examined through binoculars or from a swing scaffold.

The original, buff-colored brick of the facades had deteriorated and cracked over the years. Some brick had lost its vitrified face so that the soft porous interior was exposed. Because stock replacement to match the original brick was no longer available, new brick was produced to match the original.

Sandstone elements were cracked and spalled in many areas. Stone dutchmen—or substitute pieces—were provided to fill areas with large gouges. The new stone was chosen based on its mineral content and unweathered appearance to blend with the original stone. In areas where damage was extensive, colored-mortar patches were applied.

Most of the slate roof was in good condition, although in some areas, original slate had been either patched with asphalt shingles or coated with coal tar. Broken shingles were replaced with new matching slate, and new flashing was installed. Gutters were repaired, replaced, and resecured with new copper straps.

The Dakota has more than 2,000 windows, most of which were in a poor state of repair, with dry rot permeating sashes, frames, and window moldings. Sashes were inoperable, glazing leaked, and hardware was missing. Deteriorated sections of exterior molding were cut out, and new cherry molding was spliced in with a scarf joint. All gaps between the molding and stoneware were filled with polystyrene backer rods and caulked. Sashes beyond repair were replaced with new sashes, fabricated off-site to standards established by the New York City Landmarks Preservation Commission.

During the course of the restoration work, the owner decided to clean the facade, a controversial decision since some attributed the Dakota's charm in part to its decayed, blackened appearance. However, cleaning facilitated the evaluation of the structure, and it also made it possible to immediately blend new and existing work.

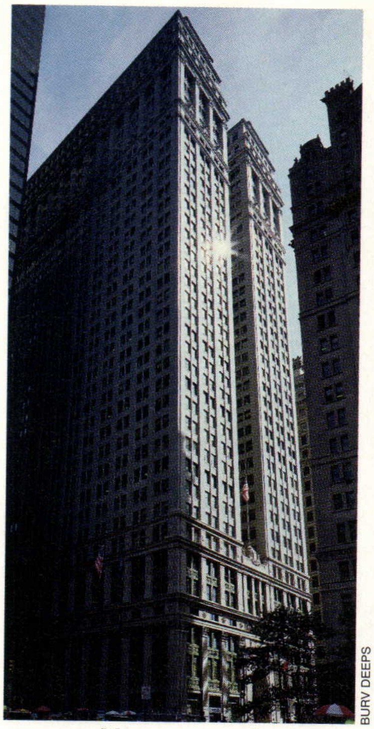
Equitable Building
New York City

The brick and terra-cotta-clad, steel-framed structure of the 1.2 million-square-foot Equitable Building is enormous even by today's standards, and its restoration demanded an undertaking of similar magnitude. The scope of work by Ehrenkrantz & Eckstut Architects, in conjunction with project contractor Remco Maintenance Corporation, included the complete inspection of all facade, roof, and penthouse areas; the replacement of existing windows; and the renovation of public spaces.

Initially, four prototypical areas were selected for survey. Hanging scaffolding was dropped on the building's Broadway facade, portions of which were inspected by two architects. Drawings of typical bays were prepared, noting conditions such as cracked and loose brick, as well as broken or missing terra-cotta sills, cornices, and molding. The exterior was cleaned by a chemical wash at night to prevent damage to vehicles from cleaning materials. The architectural team then rode the rigs and identified brick and terra-cotta elements to be removed. All surfaces were sounded with hammers to determine whether they had deteriorated or become separated from the backup brick masonry. Areas that could be reattached to the brick backup were identified.

We replaced the damaged terra-cotta with glass-fiber-reinforced concrete (GFRC), which we selected for its ready availability. Molds were fabricated from existing terra-cotta pieces, from which GFRC replacements could be cast. The GFRC cornices were supported by a new steel armature. Special bricks were ordered to match the color of the bricks of the existing facade.

The benefits of unit price contracting on this project included avoiding expensive pipe scaffolding, since no extensive surveying, documenting, and pricing phases were required prior to work. During the three years of phased construction, crews remained continuous in both the architect's and the contractor's teams. Thus, the workers' familiarity with the project was greatly enhanced, allowing the restoration project to proceed as one continuous operation. Speed of execution was improved; and initial, postremoval, and final inspections were accomplished with the same rig location.



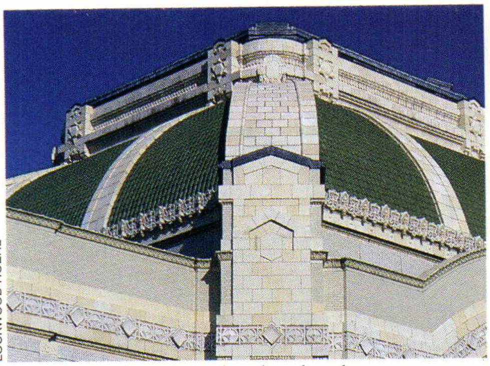
BURV DEEPS

EQUITABLE: Masonry repaired.

BURV DEEPS

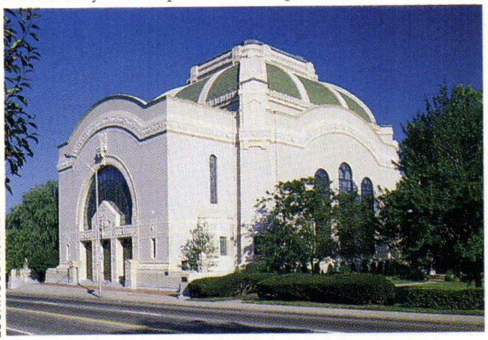
INTERIOR LOBBY: Renovations included in unit price contracting.

UNIT DESCRIPTION	ESTIMATED QUANTITY	UNIT PRICE	ESTIMATED COST
Patch terra-cotta, floors 5-40	7,000 sq. ft.	$35 per sq. ft.	$245,000
Demolish existing sills, as necessary, and replace with cast-in-place concrete sills, as per approved prototype and specifications, floors 5, 7, 8, 31, and 32, all elevations	430 sills	$375 each sill	$161,250
Point terra-cotta, all elevations, floors 5-40	120,000 linear ft.	$1.50 per linear ft.	$180,000
Replace lintels with aluminum, floors 32-36	150 lintels	$450 each lintel	$ 67,500
Pin terra cotta, excluding cornices covered by base contract, including friezes and other horizontal bands, with 16 22-inch-long, threaded stainless steel rod, 1/2 inch diameter	7,405 pins	$35 each pin	$259,175
Provide epoxy pinning of cornice, floor 40	200 pins	$35 each pin	$ 7,000
Replace spandrels, floors 38-39	200 spandrels	$725 each spandrel	$145,000
Apply waterproof coating to areas other than contract cornices, standard coating	1,600 linear ft.	$4 per linear ft.	$ 6,400
Replace terra-cotta lintels, floors 38-39, as required, design similar to lower levels	140 lintels	$265 each lintel	$ 37,100
Replace terra-cotta blocks, with concrete masonry units, other than cornices, all elevations, single blocks only, without special anchor, floors 5-40, as required	900 blocks	$165 each block	$148,500
Apply resin-based epoxy coating to top surface of glass-fiber-reinforced concrete cornices only, all elevations	4,000 linear ft.	$5 per linear ft.	$ 20,000



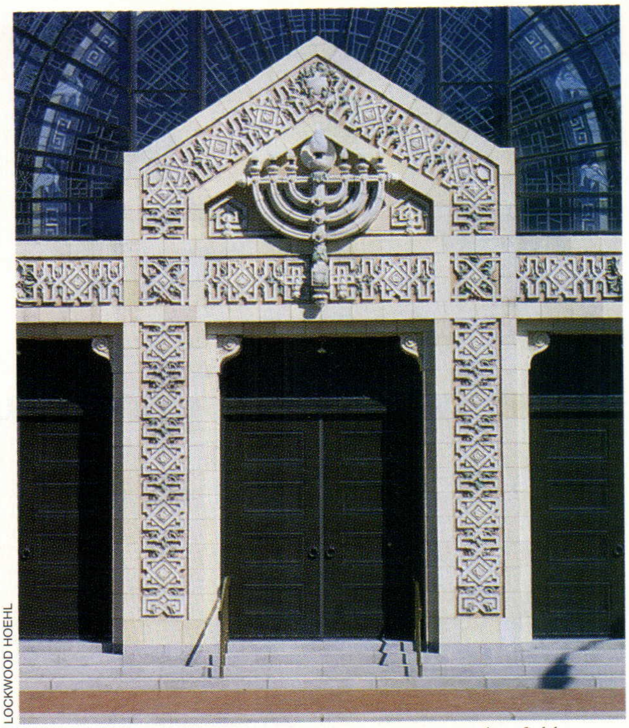
LOCKWOOD HOEHL

DOME: Clay tiles repaired and replaced.



LOCKWOOD HOEHL

EXTERIOR: Repairs included lump-sum estimates.



LOCKWOOD HOEHL

TERRA-COTTA DETAILS: Areas of restoration determined in field.

UNIT DESCRIPTION	ESTIMATED QUANTITY	UNIT PRICE	ESTIMATED COST
Provide power-driven pinning of terra-cotta	100 pins	$73 each pin	$ 7,300
Pin brick	500 pins	$51 each pin	$ 25,500
Remove existing face brick and salvage brick	2,000 sq. ft.	$51 per sq. ft.	$102,000
Provide new face brick, including rebuilding of backup as required, setting, and anchoring	1,000 sq. ft.	$44 per sq. ft.	$ 44,000
Salvage brick, including preparing brick for resetting, rebuilding of backup as required, setting, and anchoring	1,000 sq. ft.	$33 per sq. ft.	$ 33,000
Pump grout masonry	20 cu. ft.	$15 per cu. ft.	$ 300
Patch terra-cotta	50 sq. ft.	$25 per sq. ft.	$ 1,250
Coat terra-cotta patch	50 sq. ft.	$10 per sq. ft.	$ 500
Provide mold for terra-cotta block	10 molds	$2,550 each mold	$ 25,500
Fabricate and install terra-cotta block	20 blocks	$1,000 each block	$ 20,000
Test salvaged brick, per ASTM C67, from 5 different locations on the building	5 locations	$1,350 each location	$ 6,750
Provide galvanized steel support beams, as per AISC standards to match existing, for terra-cotta buttress tops	80 linear ft.	$120 per linear ft.	$ 9,600

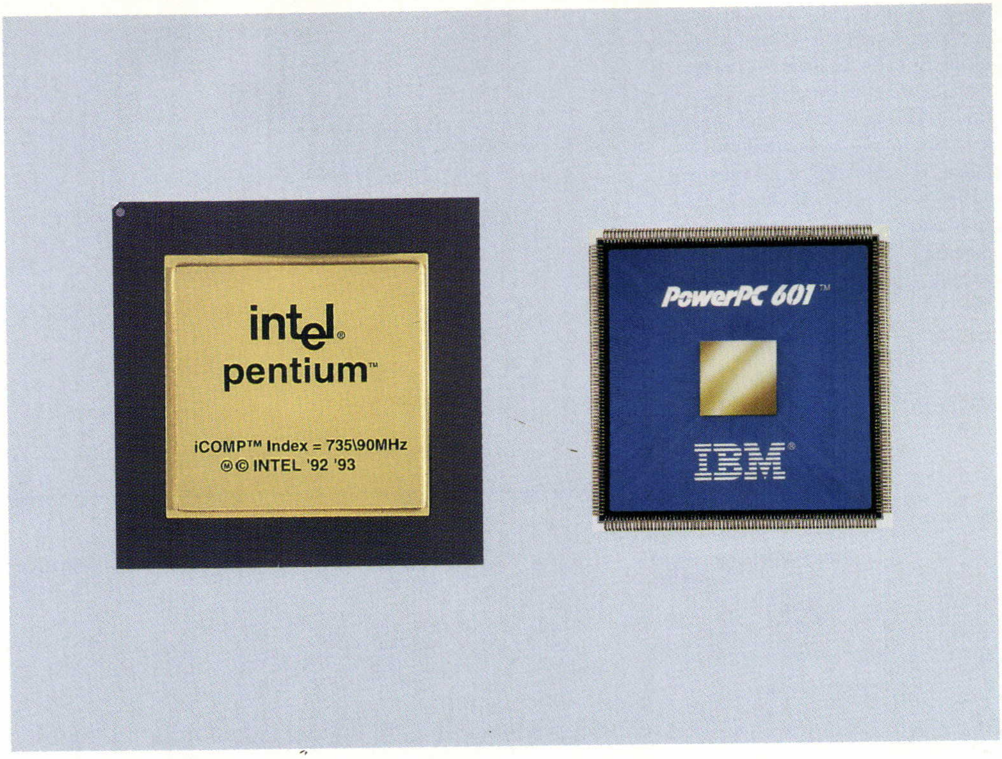
Temple Rodef Shalom
Pittsburgh, Pennsylvania

The Neoclassical form of Temple Rodef Shalom reflects the Ecole-des-Beaux-Arts education of its architect, Henry Hornbostel. The building is constructed of a steel frame supporting local glazed brick and polychromed terra-cotta and is crowned by a Guastavino dome clad in green terra-cotta tile. Over the years, the brick and terra-cotta were subjected to water penetration, air pollution, and harsh cleanings, promoting cracking, spalling, and fading of colored glazes.

Ehrenkrantz & Eckstut restored the exterior and interior finishes on the dome, working with restoration contractor Jendoco Construction Corporation. The exterior work included repairing and replacing face brick, ornamental terra-cotta, and clay roof tile. The amount of repair versus replacement of these items could not be determined at bid time by visual inspection alone.

Our approach to documenting and bidding the synagogue restoration differed from our approach to the Equitable Building. In the Equitable Building, the unit price was based on prototypical areas evaluated in the initial stages of the project and adjusted as more information was gathered during the course of renovation. In the temple restoration, however, more information was known earlier and more could be assumed and identified in the preparation of documents. There was certain base work, such as all cleaning and repointing, that could be bid as a lump sum. Terra-cotta replacement and repair and replacement of bricks in the facade were bid on a unit price basis, including changes that might occur as a result of closer inspection by the architects from scaffolding installed for construction.

The benefits of unit price contracting for Temple Rodef Shalom included the identification of areas that could be adjusted in the field according to the scope of work required. For example, the architects might determine that a certain terra-cotta element should be repaired rather than replaced, or that joints should be saw-cut for repointing instead of simply having loose mortar removed. Unit prices were bid and contracted for all these numerous alternatives so that architects and client could decide just what to do as the work progressed in the field.



New Chips Empower CAD

Microprocessors transform personal computers into graphics workstations.

ABOVE RIGHT: Smaller in size, the PowerPC 601 chip generates less heat and takes up less space in the computer's logic board than does Intel's Pentium.

Any architect who sits in front of a computer screen waiting for a design to render will be delighted by the latest advances in computer technology. Recent developments in the field of microprocessors have led to more powerful desktop computers that allow architects to work faster than they have in the past. But to take advantage of this potential, practitioners must choose between two chips: the Pentium processor from Intel and the PowerPC processor from Apple, IBM, and Motorola. Both chips claim to be leading the revolution, but they represent different approaches.

CISC versus RISC

The Pentium is the older of the two; it was unveiled in March 1993 and is based on Complex Instruction Set Computing (CISC) "architecture," which in this sense means the logic behind a chip's design rather than buildings. For the past decade, almost all personal computers have followed CISC's design. Probably the most famous of these are the 80386 and 80486 chips. The IBM computers that house these Intel chips are usually referred to as 386 and 486 machines, and there are millions of them in circulation. The Pentium represents the next step in the evolution of the CISC chip. In 1991, however, IBM began working with Apple and Motorola on a new type of processor.

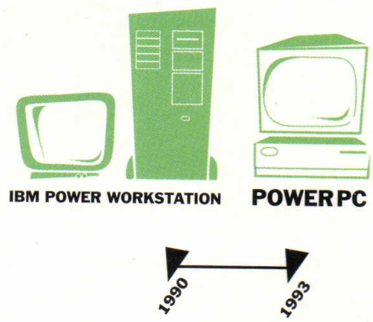
That processor, the PowerPC, is a RISC chip, so named for its Reduced Instruction Set Computing architecture. A reduced instruction set runs faster than a CISC chip's instruction set because there are fewer instructions for the computer to handle. A RISC chip contains only the most frequently used instructions and is designed to execute these simple instructions very quickly. This speed advantage when multiplied by millions of instructions per second is great enough that it outweighs the disadvantages of not having all the instructions of a CISC chip. To make up for the fact that it has fewer instructions, the RISC chip simply implements complex instructions with dozens of small ones—a common technique for all computers. In the past, RISC technology has been largely confined to powerful, more expensive workstations. The PowerPC 601, the first chip being manufactured in the PowerPC series, is the first to bring RISC design to the desktop.

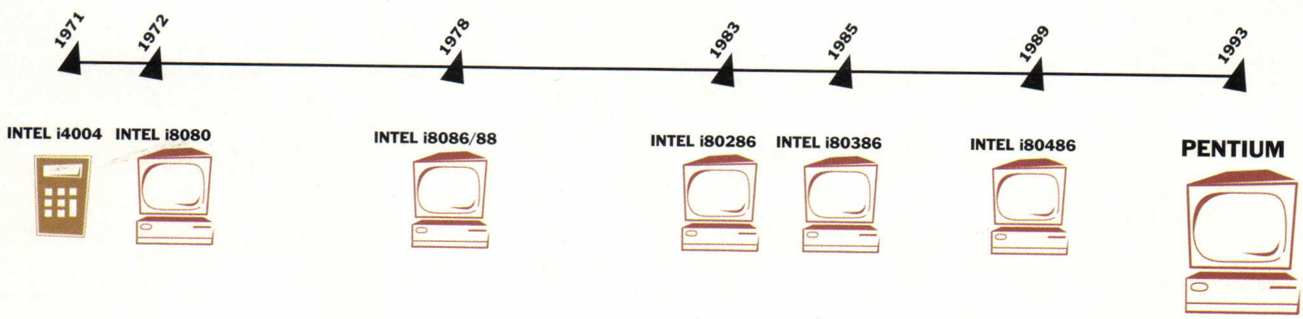
Advantages for architects

Both the Pentium and PowerPC chips are very fast. Terry Beaubois of Terry Beaubois and Associates in Palo Alto, California, finds his PowerPC "blazingly fast," while Robert Clarke of LS3P Architects in Charleston, South Carolina, remarks, "The big advantage of the Pentium is speed." In both cases, applications such as AutoCAD on the Pentium and ArchiCAD on the PowerPC are running two to four times faster than they did on a 486 or on an older Macintosh.

Clarke explains that, until now, "the big problem with CAD has been the speed of the machines." Earlier models were too slow.

BELOW: The Pentium has a long pedigree, stretching back to Intel's early calculator chips. Relying on Complex Instruction Set Computing architecture, it belongs to a family of systems that includes the 386 and 486 computers. The PowerPC is a descendant of IBM workstations, which use Reduced Instruction Set Computing architecture. This technology has only recently migrated to the desktop.





With the Pentium and PowerPC, architects can work on much larger drawings that include a great deal of detail. This is particularly true for renderings and complex models.

The speed of the new processors also blurs the line between personal computers and graphics workstations. In the past, workstations represented the next step up from personal computers, but now, architects can get workstation performance at desktop prices.

This also means that powerful software is migrating from workstations to personal computers. For example, software such as MicroStation ran on Intergraph workstations, and its less powerful versions ran on 486 and Macintosh computers. Now, however, Steve Pesto, senior manager of Intergraph's Advanced Graphics Systems Design, notes, "The Pentium has allowed us to move the more powerful MicroStation functions from graphics workstations to personal computers." Some large firms even think these chips may indicate that it's time to abandon their workstation approach. Tony Rinella, director of computer services of Anshen+Allen in San Francisco, explains, "Our firm is exploring the Pentium CADstation as an alternative to our UNIX workstations."

The new chips not only point toward greater sophistication in 3D modeling and rendering, but they also allow architects to branch out into other areas. Notes Beaubois, "The architect has an opportunity to evolve into a multimedia professional. With the Power Mac, we can design in three dimensions on the computer with the client sitting beside us. We can do in-house videos, including voice-overs and music." Beaubois feels that multimedia offers architects the chance to become more involved at the building site. For example, he takes to each job a small QuickTake 100 Digital Camera that allows him to download site photos into his computer. He then employs applications such as PhotoShop to make design changes so that he can clearly and quickly communicate his ideas to the client and the contractor.

Pentium versus PowerPC

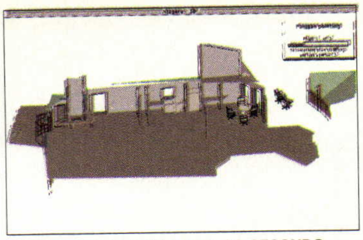
One of the major reasons both chips are faster is because of their increased "clock speed" over older models. The "clock" sends electronic pulses through the computer, and this, in turn, controls the firing of its circuits. The higher the clock speed, the faster the computer can execute instructions. The first Pentiums had a clock speed of 60 megahertz (MHz). In other words, there were 60 million pulses per second. Now Intel also offers models that run at 66, 90, and 100 MHz.

Similarly, there are three models of the PowerPC 601 processor, running at 60, 66, and 80 MHz. Thus, Apple offers three Power Macintoshes—the 6100/60, the 7100/66, and the 8100/80—where the second number indicates clock speed. There's really no such thing as the definitive Pentium computer or PowerPC computer since both chips come in a number of different clock speeds. Clock speed, however, only controls the speed of the chip itself. Somehow the chip has to communicate these instructions to the rest of the computer. Most importantly, the chip has to transfer information back and forth between itself and its internal hard drive.

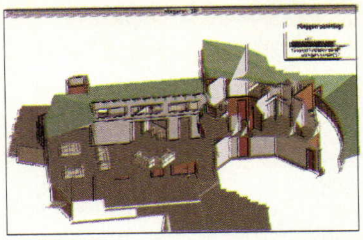
The fastest machine that Apple is offering, the Power Macintosh 8100/80, can transfer data at a rate of 10 megabytes per second (MB/sec). This is roughly the equivalent of transferring 5,000 pages of double-spaced type every second. The top-of-the-line personal computer marketed by Intergraph, the TD-5, which uses a Pentium chip, only achieves an internal transfer rate of 5.0 MB/sec, or about 2,500 pages per second.

But these facts don't tell the whole story. Computers are built around graphics accelerators, different types of memory, and bus structures—the technology that transfers information between the microprocessor and its display devices. All of these elements affect the speed of a computer.

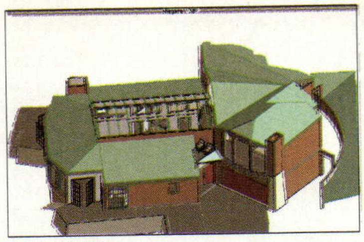
While allegiance to Intel or Macintosh computers is still an issue, the truth is that comparable software exists on both for doing all the things that architects do. But it's not just single applications that make the Pentium and PowerPC processors attractive. Anshen+Allen's Rinella, for example, would like to "put a machine on every architect's desk—a machine that will do everything." Rather than a single, phenomenal application, architects are looking for the Pentium and PowerPC to be multipurpose machines that can handle simple business functions,



POWER MACINTOSH 6100: 20 SECONDS

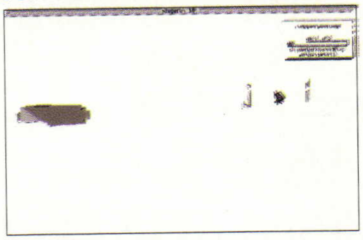


40 SECONDS

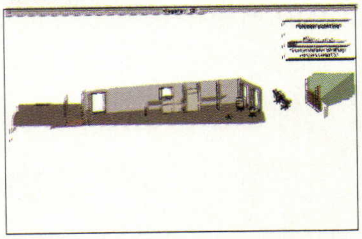


60 SECONDS

LEFT AND BELOW: A Power Macintosh 6100 running ArchiCAD software from Graphisoft takes 60 seconds to rebuild a three-dimensional view of a house (top row). On a Quadra 700, the same image takes 160 seconds to reconstruct (second and third rows). Similar increases in speed can be expected when comparing a Pentium to a 486.



QUADRA 700: 20 SECONDS



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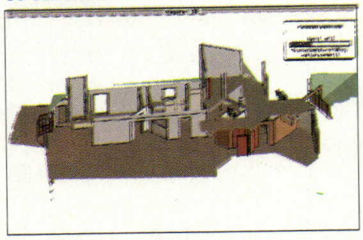

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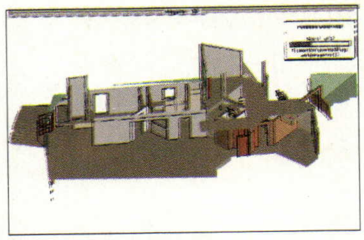

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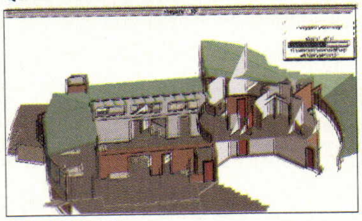

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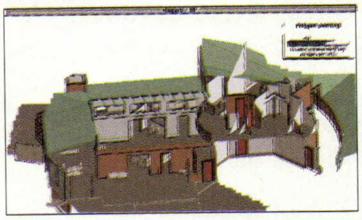

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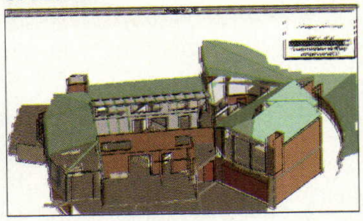
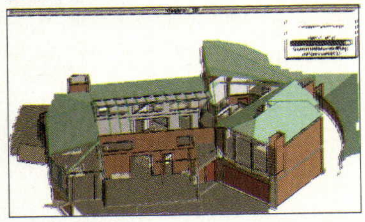


140 SECONDS



160 SECONDS

such as spreadsheets, as well as CAD. While speed is the most noticeable characteristic of these chips, there are other criteria for comparison as well. For example, a fast computer is of little use if it won't run at all. It is always smart to be cautious of a new computer design—it will have bugs and flaws. Both Robert Clarke and Tony Rinella reported that the Pentium has a higher rate of failure than a 486. Rinella's problem turned out to be software-based, but others have attributed this to the overheating of the 60 MHz model. Intergraph's Pesto states categorically that this is no longer a problem and does not affect the newer, faster models.

Software constraints

Running software, however, is what hardware is all about, and here the new chips impose important constraints. The Pentium, because it uses the same architecture as the 80386 and 80486, will run the same software. This means substantial savings because costly software upgrades don't need to be purchased by Pentium users. AutoCAD Release 12 will run faster on this new chip.

Apple computers used to be based on the Motorola 68000 chip design. The PowerPC is not. Apple has tried to ensure that most of the software from its older machines will run on the PowerPC as well, but there are caveats. First, when a PowerPC runs a piece of older software, it may actually run slower than on another Macintosh because the PowerPC is forced to emulate or copy the way the older chips behave. Second, many pieces of CAD software won't run at all on the PowerPC. This is because those packages make heavy use of what's called the Floating Point Unit—a chip or part of a chip for performing mathematical calculations—in the older machines. The new design of the PowerPC doesn't use this same structure, and hence, some CAD packages just won't run.

To really exploit the potential of the PowerPC, users must wait for what are called native versions of the software. These are optimized for the PowerPC, and many developers are claiming that their software will run two to four times faster in native mode. ArchiCAD, form•Z, and PhotoShop are already made in native mode, but AutoCAD is not, and Autodesk has not announced when a native version will be available.

While both the Pentium and the PowerPC are new, fast microprocessors, they do represent different approaches to manufacturing computers. At the moment, only three computers use the PowerPC processor, and all of them are made by Apple. But according to Carleen Levasseur of Intel, "There are more than 200 companies putting the Pentium into 500 different types of models of computers." Respected companies such as Dell, Intergraph, Compaq, DEC, Hewlett-Packard, and even IBM all make machines with the Pentium inside, but they all make them differently. The only item they really share is the chip itself. In purchasing one of these machines you really need to do your homework.

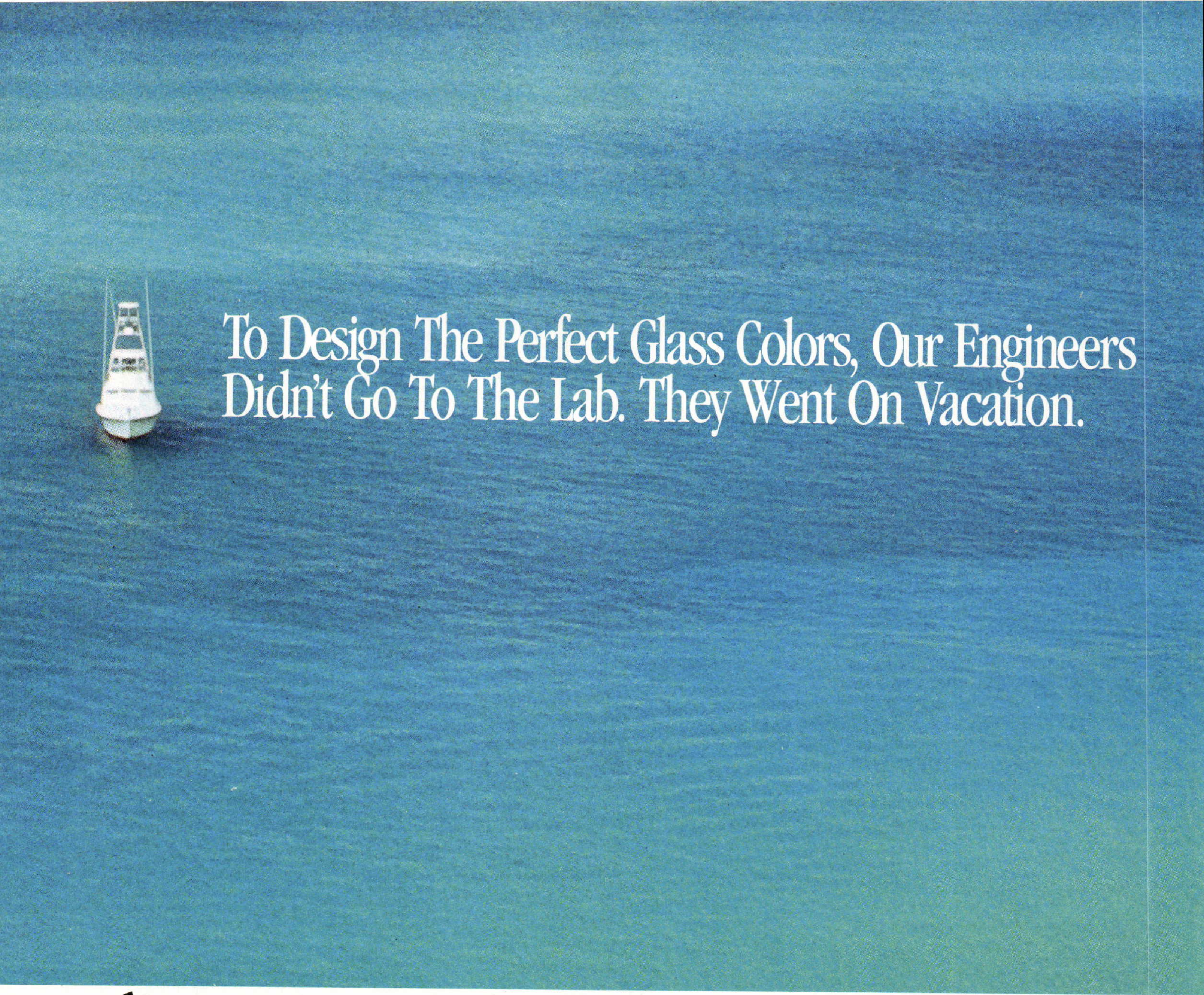
When it comes to upgrading older systems, you should increase your Random Access Memory (RAM) to 16 megabytes (MB) and preferably to 32 MB with either chip. A large amount of short-term memory in the form of RAM is required to run graphics applications. Also remember that more sophisticated graphics software takes up more memory and creates larger files, so make sure the hard drive is at least 1 gigabyte (GB) in size. For rendering applications, the 80 MHz chips in the PowerPC line and the 90 or 100 MHz Pentium versions are strongly recommended.

New chips in old computers

In both cases, however, there are a number of options for taking advantage of the new chips without buying a new computer, but it's not as easy as just plugging in a new chip. In fact, you'll probably need to purchase a new motherboard—the main board to which the processor is attached—for your computer. Nonetheless, Apple offers upgrade packages for different models, including some from the Macintosh II series, which will give your machine the power and speed of a PowerPC for a fraction of the cost.

Upgrading from a 486 to a Pentium can be confusing. Many vendors recommend that you buy a new computer. Others note that 486 computers that are advertised as "Pentium-ready" do not attain the speed of a real Pentium machine when Pentium chips are plugged in since they work with a bus

continued on page 149



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Circle 120 on information card

structure designed for the 486, which will slow down the performance of the new chip.

In the long run, the PowerPC does have two distinct advantages. First, its RISC architecture has great potential for growth. Future chips will be faster and faster. In contrast, the Pentium is starting to push against the upper limits for CISC computing. Faster clock speed will mean faster computers, but these increases will be incremental because CISC has, to a great extent, already maximized its possibilities. RISC, however, does hold the potential for still further increases in speed as chip designers learn how to exploit its possibilities. Second, while both the Pentium and the PowerPC are 32-bit chips (this means they deal with information in 32-bit chunks), Macintosh applications are more likely to be written to take advantage of this fact.

Operating systems

The critical factor here is the operating system. Older operating systems for the Intel world such as Windows or DOS are 16-bit systems. Newer systems such as WindowsNT and OS/2 are 32-bit systems, but these have nowhere near the popularity of the older two. This means that most software the Pentium can run is not optimized to take advantage of its larger bit size. All Apple software, on the other hand, is 32 bit. Operating systems are of such importance that many industry analysts feel that the ultimate success or failure of these new chips will really depend on which operating systems they support. Architects should also know that there are products such as SoftWindows by Insignia Solutions that will allow you to run Windows software on the PowerPC, but like a PowerPC in emulation mode, you will see a noticeable decrease in speed relative to the softwares' performance under Windows.

In addition to their newfound speed, the Apple products are now priced far lower than in the past. Nonetheless, their top-of-the-line machine, the 8100/80 will still cost at least $1,000 more than a comparable Pentium system. For either system, architects can expect to spend between $4,000 and $5,000.

Are they worth it? And should you upgrade? LS3P's Clarke advises, "It's not worth investing in a hardware change unless you can double the speed at which you're processing. A 20 to 30 percent increase just isn't noticeable." These new chips do offer twice the speed of their older versions. Beaubois asserts, "It's definitely time to consider an upgrade," but he adds that architects must carefully ensure that the software they are using will run on these new microprocessors. Manufacturers continue to progress. Intel is currently working on a 150 MHz Pentium chip. Some companies, such as Intergraph, are beginning to offer computers with two Pentium chips in one chassis. This makes software run faster by sharing the computational tasks between a number of chips.

Meanwhile, the Apple, IBM, and Motorola consortium has already announced 603, 604, and 620 versions of the PowerPC. The 620 is the chip to watch, since it is supposed to have all the power of a graphics workstation; it should be available a year from now. IBM, too, will soon be offering computers with the PowerPC inside. According to IBM's Jawlick, its laptop portables and massively parallel supercomputers, based on the PowerPC chip architecture, should be on the market late this year. However, IBM recently announced that it would delay the introduction of its PowerPC personal computer because there was not enough software yet available.

Computer culture

A microprocessor is just one piece in an array of boards, chips, and peripherals that make up today's personal computers. Architects don't actually buy a microprocessor so much as they buy into a computer culture. Purchasing hardware should ultimately depend on an in-depth analysis of a firm's application needs, current computers, software, budget, and even what kind of computers a firm's consultants are using.

It is safe to say, however, that the Pentium and the PowerPC are fast and affordable. They both offer better rendering, better modeling, and the real promise of complex 3D models and sophisticated renderings at an affordable price. What is not clear, however, is how these quantitative increases in speed will translate into qualitative changes in the practice of architecture. Designing in 3D and creating intricate models of a building, rather than drawing a series of orthographic projections, are two very different techniques. Three-dimensional computer models may allow the computer to automatically generate all the plans, sections, and elevations that architects previously created manually. While these new chips are still a long way from offering the capability of automatic drawing, they are clearly pointing architects in that direction.—*Douglas MacLeod*

Douglas MacLeod, a registered architect, is the Director of the Computer Applications and Research Program of The Banff Centre for the Arts.

New S-500 Setting and Grouting Epoxy.

S-500 offers a wide range of time saving, long lasting advantages over traditional epoxies.

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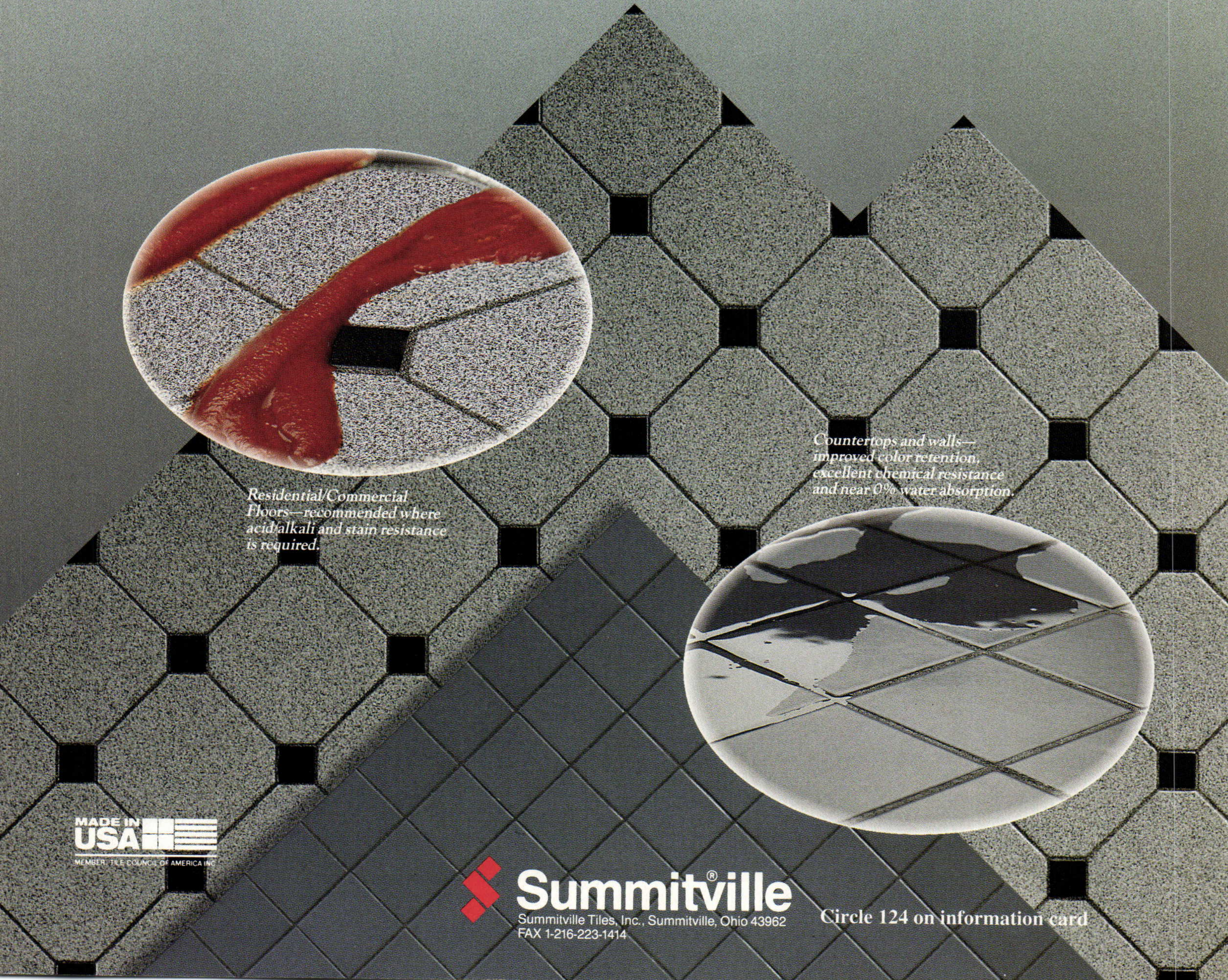
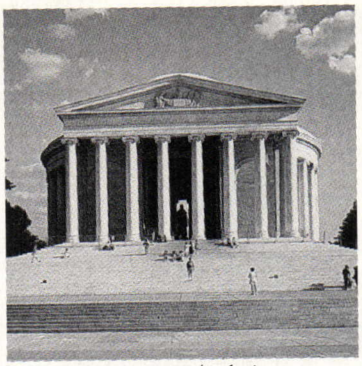


Two Classical monuments in Washington, D.C., undergo first-time restoration.

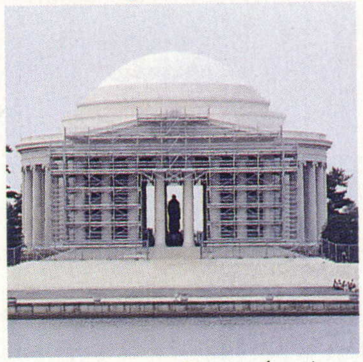
Memorials Pose Preservation Challenges


HABS

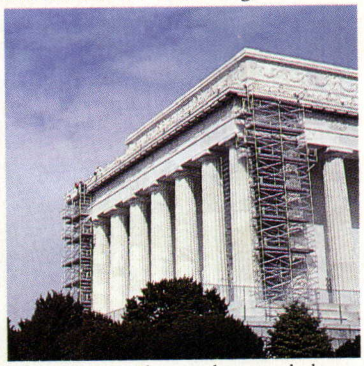
JEFFERSON: Pope's 1941 design.


HABS

LINCOLN: Bacon's 1922 design.

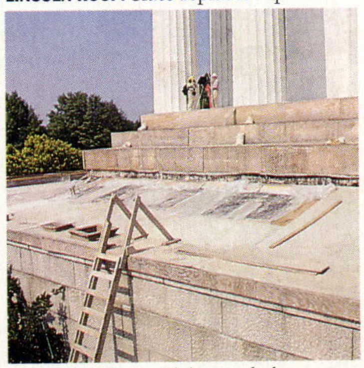


JEFFERSON PORTICO: Structural testing.



LINCOLN ROOF: Slate replaces asphalt.

VOLUTE: Threatened by vibrations.


NPS, EXCEPT AS NOTED

LINCOLN TERRACE: Slab resealed.

When part of a marble volute at the Jefferson Memorial fell 42 feet to the ground in 1990, efforts to preserve the landmark were promptly accelerated. Today, the restoration of the Jefferson Memorial, designed by John Russell Pope and completed in 1943, continues alongside preservation of the Lincoln Memorial, designed by Henry Bacon and completed in 1922. Architects from the Washington, D.C., firms Einhorn Yaffee Prescott and Hartman-Cox are collaborating with specialists to conserve bronze, marble, and murals. They are also consulting with ornithologists, entomologists, landscape architects, and engineers to devise new endurance strategies for the memorials. Consultants to the 10-year project are led by the National Park Service's Denver Service Center, which manages 70 contracts on the pair of memorials.

Neither of the Classical monuments has undergone restoration since each was repaired shortly after construction to correct siting problems on landfill adjacent to the Potomac. Both memorials are fundamentally sound, but architects are monitoring the magnitude and direction of structural movement. At the Jefferson Memorial, consultants suspect that the columns' thin volute carvings are vulnerable to the vibrations of aircraft, trains, and cars.

Structural testing of the memorials through nondestructive technologies includes impact-echo, sonic and ultrasonic pulse velocity, spectral surface analysis, and resonance imaging to determine the stability of stone elements and statuary. Staff architects of the Historic American Buildings Survey (HABS), an arm of the National Park Service, manually surveyed, photographed, and measured both memorials with the aid of a photogrammetric camera, which calibrates images to 10 decimal points. PhotoCAD software and a digitizing table enabled the team of architects to trace the photographs and correct any distortions to produce drawings of accurate dimensions. This is the first time that as-built drawings of these historic monuments have been produced on CAD.

The architects' research is being cataloged in a database detailing the age, condition, and geologic history of each stone in the structures. Historic data will be cross-referenced with new information gathered by environmental sensors, which will be installed to detect heat, humidity, and vibration levels influencing the condition of the memorials.

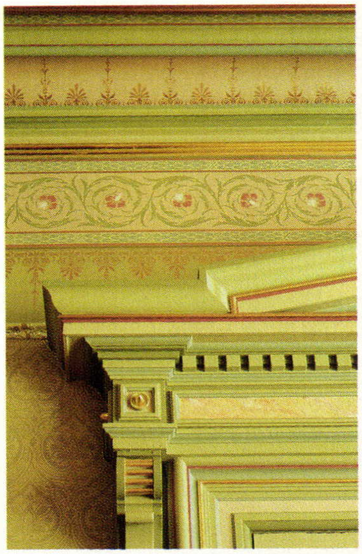
Thus far, preservation repairs are concentrated on water infiltration problems. In resealing the Lincoln Memorial, contractors are replacing asphalt paving on the roof with historically accurate slate pavers, repointing stones on the upper part of the elevation, and waterproofing the slab beneath the grassy, raised terrace. Water-related repairs at the Jefferson Memorial range from installing drains and replacing the roof to repointing the low wall surrounding the central structure.

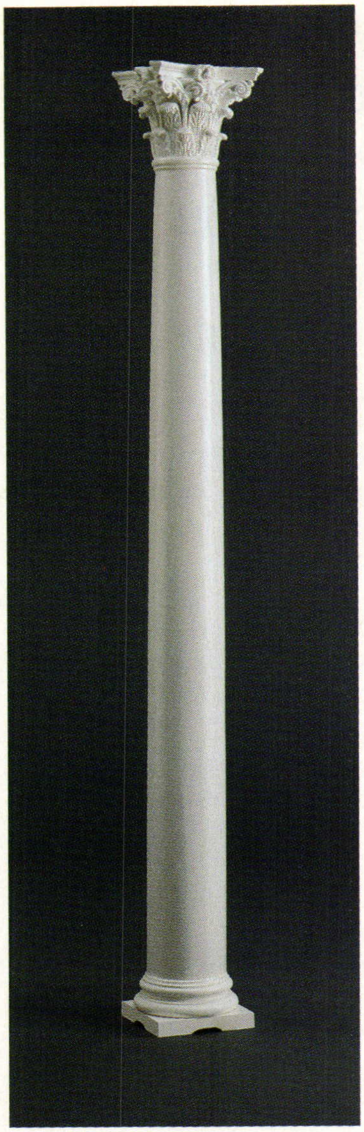
Currently, three-dimensional modeling of lighting patterns is under way at the Lincoln Memorial to enhance its illumination at night. Consulting entomologists are testing various wavelengths of light in the laboratory to see whether timed illumination can reduce the swarms of midges that continually deface the memorial's marble surfaces. Additionally, conservators are collecting current data on the historic Guerin murals inside the Lincoln. Their aim is to rectify damage to the delicate artworks from condensation on unheated stone surfaces. One potential solution calls for a radiant heating system that would gradually warm the objects in response to changes in temperature and humidity detected by affixed sensors.

The architects are bringing both the Lincoln and Jefferson memorials into ADA compliance while restoring exhibition spaces and restrooms. The demands of the project favor standard materials and methods, notes Hartman-Cox architect Mary Kay Lanzilotta: "These buildings are not the place to try unproven technologies."—*Carrie Fischer Alexander*

Products

Replications of historic details and materials preserve the grandeur of centuries past.





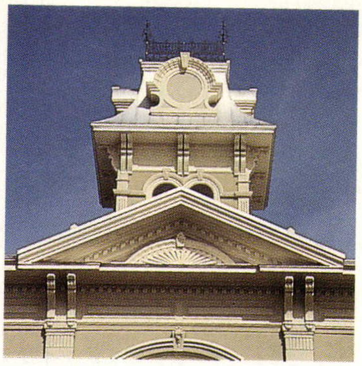
TOP: Bradbury & Bradbury Art Wallpapers creates historically accurate wallpaper and border designs, culled from the Victorian and Arts and Crafts periods between 1860 and 1918. Over 100 patterns are available in multiple colors. The wallpapers are hand silk-screened using oil-based inks and sold in 27-inch-wide rolls; borders are sold by the yard. The company also offers designs for ornamental ceilings.
Circle 401 on information card.

ABOVE: The antiquities program of Ann Sacks Tile & Stone features reclaimed limestone and terra-cotta from Israel, France, Italy, and Indonesia. Without disturbing historical or culturally significant buildings, the Portland, Oregon-based distributor salvages stone and tile from abandoned, renovated, or unsafe structures. Pavimenti Toscani with Antique Terra-Cotta (shown) combines squares of reclaimed terra-cotta with triangles of new tumbled marble, finished to appear antique.
Circle 402 on information card.

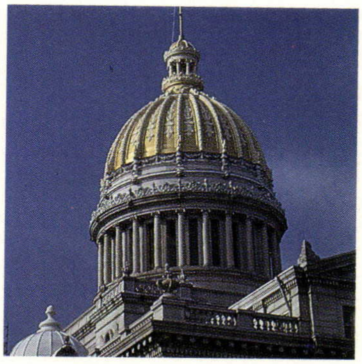
ABOVE: Architectural columns from NT Hartmann Sanders replicate the Classical orders of architecture in their proportion, shape, and detail. Styles include Greek and Roman Doric and Ionic, Corinthian (shown), Tuscan, and Erechtheum. The columns feature lock-joint construction and are available in redwood, pine, poplar, and mahogany. Columns range from 6 inches to 36 inches in diameter and up to 38 feet in length and may be specified with or without fluted shafts.
Circle 403 on information card.

TOP RIGHT: The archives of an English mill founded in the 18th century inspired the Stourvale Mill collection of woven carpets. Distributed by J.R. Burrows & Company, historical design merchants based in Rockland, Massachusetts, the carpets recall late 19th- and early 20th-century textile patterns. The design of the Anglo-Japanese carpet (shown) dates from 1877 and is available in a Brussels weave (needlepoint) or velvet pile. Composed of 80 percent worsted wool and 20 percent nylon, the 27-inch-wide carpet is purported to withstand heavy foot traffic in residential settings. Historian and designer John Burrows also offers Victorian curtains and Arts and Crafts wallpaper through his company.
Circle 404 on information card.

ABOVE: Hardwood flooring from Historic Floors of Oshkosh is based on designs found in late 19th- and early 20th-century American houses. The $^5/_{16}$-inch-thick, laser-cut flooring is manufactured with an adhesive strip for simple application, or mounted on $^1/_2$-inch plywood. Two new patterns, Grapevine (shown), and Rose and Vine are appropriate for both residential and commercial applications. The 6-inch grapevine border and corner pieces are available with a maple or red oak background; purple heart and bubinga combine to create the grapes; Brazilian cherry shapes the stems; and natural green poplar defines the leaves.
Circle 405 on information card.

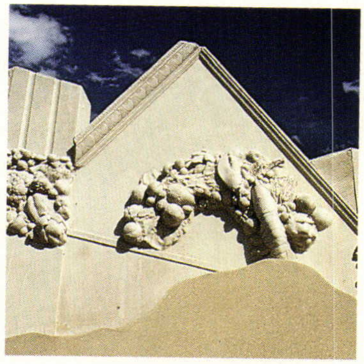


Metal roof restoration
Carlisle Engineered Metals manufactures metal roofing and building components. The company's TR Series and 24-gauge AP Panels were incorporated into the restoration of the 1886 Columbia County Courthouse in Dayton, Washington (above). These galvalume finish aluminum panels with standing-seam connections replicate the original detailing of the courthouse's tin roof. *Circle 406 on information card.*



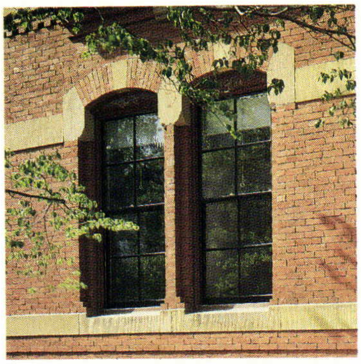
Cast aluminum dome
A new aluminum dome fabricated by Historical Arts & Casting replaced the original terra-cotta dome of the Westmoreland County Courthouse in Greensburg, Pennsylvania (above). To replicate the original forms and detailing, the Utah-based company created molds from existing pieces; cast aluminum panels; and then treated the new dome with Kynar 500 resin, a floor polymer. Historical Arts & Casting has also restored lighting in the Los Angeles Central Library and a cast iron bridge in New York's Central Park. *Circle 407 on information card.*

Laser cleaning
Quelin, a French company that specializes in historic restoration, and BM Industries, a French manufacturer of laser equipment, have developed Artlight, a laser process for cleaning monuments. Artlight cleans stone surfaces by training infrared light from a laser beam onto the masonry. The light is absorbed by the grime, and the reaction loosens the layers covering the stone. Artlight is purported to clean damaged or soft stone gently and eliminate stains without modifying the material's surface. The system consists of a mobile unit containing electronic and laser equipment and an adjustable arm, which enables an operator to obtain a high degree of precision. *Circle 408 on information card.*



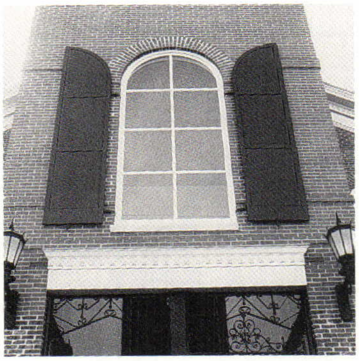
Concrete form liners
Scott System manufactures reusable custom form liners for large-scale concrete construction. The Denver company fabricates an elastomeric urethane mold, as in designer Carolyn Braaksma's project for the Broadway Marketplace in Denver (above), or, the company inserts a sheet metal cutout into a form liner for smooth surface installations. *Circle 409 on information card.*

Roof preservation
Acrymax restores and preserves commercial and residential roofs (above). Manufactured by Chemical Coatings & Engineering Company, the company's reinforced membrane adheres to an existing base roof. Acrymax elastomeric coatings remain flexible in low temperatures, thereby accommodating a roof's expansion and contraction. *Circle 410 on information card.*



Window reproductions

Architectural Components reproduces 18th- and 19th-century windows, doors, and moldings. The company's newest line of divided windows (above) features thin muntins and narrow profiles. Individual panes of hand-blown restoration glass, double-sealed insulated glass, or low-E glass are available with frames of kiln-dried eastern white pine or mahogany woods.
Circle 411 on information card.



Historic shutters

Historic Shutter & Restoration (HS&R) of Key West, Florida, combines historical accuracy with environmentally conscious design in interior and exterior shutters (above) and blinds. Using recycled heart cypress salvaged from demolished buildings, the company offers custom-designed sets and restores old window treatments. Its restoration services include disassembly of frames and removal of hardware. Components are then squared, sanded, and reassembled with original materials and replacement slats, rods, and pegs as necessary. HS&R's shutters feature mortise and tenon joinery, wood pegs, and brass hardware.
Circle 412 on information card.

Masonry cleaning

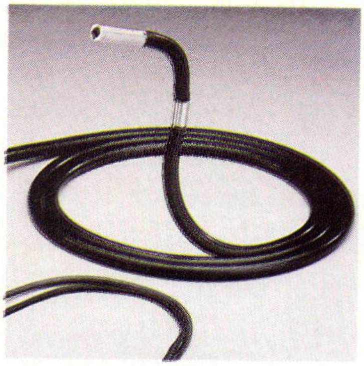
ProSoCo manufactures a line of masonry cleaning, restoration, and waterproofing products. Its Sure Klean restoration cleaners are formulated to remove heavy accumulations of dirt, carbon, algae, and oxidation typically found on old masonry surfaces. One of the newest products added to Sure Klean's weather seal line is Blok Guard, formulated to protect porous concrete block and other hard-to-seal masonry surfaces. Weather-resistant and UV-stable, Blok Guard products protect masonry against damage and staining caused by water infiltration.
Circle 413 on information card.

Metal ceilings

W.F. Norman Corporation's Hi-Art line of metal ceilings (above) reproduces more than 60 designs. Standard panels are constructed of 30-gauge matte-finished tin plate, which may be left natural with a coat of polyurethane or painted any color. Components include borders, moldings, center medallions, cornices, and wainscoting.
Circle 414 on information card.

Mural restoration

Conrad Schmitt Studios restores ornamental plaster and cleans and repairs murals, mosaics, glass, sculptures, and furnishings. Since 1889, the studios' artisans and craftspersons have worked with architects in restoring churches, banks, railway stations, and theaters, including Boston's Wang Center for the Performing Arts (above).
Circle 415 on information card.

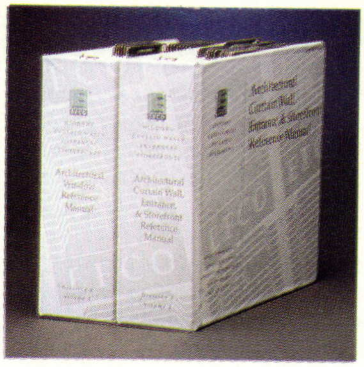


Flexible camera

Based in Annapolis, Maryland, Eckert Optical Instruments provides video inspection services for historic restoration projects nationwide. Eckert's newest camera is a lightweight, compact videoscope from Instrument Technology (above). Measuring just over $^{1}/_{2}$ inch in diameter and up to 15 feet in length, Instrument Technology's 162000 series videoscope is capable of providing high-resolution images of unreachable areas under floorboards, behind walls, or inside mechanical systems with minimal disturbance to a building's historic fabric. Internal fiber optic bundles transfer light from an external source through the length of the videoscope to illuminate the concealed area. Features include remote focus control and an optional right-angle viewing adapter that enables 90 degree side views. The videoscope is constructed of stainless steel monocoil with a moisture-sealed PVC protective covering.
Circle 416 on information card.

Terra-cotta tiles

Hastings Tile & Il Bagno Collection of Freeport, New York, offer handmade terra-cotta tile from Spain. Stock sizes include 12-inch-square and 16-inch-square field tiles and two types of geometric borders, mesh-mounted for easy installation. A number of accent shapes are also available, including an octagonal field tile and star-shaped and triangular inserts. Varying color tones and hand-formed edges are intended to create a hand-crafted look.
Circle 417 on information card.



Glazing system catalog

Monett, Missouri-based EFCO Corporation has released a new user-friendly reference manual (above) for architects and designers. The two-volume set includes general product overviews, detail charts, and specifications for each of the company's high-performance aluminum windows, curtain wall systems, and entrance and storefront framing products. EFCO Corporation has manufactured custom-designed glazing systems for nearly 40 years.
Circle 418 on information card.

Bird control

The familiar "porcupine wire" stainless steel needle strips often seen mounted on cornices and window sills effectively repel birds and deter human intruders; manufactured by Nixalite of America, they are also approved for historic buildings.
Circle 419 on information card.

Wood restoration

Abatron has released a new catalog illustrating its complete line of restoration and maintenance products. The Gilberts, Illinois-based company manufactures products for wood, masonry, and metal projects. The company's wood restoration system includes LiquidWood, a blend of resin plus hardener that restores structural integrity to wood fibers; and WoodEpox, a lightweight epoxy adhesive that fills cracks, holes, and voids. Cold-weather hardeners are available for use with both products. Adhesives, protective coatings, and mold-making and casting compounds are also available.
Circle 420 on information card.

Metal tile

The look of Spanish mission-style tiles can be achieved with Met-Tile's lightweight, fire- and weather-resistant metal panel roofing system. Colors include white, brown, red, gray, blue, and green. The Ontario, California-based company's tile panels can be assembled directly over existing roofs or attached to built-up roof decks, open steel purlins, or wood rafters. Steel panels are applied vertically in one piece from ridge to eave and anchored with screw fasteners. Available in 36-inch-wide sections, each panel contains six $1\frac{1}{2}$-inch-high corrugations that resemble the arc of Spanish tile. Vertical lengths vary from 2 to 20 feet.
Circle 421 on information card.

Structural coating

Sealtight Onatex textured structural coating from W.R. Meadows is designed to decorate and weatherproof concrete, masonry, stucco, and plywood surfaces. Appropriate for both interior and exterior applications, Onatex bonds to finished surfaces and remains slightly flexible to accommodate movement of the substrate. This weather-resistant product is available in white or gray, and it is sold in 5- or 55-gallon containers.
Circle 422 on information card.

Concrete steps

Bomanite Corporation has designed three distinctive patterns for concrete risers in interior and exterior stairs. The patterns are inspired by the texture of natural stone: Cliff-rock resembles jagged rocks and measures up to 2 inches in relief; River-rock is composed of oval-shaped rocks averaging 6 inches in diameter and up to 1 inch in relief; and Chipped-granite is patterned after quarried granite. The risers are designed to coordinate with the company's concrete paving systems; they can be colored by applying the company's chemical stains.
Circle 423 on information card.

Cast marble tiles

Two tile systems from PermaGrain Products encourage architects to design custom floor patterns. The Media, Pennsylvania-based company's Permétage Portfolio of cast marble tiles consists of 18 colors and five standard-size squares. Created by combining crushed marble with a polymer resin, the tiles eliminate surface pores and fissures typical of quarried marble and reduce absorption-related problems. The Perma-Grain Series acrylic-impregnated solid hardwood tiles resist abrasion and are ADA-compliant. Available in three species and 18 colors, the hardwood tiles may be combined to create custom applications.
Circle 424 on information card.

Storm windows

Allied Window of Cincinnati, Ohio, manufactures storm windows for historic restoration and renovation projects. Narrow trim lines and custom colors and shapes allow the windows to blend unobtrusively with their surroundings. The company's new Monumental Magnetic One Lite is designed specifically for large interior storm-window applications. Magnetic fasteners maintain a tight seal while allowing easy removal for cleaning. An aluminum frame accommodates glass or acrylic panels up to $\frac{3}{16}$ of an inch thick and as large as 64 by 92 inches. Allied's windows have been approved for interior installation on historic renovation projects certified by the U.S. Department of the Interior.
Circle 425 on information card.

Textured paint

California Products Corporation, based in Cambridge, Massachusetts, has introduced Aquafleck, a water-based multicolor wallcovering for interior walls. Appropriate for a variety of surfaces including drywall, plaster, brick, concrete block, and metal, Aquafleck adds color and depth by blending an acrylic basecoat with a finish coat that contains fragments of color. The basecoat may be applied by brush, roller, or spray; the finish coat is applied with spray equipment in order to evenly distribute the specks of color.
Circle 426 on information card.

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U.S. Postal Service

STATEMENT OF OWNERSHIP, MANAGEMENT AND CIRCULATION

(Required by 39 U.S.C. 3685)

1. Publication Title	2. Publication No.	3. Filing Date
Architecture, Incorporating Architectural Technology	0 0 9 – 8 8 0	Oct. 1, 1994

4. Issue Frequency	5. No. of Issues Published Annually	6. Annual Subscription Price
Monthly	12	$42.00

7. Complete Mailing Address of Known Office of Publication *(Street, City, County, State and ZIP + 4) (Not printer)*
1515 Broadway, New York, NY 10036

8. Complete Mailing Address of Headquarters or General Business Offices of Publisher *(Not Printer)*
994 Old Eagle School Rd., Ste. 1010, Wayne, PA 19087

9. Full Names and Complete Mailing Addresses of Publisher, Editor, and Managing Editor ***(Do Not Leave Blank)***

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Architecture	September 1994

15. Extent and Nature of Circulation	Average No. Copies Each Issue During Preceding 12 Months	Actual No. Copies of Single Issue Published Nearest to Filing Date
a. Total No. Copies *(Net Press Run)*	72,773	72,642
b. Paid and/or Requested Circulation (1) Sales Through Dealers and Carriers, Street Vendors, and Counter Sales *(Not Mailed)*	608	931
(2) Paid or Requested Mail Subscriptions *(Include Advertisers' Proof Copies/Exchange Copies)*	67,529	66,694
c. Total Paid and/or Requested Circulation *(Sum of 15b(1) and 15b(2))*	68,137	67,625
d. Free Distribution by Mail *(Samples, Complimentary, and Other Free)*	2,641	2,786
e. Free Distribution Outside the Mail *(Carriers or Other Means)*	264	437
f. Total Free Distribution *(Sum of 15d and 15e)*	2,905	3,223
g. Total Distribution *(Sum of 15c and 15f)*	71,042	70,848
h. Copies Not Distributed (1) Office Use, Leftovers, Spoiled	1,731	1,794
(2) Return from News Agents	0	0
i. Total *(Sum of 15g, 15h(1), and 15h(2))*	72,773	72,642
Percent Paid and/or Requested Circulation *(15c/15g × 100)*	95.91%	95.45%

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Copper Flashing

CSI Section 07620

Rebuilding gable ends

In renovating Harvard University's Weld Hall, a dormitory designed by the Boston-based firm of Ware and Van Brunt and built in 1870, we found the masonry gable ends to be one of the more deteriorated areas of the exterior facade. Brick was displaced and bulging from water that had penetrated coping stone joints along the top and brick joints at the back face. And zinc step flashing at the juncture of the slate roof and gable had deteriorated.

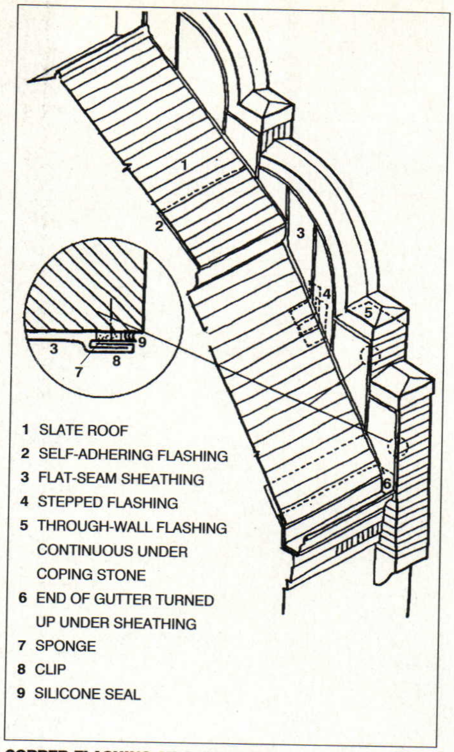
As a result, four of the eight gable ends required complete rebuilding. We developed a comprehensive copper flashing system to protect the gables from water penetration through horizontal and vertical joints. Through-wall flashing was installed under the stone coping and folded into vertical flat-seam copper sheathing, which covered the entire back side of the masonry gable. This copper sheathing was secured to the wall with cleats to allow for expansion and contraction. Conventional stepped flashing was placed behind the sheathing and interwoven into the adjacent slate.

The stepped, curved stone coping of the gable ends presented a real challenge, especially because it is difficult to provide a clean, watertight flashing termination at exposed masonry corners. This condition was particularly complicated at the juncture of the gable end, gutter, and slate roof edge.

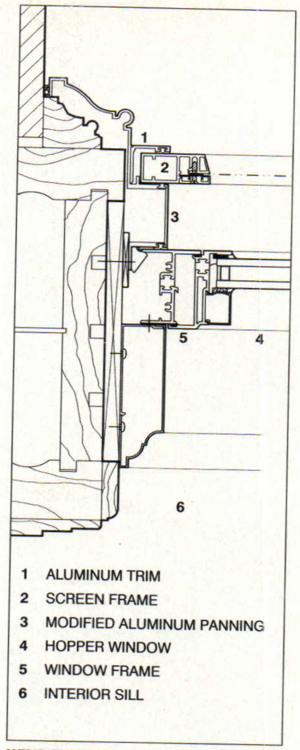
In a typical brick parapet, where the masonry wall continues around the building, a reglet system is cut into the brick to terminate vertical copper sheathing. This is not possible, however, at an exterior masonry corner, because one cannot cut so close to the end of a brick without destroying the unit.

In order for the sheathing termination to be sealed tightly to the wall, but to allow it to move independently of the masonry, a continuous vertical copper clip was secured to the masonry wall.

The copper sheathing was then folded into the clip. To ensure that the irregularities between the masonry and the copper were sealed, a double sealant system, consisting of a compressible polyurethane sponge and silicone sealant, was placed between the copper clip and the masonry (detail, top left).



COPPER FLASHING AT GABLE ENDS



WINDOW JAMB DETAIL

This detail provided a neat, watertight termination to the copper sheathing and also allowed the copper gutter ends to be easily terminated by running the vertical gutter ends up under the copper sheathing and stepped flashing.

James Norris, AIA
Goody Clancy & Associates
Boston, Massachusetts

Metal Windows

CSI Section 08500

Hopper window screens

Our recent aluminum window replacement project in an historic school building called for the installation of rock-protection screens at all windows. Such protective screens are typically installed on the exterior after the windows and pannings are positioned in place.

In the case of double-hung windows, which open completely, a contractor has enough room between the window and screen to screw the frame of the screen to a subframe, and the subframe to the aluminum panning. This construction ensures that the attachments are hidden from view.

However, when hopper windows, which tilt into the interior, are specified for deep openings, as was the case in this renovation, there is not enough space between the open windows and the sill to insert a screwgun to fasten the screens in this manner. Instead, the contractor must fasten the screens through the exterior finish face. A screen detailed this way appears applied, rather than integral, to the window system, thus compromising the elevation. The exposed fastener heads at the exterior finish face also detract from the overall appearance of the new window.

In our custom detail (top right), the profile of the aluminum panning was reconfigured to double as a subframe for the screen. Following completion of the window installation, the frame of the screen is held in place against this modified panning with specially designed aluminum trim. The result is a cleaner finished product, as the fastener heads are eliminated and the screen is better integrated into the panning profile.

Walter Eric Kluz, AIA
Alison Smith, Associate AIA
Li-Hang Wang
HKT Architects
Boston, Massachusetts

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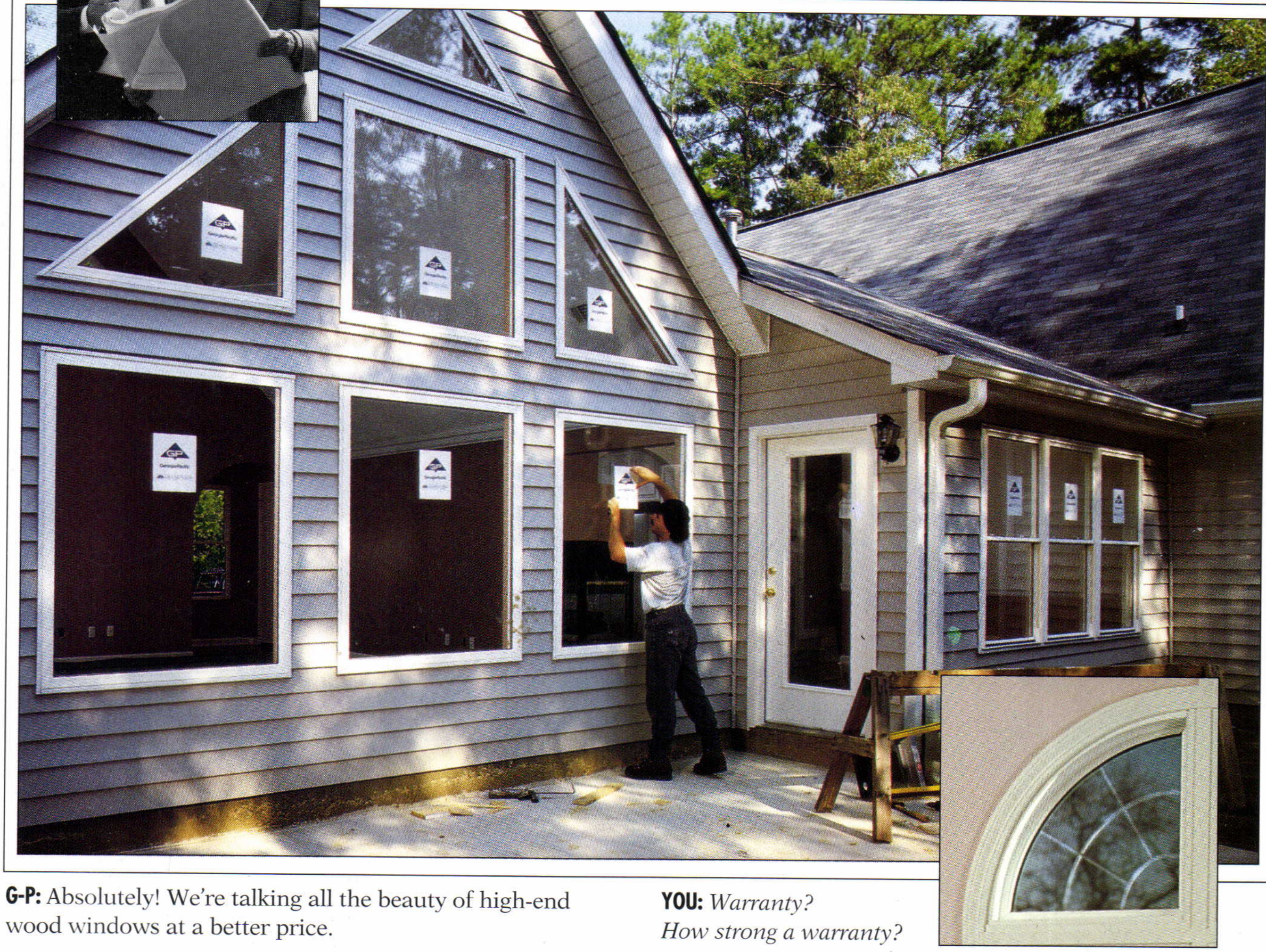

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