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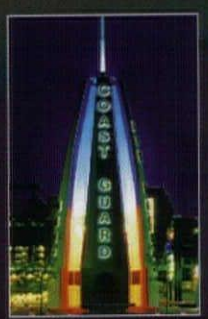
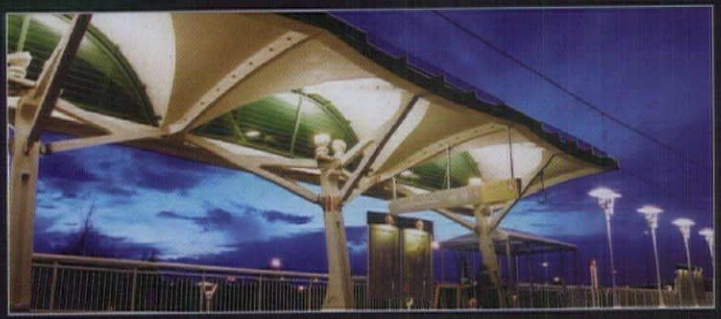


The Brown County
War Memorial
Green Bay, WI



Shawnessy Light Rail Station
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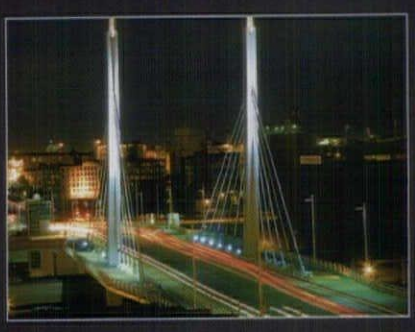
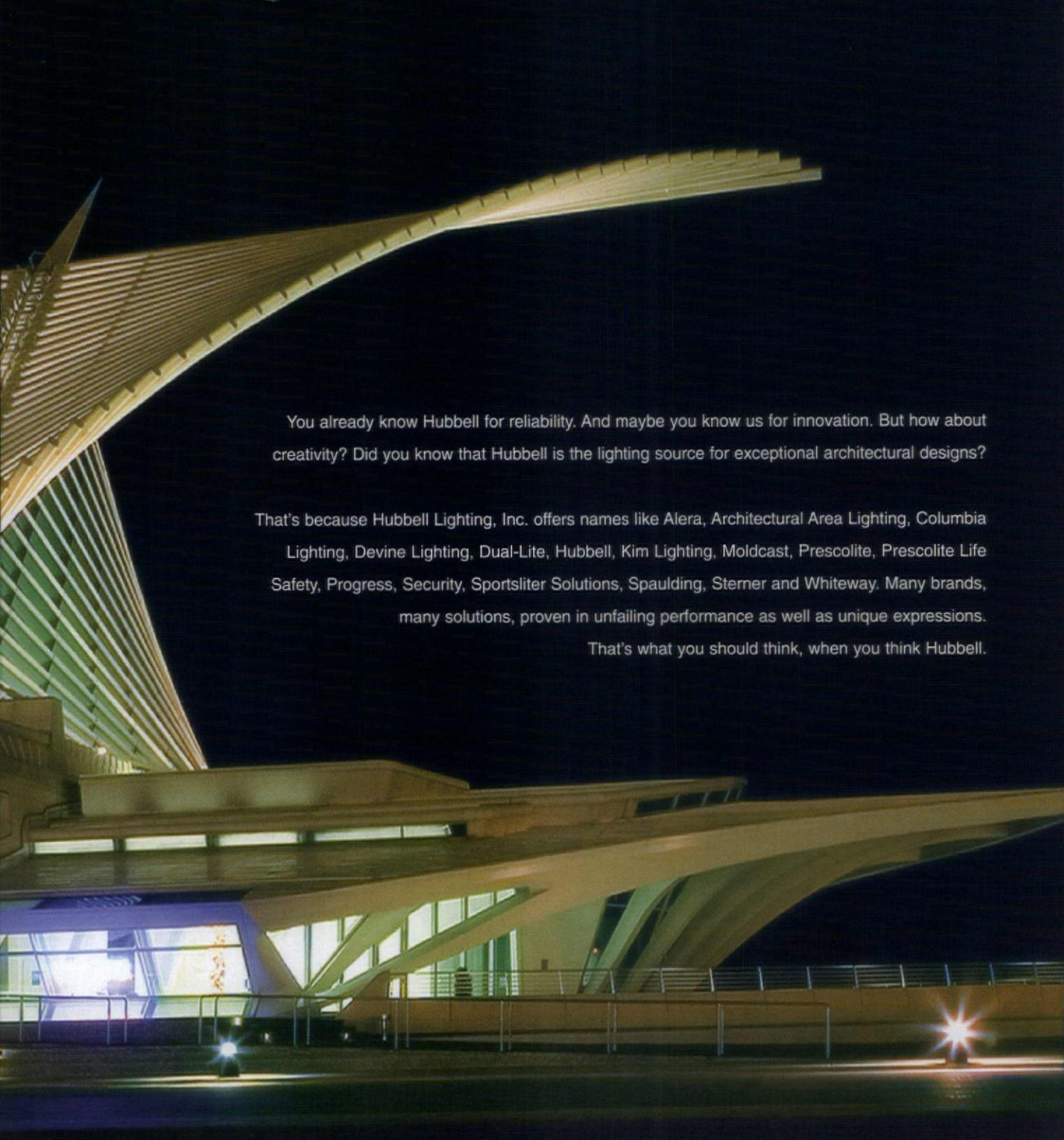


Sixth Street Bridge
Milwaukee, WI



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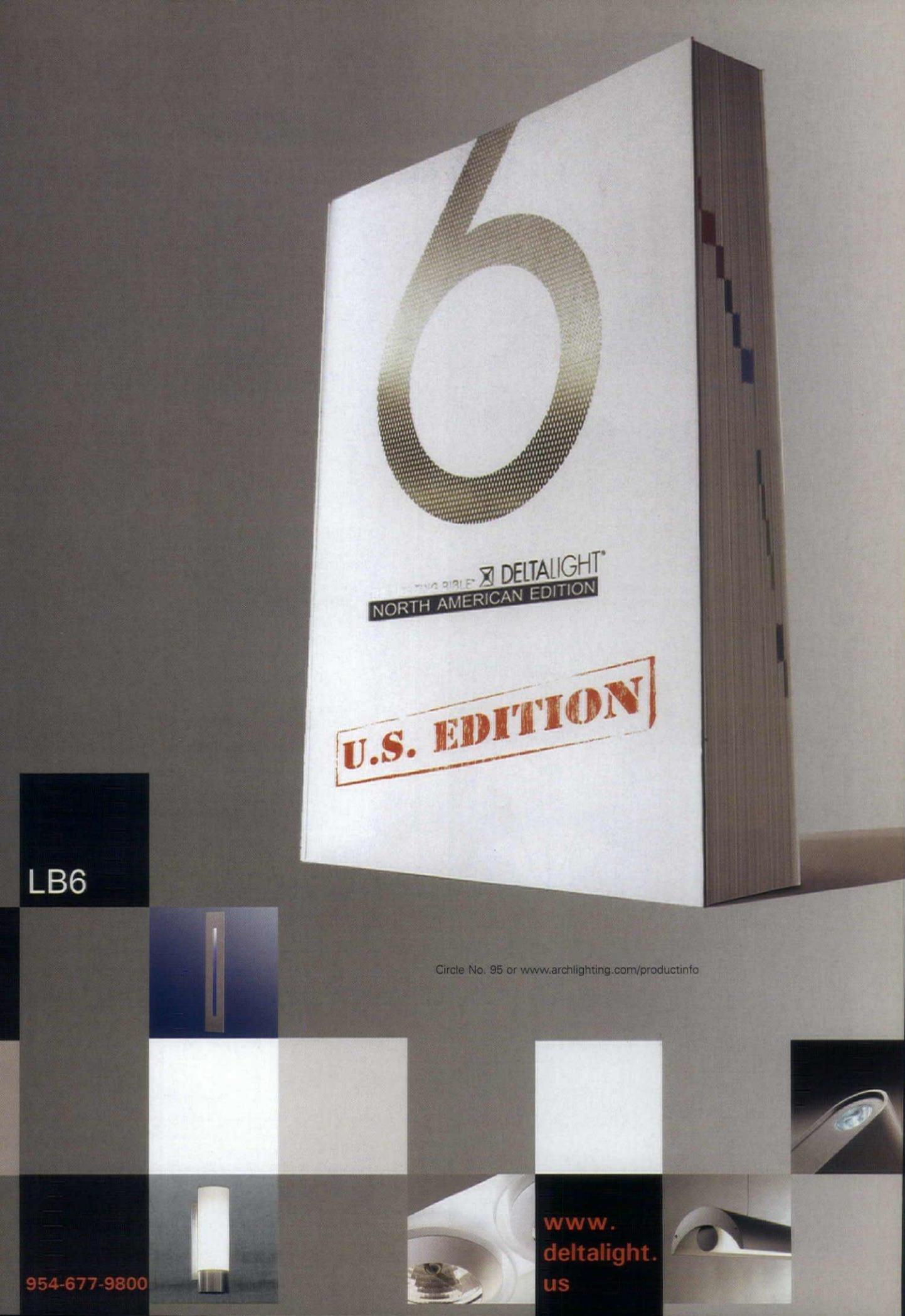
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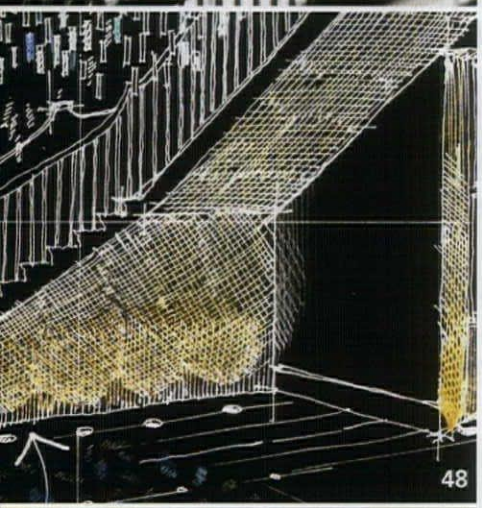

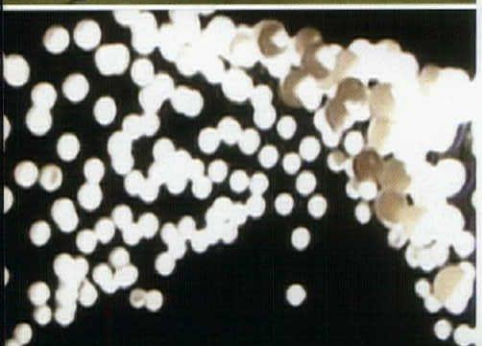

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projects

details

Cover: The LED-dotted mesh façade of Hotel Habitat, Barcelona.
IMAGE COURTESY CLOUD-9 STUDIO, BARCELONA

This page: Richard Kelly's lighting for the Seagram Building in New York City; Hand-drawn rendering of Cowley Manor by Speirs & Major; Steelcase's Digital Yurt; "Cloud of Light" installation in Tallinn, Estonia with lighting by Rogier Van der Heide.

A sustainable design article

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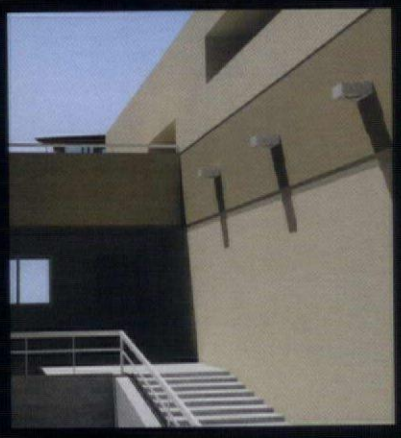

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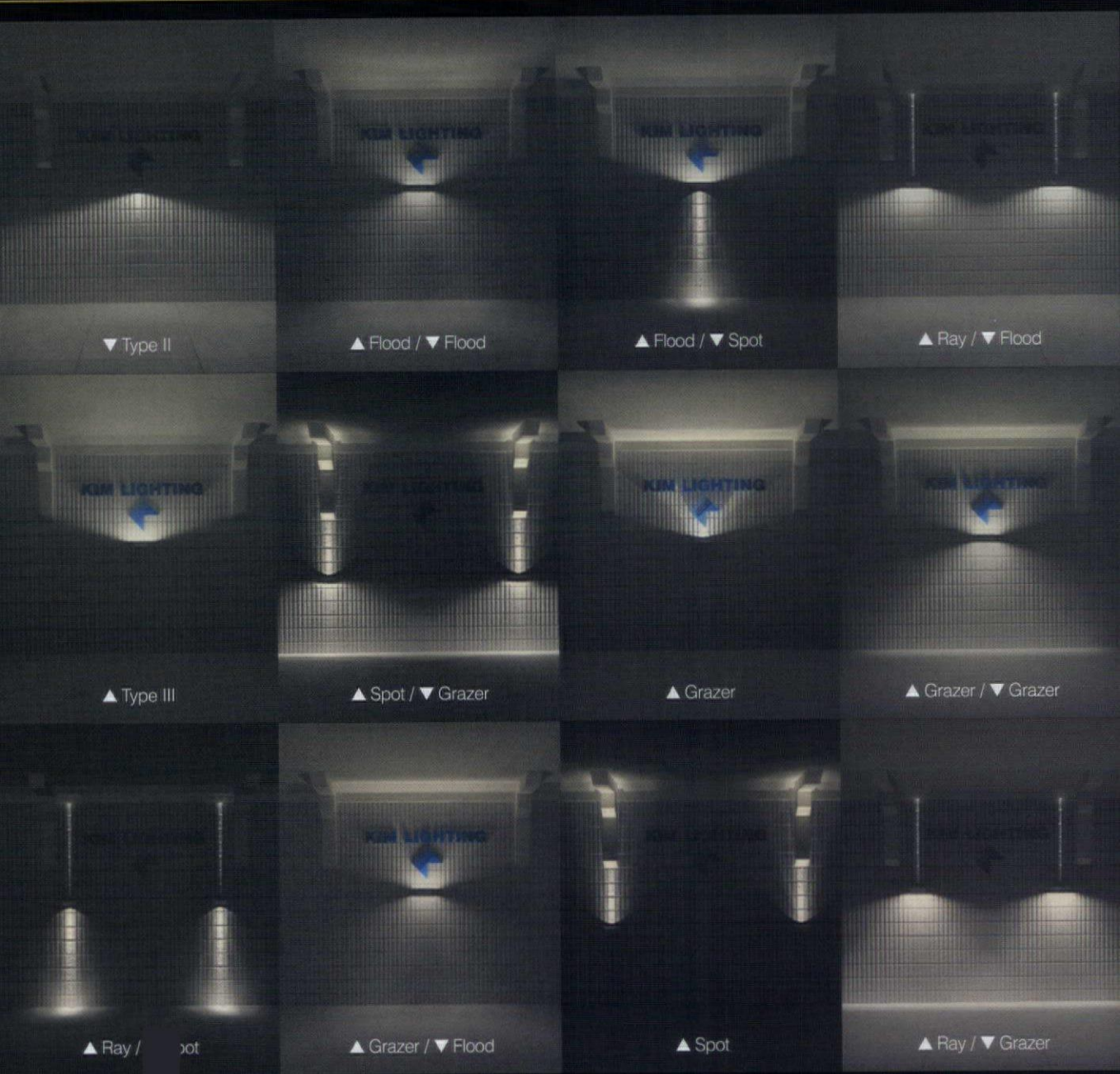

Photos represent only over 40 Wall Commander optical configurations available. Contact Kim Lighting for more information.

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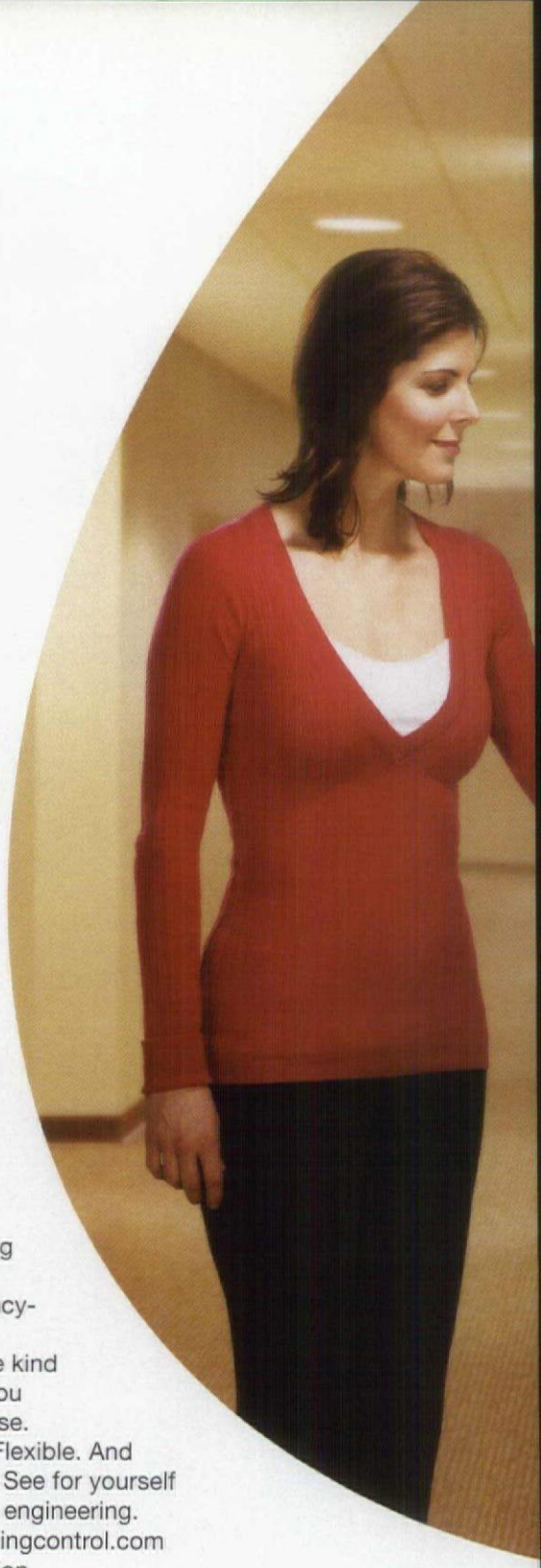

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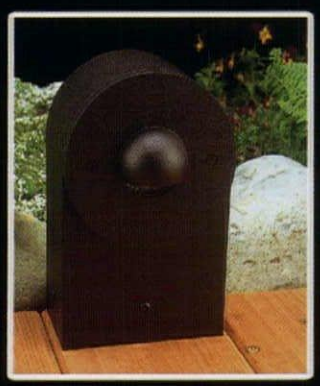

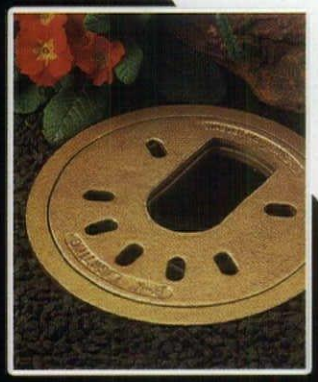

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Inspiration Abroad

THE TIMING OF LIGHT + BUILDING, AND A|L'S annual nod to innovation and inspiration could not have been better. I'm writing this—the final page of our April/May 2006 issue to be sent to press—from Germany, having just spent several long days hungrily roaming the 15 lighting-devoted floors of the Frankfurt-located trade show (and several late nights further investigating the subject in appropriately festive dinner conversation). This biennial event is a moveable feast for anyone with a love of light.

In my mind, the influence inherent in Light + Building lies not so much in a rush of new technology. The show's trends are more or less familiar: Like most of the events both domestically and internationally over the last several years, Light + Building's new offerings seem focused first and foremost on LEDs. Philips' extensive booth was dominated by solid-state content, and nearly every luminaire manufacturer I visited had at least one or two LED-compatible products. One U.S. lighting designer, who has attended the show since its residence in Hanover years ago, observed that the LED technology exhibited this year has advanced beyond the gimmick stage, and is now making its way into refined, practical applications. DALI-related products were also laced throughout the show, comprising for example the focus of Erco's sizeable stand. And color and color-changing capabilities echoed as a theme, though a few manufacturers—such as Artemide—acknowledged in their displays the simple power of white light. These developments are relevant to progress, but nonetheless, somewhat predictable. Indeed, I expect to see these currents at Lightfair in a month.

Where Light + Building seems to make the eyes of both designers and manufacturers shine is in its energy and comprehensiveness, and in the inspired, and consequently inspirational, aesthetic—of pretty much everything. From the actual products and booth displays, to the peripheral events and sophistication of attendee, the show is one of a kind. (I have heard mixed reviews about the seminars, but must confess to not having enough time to attend them.)

The European manufacturers have an awareness of design that puts U.S. product in its place. While Euroluce, the biennial lighting event during Milan's annual furniture fair, presents an equally compelling lineup of decorative luminaires, Light + Building's offerings are that much more extensive, encompassing the architectural along with the technical, with as much attention to detail. The booths themselves are designed environments (no pipe-and-drape, table-top schlock here), and in the larger ones, where both food and drink are served continually, there is a celebratory atmosphere. Light also takes over the city outside the convention center. In conjunction with the show, its organizer Messe Frankfurt coordinates Luminale, a series of installations, events, exhibits, and other points of interest around the city and outlying areas, all unified under the common theme of light. While many of the more than 160 programs are amateur and not worth a dedicated trek, an equal number are thoughtful and eye-catching. Together, however, as either happened-upon or sought-after experiences, they create a public celebration of light, small—and large, as in the case of the permanent Turrell installation on the Dresdner Bank building—moments designed to inspire both attendees of the show and the populace at large.

According to a spokesperson from Messe Frankfurt, U.S. attendance at Light + Building in the form of both visitors and exhibitors grew substantially this year. As I write, the event is still in progress, so final numbers are yet to be tallied. However, if anecdotal evidence is any indication, American designers and manufacturers are beginning to make this a regular stop on their trade-show circuit, at the very least as attendees, if not as speakers, organizers, or exhibitors. With Lightfair around the corner, it is impossible not to compare the two, and to wonder, a little longingly, if the United States couldn't host a similarly energized event. Here, we come to the regularly debated issue of whether Lightfair should be every other year, like Light + Building, which given the size of the market, would be the first of several necessary changes—a difficult decision for many reasons. But the reported success of the Frankfurt show with the American market begs the question: Can Lightfair afford not to? This year, the juxtaposition is interesting, as Lightfair's speaker lineup has a definitive international presence. Perhaps the metamorphosis has already begun.

EMILIE W. SOMMERHOFF
EDITOR-IN-CHIEF

INDUSTRY EXCHANGE TAKES A BREAK IN JUNE TO MAKE WAY FOR EDITORS' PRODUCT PICKS. EXCHANGE WILL RESUME WITH THE JULY/AUGUST ISSUE.

PHOTO BY BJORN WALLANDER

A|L 20 YEARS 1986-2006

LIBERTY RELIGHTING, 20 YEARS LATER

A|L KNOWS ANNIVERSARY CELEBRATIONS AREN'T JUST FOR MAGAZINES. LIGHTING design firm Domingo Gonzalez Associates is observing 20 years in practice, while manufacturers Lucifer Lighting and Progress Lighting are marking their 25- and 100-year anniversaries, respectively. The Aalto vase turns 70, and the Eames lounge chair is a memorable 75. Indeed, 2006 is a celebratory year for a broad mix of firms, businesses, and iconic objects in the world of lighting and design. We feel particularly admiring of one project, however—the Statue of Liberty.

Recognized around the world as a powerful beacon for freedom, hope, and opportunity, the Statue of Liberty's light is not just metaphorical: her dramatic illumination is a perfect example of American ingenuity and engineering. Since the statue's installation in New York Harbor in 1886, lighting engineers and designers had struggled to illuminate the 150-foot copper-clad monument in a manner becoming an American icon. It took the thoughtful and creative approach of Howard Brandston—a legend in his own right—to solve this lighting challenge. In 1984, the designer was asked to give the statue a much-needed lighting makeover in preparation for its centennial. In order to avoid the shortcomings of previous attempts, he studied the monument from every angle and in all lighting conditions, discovering that it looked best in the light of dawn. Brandston determined that he would need "one lamp to mimic the morning sun and one lamp to mimic the morning sky." Learning that no existing lamps could simulate these conditions, Brandston partnered with General Electric to develop two new metal halide products. With only a short time for R&D, a team of engineers at GE's Nela Park laboratories assembled a "top secret" testing room dedicated to the Statue of Liberty project. After nearly two years of work to perfect the new lamps, the "dawn's early light" effect was finally achieved just days before the centennial celebrations were to take place in 1986. "It was truly a labor of love," he recalls. **MARGARET MAILE PETTY**

Margaret Maile Petty, a doctoral candidate at the Bard Graduate Center in New York City, teaches in the lighting MFA program at Parsons the New School for Design, and specializes in the history and theory of twentieth-century architectural lighting design.

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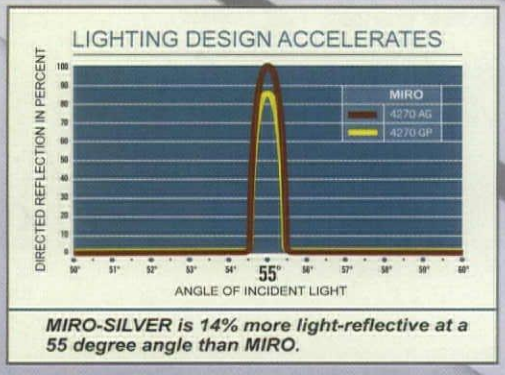

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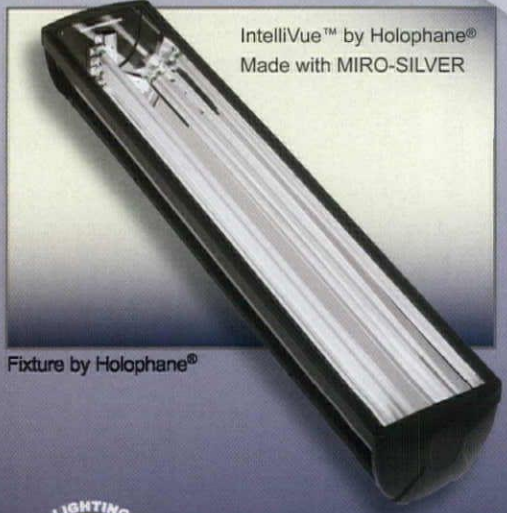

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IESNA, USGBC, AND ASHREA PARTNER ON GREEN BUILDING STANDARDS

As sustainable building strategies continue to be incorporated into mainstream construction processes, individual organizations are coming together, lending their particular areas of expertise in order to create a baseline set of green building standards, which are both comprehensive and accessible. The latest such partnership, formally announced in February 2006, is between the U.S. Green Building Council (USGBC), the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE), and the Illuminating Engineering Society of North America (IESNA).

Using the USGBC's LEED Green Building Rating System as a resource, Proposed Standard 189, *Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings* (Standard 189P), will seek to provide a core set of requirements for the design of sustainable buildings in an effort to balance "environmental responsibility, resource efficiency, occupant comfort and well being, and community sensitivity." In a prepared statement Dr. Alan Lewis, president, IESNA noted, "Sustainability is the next natural progression in the evolution of standards for building design, allowing us to weigh system solutions against the impact on the environment, while ensuring that buildings meet the needs of those who must work or live in them." Standard 189P will apply to new commercial buildings and major renovation projects, and address issues of sustainable sites, water use efficiency, energy efficiency, a building's impact on the atmosphere, materials and resources, and indoor environmental air quality.

According to information provided on the USGBC website, the standard is being developed in accordance with ASHRAE's ANSI procedures, "ensuring that it meets all three partners' commitment to consensus-based processes." The process is expected to be complete by 2007. The ANSI-accreditation will also mean that the standard can be incorporated into building code.

The goal is that Standard 189P will eventually become a LEED prerequisite, drawing on the recognized performance criteria of LEED, but remaining distinct. In addition to the development of Standard 189, the USGBC is also proceeding with its plans for LEED Version 3.0, which will include advancements in building science and technology such as Lifecycle Assessment and bioregional weighting.

Rick Fedrizzi, president, CEO and founding chair of the USGBC commented in a prepared statement, "Given ASHRAE's integrity and long history of leadership in energy efficiency and indoor environment, and IESNA's technical strength in lighting, they're ideal partners in this effort. We're confident that the baseline standards we'll develop together will raise the entirety of the commercial building marketplace to a new level of resource efficiency." **A|L**

LED ADVANCEMENTS AHEAD

ATTENTION IS BEING PAID TO THE DEVELOPMENT OF SOLID-STATE LIGHTING, AND FUND-ing is following suit. Partnerships, such as the agreement signed in February 2005 by the U.S. Department of Energy (DOE) and the National Electrical Manufacturers Association (NEMA)-administered Next Generation Lighting Industry Alliance (NGLIA), which will support the development and commercialization of solid-state lighting technology, and legislation providing funding, like the Energy Policy Act of 2005, have paved the way for the LED technology advancements.

According to the DOE's 129-page multi-year program report (released in March 2006) for its solid-state lighting initiative, its level of funding has increased from $3 million for fiscal year 2003 to $13 million for fiscal year 2006. And in February, President Bush's proposed 2007 fiscal budget increases solid-state lighting technology funding by 75 percent from last year, bringing it to $19.3 million.

Also in March 2006, the DOE announced funding selections for its solid-state lighting program with the goal to "develop advanced solid-state lighting technologies that, compared to conventional lighting technologies, are much more energy efficient, longer lasting, and cost competitive by targeting a product system efficiency of 50 percent with lighting that accurately reproduces sunlight spectrum" by 2025.

Pushing technology advancement even further is the use of nanotechnology—technological developments on the nanometer scale, usually 0.1 to 100 nm—in solid-state lighting. As part of the Energy Policy Act of 2005, the DOE is mandated to designate one of five federal nanotechnology research centers as a national solid-state lighting center, for which Congress has appropriated $5 million in funding. This technology is expected to create high-performance results in areas including photovoltaics, thermoelectrics, and sensors, though NGLIA manufacturers are working with the DOE to evaluate its use in solid-state lighting semiconductors.

To this end, NEMA has created a Nanotechnology Advisory Council, comprised of a panel of experts, to provide guidance to the electrical manufacturing community on this emerging technology. According to NEMA, the council will act as a "resource for manufacturers interested in the research and public policy implications of nanotechnology development as they seek to apply the technology in their products." **A|L**

100%LIGHT

100% DESIGN, ONE OF ENGLAND'S MOST NOTABLE ARCHITECTURE AND DESIGN shows is adding a new event to its lineup—100% Light. The 100% brand will now encompasses six venues: 100% Design (the first of the shows, established in 1995), 100% Detail, 100% Materials, 100% Light, 100% East, and 100% Design Tokyo. Ian Rudge, 100% Design co-founder and brand director, says, "Last year the shows had over 36,000 visitors, and the majority of them told us that they would like to see more lighting." Responding to this demand, 100% Light was born.

Delivering a forum for the latest architectural and contemporary lighting products, 100% Light will also serve as a launching pad for new lighting manufacturers and designers. Dedicated solely to lighting, the show will help bridge the contemporary interiors showcased at 100% Design and the building innovation shown at 100% Detail. A series of lighting-dedicated seminars and installations will also be held.

Of the new addition, Rudge says, "100% Light is a natural extension to the existing brands" and proof of the steadfast emergence of the U.K. lighting design community. Highlighting this notion is an entire panel of London-based industry experts—lighting designer Jason Bruges of Jason Bruges Studio; lighting designer Paul Cocksedge of Paul Cocksedge Studio; Cressida Granger, managing director of Mathmos; Laurent Louyer, founder of lighting design firm Creatmosphere; and architect John Norden of IDE Architects—who will advise on show content.

To ensure the relevance and quality of products, prospective participants must submit a product portfolio that will be vetted by the panel. The shows will run September 21 to 24, 2006 at London's Earls Court. For more information, visit www.100percentlight.co.uk. **A|L**

LED HOME INVASION

ACCORDING TO VICE PRESIDENT AND GENERAL MANAGER OF PHILIPS LIGHTING North America's solid-state lighting business Govi Rao, the U.S. will see a "dramatic shift from incandescent lighting to LEDs" during the next few years.

Emphasizing its role in this emerging market, Philips has unveiled a variety of LED lighting products at the 2006 Kips Bay Decorator Show House, an annual New York City charitable event to raise money for the Kips Bay Boys and Girls Club. This year, over 20 interior designers went to town on a 19th-century mansion located on Manhattan's Upper East Side.

LEDs were used for design schemes in the kitchen, foyer, library, and some bedrooms, creating the designers' desired ambient experiences and lighting effects to capture the mood of each space. One example was the use of Philips' Aurelle LED candles, used en mass to illuminate one of the home's many fireplaces.

As Rao says, the "LED installation is a great opportunity to demonstrate what's coming in home design." Visit the showroom through May 23, 2006. For more information, visit www.kipsbay.org/showhouse.html. **A|L**

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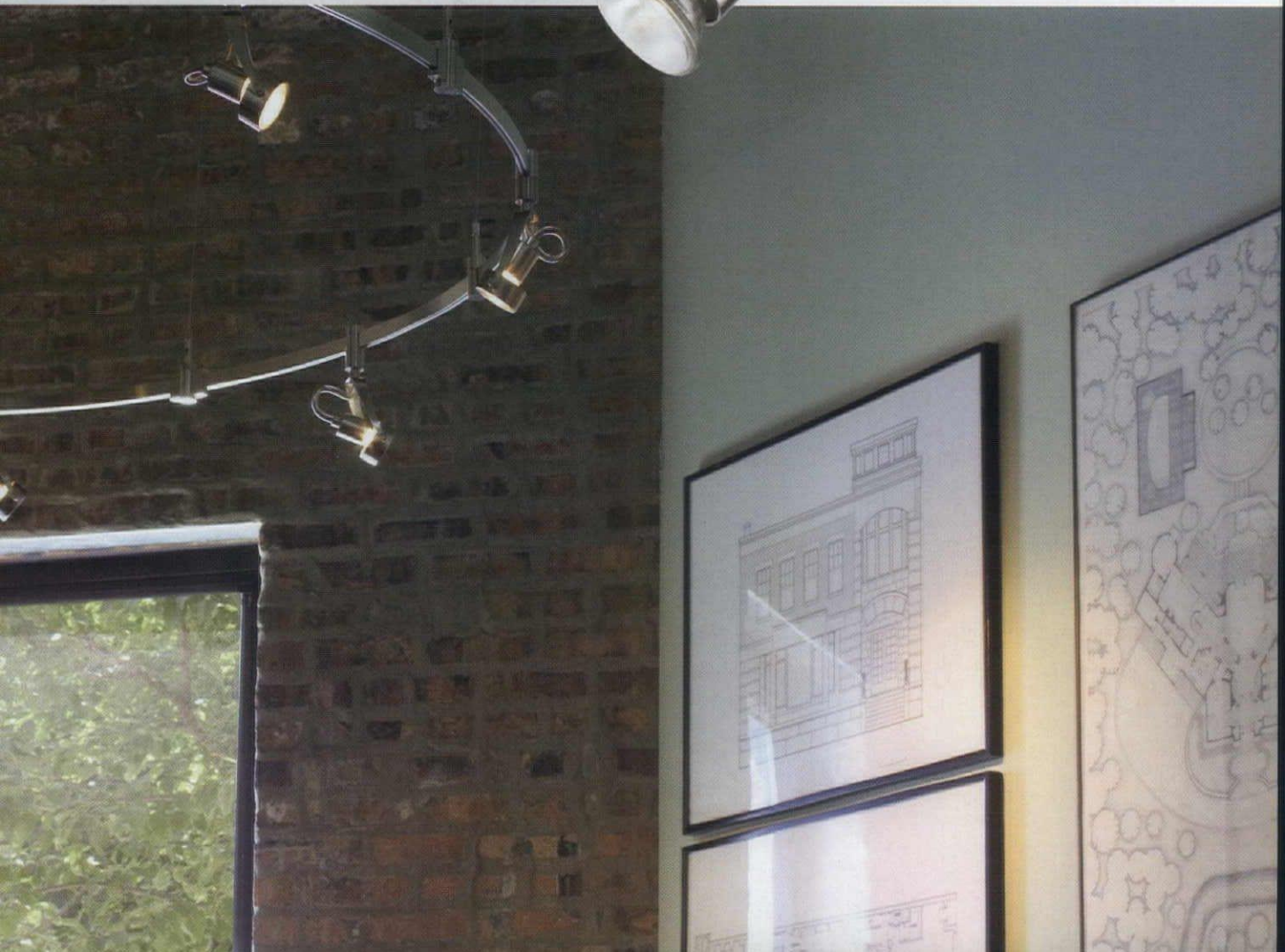

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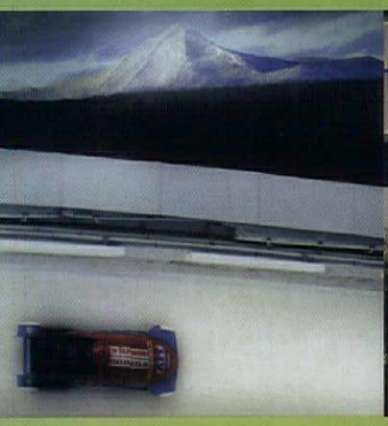

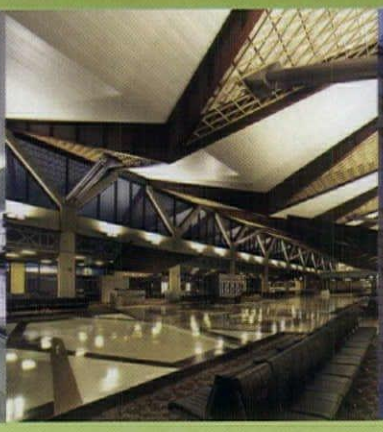

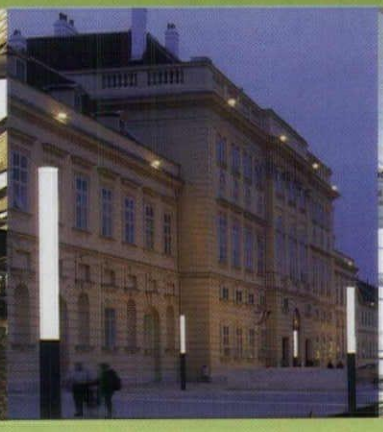

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STUDENTS SHINE IN FIXTURE COMPETITION

SELECTED FROM MORE THAN 100 ENTRIES REPRESENTING INTERIOR DESIGN, industrial design, and architecture programs across the United States, a submission from a team of industrial design students is this year's winner of Luraline Products Company's fifth annual "It's Your Light" student design competition. Luke Johnson and Jonathan Walsh of the University of Bridgeport in Connecticut collaborated on their winning entry called "RhythmiGlow," and will share the $1,500 cash prize. Honorable mentions were awarded to David Grisham of Mississippi State University for his "Pivot Lamp," and Justine Reed of Cazenovia College in New York State for her luminaire called "Pagoda Express."

The competition brief asked students to design a luminaire for upscale nightclub and entertainment venues. Johnson and Walsh's winning design makes use of electroluminescence, a process whereby a material emits light in response to an electrical current. When activated the material powers a flashing sequence of light panels underneath a translucent shade. The sequence can be random, pre-programmed by the manufacturer, or made to respond to sounds in the installed environment. Judges were impressed with the fixture's "real-world marketability" and ability "to create a mood." Details about the annual competition are available through the company's website at www.luraline.com. **A|L**

IMAGE COURTESY OF LURALINE PRODUCTS COMPANY

LETTER TO THE EDITOR

IN RESPONSE TO MARCH 2006

The article "On The Road with Light" presented a detailed review of the three methods for roadway lighting calculations. Not discussed was whether or not roadway lighting is warranted at all, and if warranted, to what degree. RP-8 does not address criteria for "when" roadway lighting is necessary—the standards only apply to continuous lighting. And what warranting criteria are to be used for "spot illumination," which applies to many if not most local roads? There are fundamental questions on the circumstances under which roadway lighting is warranted, and these questions deserve careful consideration by public officials and lighting engineers:

1. With fierce competition for limited public financial resources, under what criteria does the investment in roadway lighting provide a reasonable return on investment in terms of collision avoidance?

2. If roadway lighting does provide an appropriate return on investment, does that additional level of collision avoidance provided by lit roads apply at all hours, from dusk to dawn, or is most of the benefit realized before midnight, after which traffic volume may be negligible? Would turning streetlights off after midnight significantly contribute to energy conservation without significantly affecting rates of collision?

3. Could passive alternatives such as reflective pave-

ment markings provide a similar degree of public safety, and if so at what cost?

In the 1970s, in response to an energy crisis, CalTrans decided to remove all roadway lighting from limited access freeways, except for those located at the interchange. In the 30 years since these roadway lights were taken down, CalTrans has not seen the need to reinstall roadway lighting on freeways. CalTrans has now commissioned a study, due for completion in 2008, to determine whether roadway lighting is necessary even at interchanges.

On local roads, most lighting is mounted on wood utility poles, and the spacing requirements are based on the weight distribution factors for the wires. Streetlights mounted on utility poles may offer little, if any, public benefit in terms of collision avoidance.

100 years ago car headlights were very weak, compared to today. Back then there were few examples of roadway striping or reflective markers on the roads.

The question for future research will be to determine the public benefits gained from investment in streetlights, and to compare those benefits to other areas of investment like healthcare or public safety. Until those questions are answered, CalTrans example of not using roadway lighting for freeways deserves careful consideration.

LEO SMITH
Suffield, CT

THE AUTHORS' REPLY TO MR. SMITH'S LETTER

Thank you for your interest in our article. Your concern about Roadway Illumination Warrants ("When to Light") is important. The article was intended to introduce the reader to "How to Light" after the decision has been made to install a continuous roadway lighting system. We enthusiastically agree on the need for additional research on the benefits of installing roadway illumination systems. There are studies that show accident reduction benefits from roadway lighting, but much of the data we have is from studies done some time ago. A pending National Cooperative Highway Research Program Project, "Guidelines for Roadway Lighting Based on Safety Benefits and Costs" may help in addressing some of these issues. We welcome CalTrans research into this issue and see the need for further research on warrants for lighting of non-freeway facilities. Lighting designers would welcome more research-based guidance on "when to light."

J. DELVIN ARMSTRONG, P.E. and **BENJAMIN J. JORDAN,** P.E.

CORRECTIONS A trio of items was inaccurately identified in the March 2006 issue: The cover image should have been cited to photographer Pete Sieger. • "Crafting the Historic Luminaire" should have identified the location of Winona Lighting as Winona, Minnesota. • In "Riverfront Rebirth" Peggy Lucas should have been listed as the chief developer of the Minneapolis historic district.

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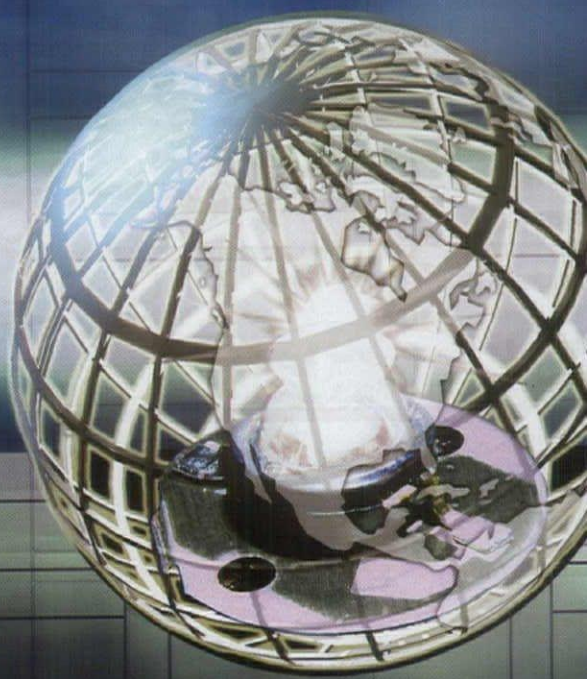

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RICHARD KELLY

A TRUE INNOVATOR IN SPIRIT AND PRACTICE, RICHARD KELLY (1910–77) DEDICATED his professional life to the recognition and advancement of lighting design, and throughout his career, championed a close partnership between light and architecture. This was far from accepted practice when Kelly opened his first lighting consultancy in 1935 in New York City. As he described this period, "There weren't lighting consultants then. Nobody would pay for my ideas, but they would buy fixtures." Frustrated, Kelly began to write and lecture on the integral relationship between lighting and architecture, giving voice and name to the emerging practice of lighting design. By the early 1950s, Kelly had defined a vocabulary for modern architectural lighting design comprised of three "light energy impacts": focal glow (highlight), ambient luminescence (graded washes), and play of brilliants (sharp detail). As an educator lecturing at institutions including Yale, Princeton, and Harvard, Kelly shared his philosophy of light with the next generation of lighting designers—establishing a legacy still visible today.

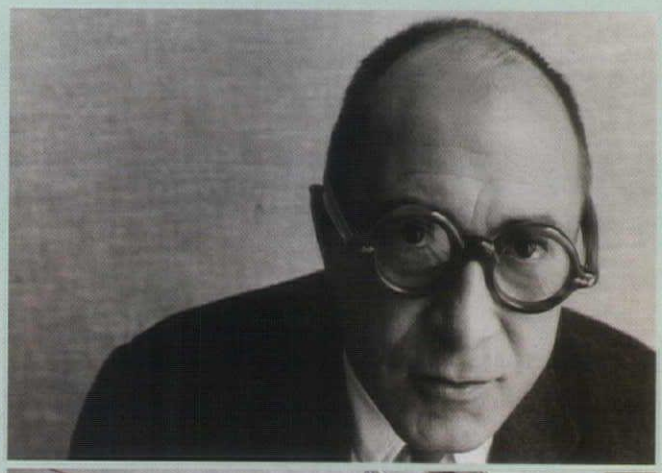
Having graduated from the Yale School of Architecture in 1944, Kelly felt comfortable addressing both the architectural and illumination engineering communities. His training and unwavering belief in lighting design earned him the respect of some of the most important architects and designers of the mid-century era, and led to collaborations with Mies van der Rohe, Philip Johnson, Eero Saarinen, and Louis Kahn, and the realization of a number of the twentieth century's most iconic buildings, including Johnson's Glass House (1949), Mies's Seagram Building (1954–58), Saarinen's General Motors Technical Center (1946–55), and Kahn's Kimbell Art Museum (1967–72). Kelly refused to be confined by contemporary lighting solutions. When he was unable to realize his concept with readily available products, he developed new lighting technologies, often seeking assistance from leading illumination and electrical engineers. To transform the Seagram Building into a "Tower of Light," Kelly partnered with Noel Florence at Lightolier, designing a custom luminous ceiling comprised of the largest flat diffusers manufactured to that date (1958). The system was outfitted with two independent circuits, one for daytime illumination and another using separate lamps running at one quarter maximum output to create a glowing tower after dark.

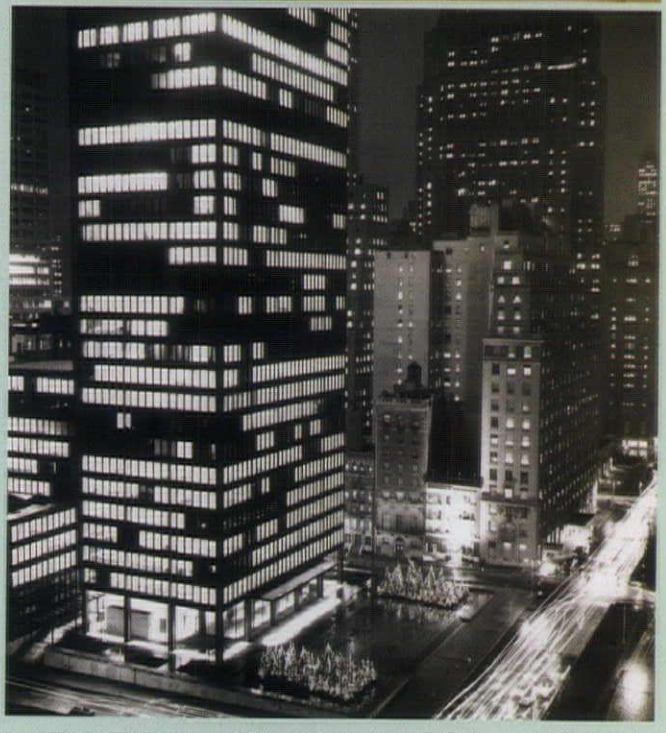
Long before daylighting became a buzzword among architects and lighting designers, Kelly argued that daylight was essential to architectural lighting design. He said, "The handling of forms, the meaning of a room has to relate to daylight." Designing the lighting for the Kimbell Art Museum, Kelly combined his knowledge of daylight with the manufacturing expertise of his long-time collaborator Edison Price, and the mathematical precision of engineer Issac Goodbar. Together they designed the now-famous cycloid vault and curved reflector of perforated aluminum that channels reflected and diffuse natural light into the museum.

Despite his many successes, Kelly was never satisfied. As he said in an interview in 1958, "Lighting is such a large part of the visual arts—architecture, most of all—that I'm sure the best we can do today will be inadequate tomorrow. I can logically project a great many techniques in lighting to improve people's lives or to make a house more beautiful, but it's all theory until we have the record of experience, which we are only beginning to write."

MARGARET MAILE PETTY

Margaret Maile Petty's master's thesis focused on Richard Kelly's formative role in the development of modern architectural lighting.





Richard Kelly (top); the cycloid vault in the North Galleries at the Kimbell Art Museum, Fort Worth, Texas (center); and the luminous glow of the Seagram Building, New York (above).

more **information** at ARCHLIGHTING.COM

IMAGES, TOP AND BOTTOM, COURTESY ADDISON KELLY; CENTER PHOTO, ROBERT LAPRELLE, COURTESY KIMBELL ART MUSEUM

ROGIER VAN DER HEIDE

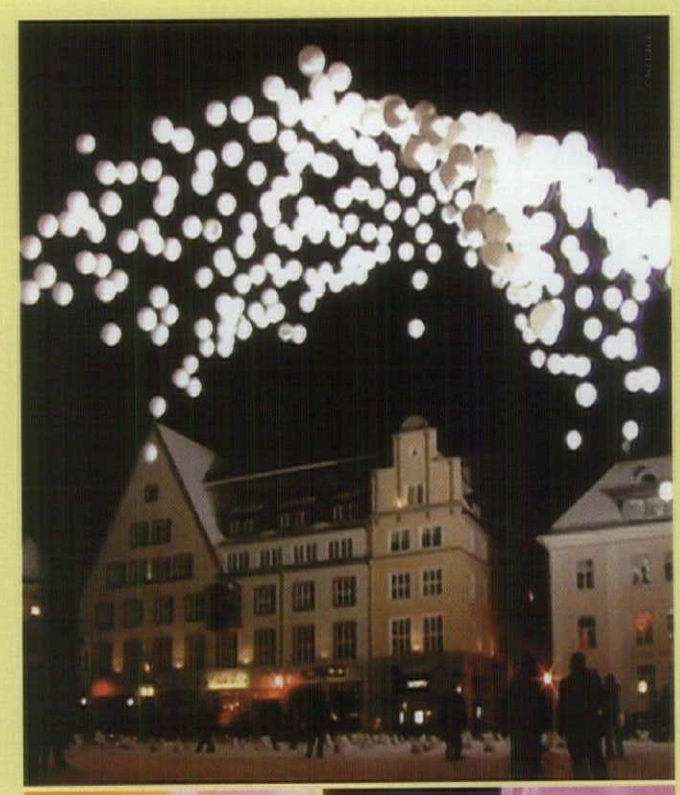
PERHAPS NOT SURPRISINGLY, ROGIER VAN DER HEIDE STARTED IN THEATER. MANY of his professional peers also began their career there, but the real hint is in the personality of his work. The Dutch lighting designer's projects exhibit a theatricality that intends to captivate—the multimedia façade of the Galleria West Shopping Center in Seoul, for example, which garnered him a 2005 Radiance Award, the IALD's highest project honor ("All Dressed Up," Jan/Feb 2005). With parents in the performing arts and music, he spent most of his childhood "on stage, or in a concert hall or the orchestra pit," and gravitated toward a related field of study, cinematography, at the Institut Supérieur des Beaux-Arts in Brussels. But, for him, theater lighting was a lonely existence, lacking the intensity and dialogue among the different participants that he would later find working in architecture. "You come in late—at best, three weeks before opening night—so you interfere with a team that is very close. You're a stranger. And after opening night, you're gone again to the next show." Approached by an architect about lighting an exhibition, Van der Heide immediately understood what he was missing, and by 1995, the designer had founded his Amsterdam-based architectural lighting practice, Hollands Licht.

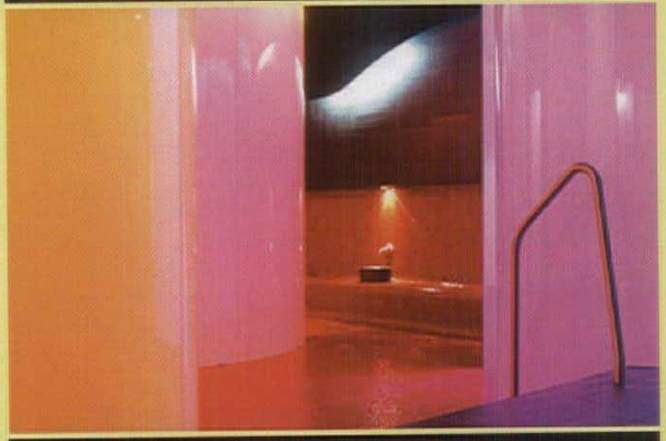
Van der Heide's affinity for the team interaction inherent in the architectural design process has continued to influence the trajectory of his career, playing a key role in his decision to sell Hollands Licht to the global engineering, design, and planning firm Arup in 2003. "It took awhile to convince me." But what he appreciated in the organization's interdisciplinary approach was the ability "to share ideas, and to work concepts up to feasible designs." True to his maverick personality, he adds, "It was not always easy in the beginning—a big company can be a big monster." As the global leader of Arup Lighting, Van der Heide directs just over 30 practitioners. "I like the process with the younger designers, seeing how they are improving and exploring their talents," he says.

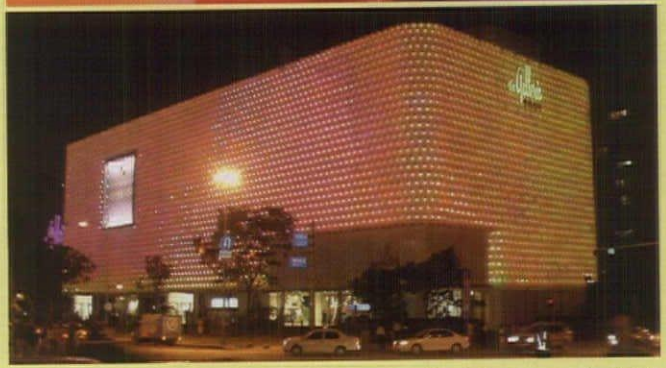
The theme of interaction carries over into the life of Van der Heide's product, his designs. "I am very much into the experiential part of lighting, how it is perceived, how it can set a mood." He describes his process as analytical, "trying to discover the real self of the client, and then finding an expression of that in light." The concept of holistic design—the built environment as a total system of things that work together—also features prominently in his professional exploration. "On the one hand, the way technology is moving requires specialized professionals in every field. On the other, we can only improve the built environment if we think about it as generalists. I am interested in how to solve that paradox."

His enthusiasm for light is infectious and inclusive. (Van der Heide insisted that his client be on stage for the acceptance of the 2005 Radiance Award.) It inspires and realizes projects, seemingly conceptualized for the sheer pleasure of considering what could be possible—work that is simultaneously playful and poetic. Last year, Van der Heide participated in a project, organized by a group of Estonian architects and conceived by Dutch architecture firm MVRDV, to launch 500 illuminated meteorological balloons, each 6 feet in diameter, over a town square in Tallinn, Estonia, during February. The installation was, more or less, for the fun of it, an exploration of light's ability to cheer a city in the depths of winter.

But for Van der Heide, fun is all in a day's work: "I need the excitement and pleasure to perform, and I can usually find a way to make that happen for the whole team. I consider that part of my job." **EMILIE SOMMERHOFF**







"Cloud of Light" installation in Tallinn, Estonia (top); the spa at the Hotel Castell in Zuoz, Switzerland, designed in conjunction with UN Studio (center); the Galleria West mall in Seoul, also designed with UN Studio (above).

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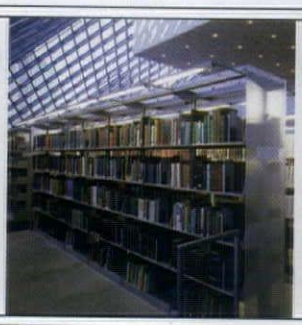
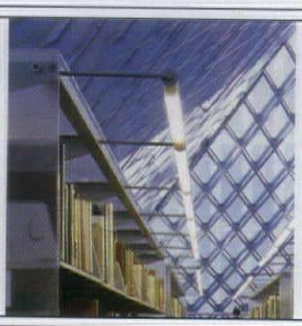
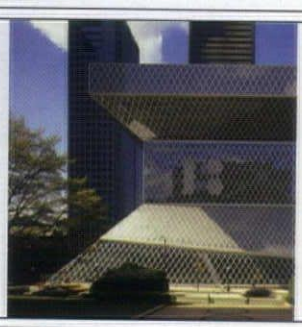

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Behind the Scenes: Lighting Research

BY SALLIE MOFFAT

Two major lighting research facilities discuss their visions for the future.

DESPITE PERSISTENT FUNDING CONCERNS, TWO U.S. RESEARCH facilities continue to discover new and improved practices for the lighting industry. The Lighting Research Center (LRC), located in Troy, New York, and part of the Rensselaer Polytechnic Institute's School of Architecture, is devoted solely to lighting. Situated in the hills above the University of California, Berkeley, the Lawrence Berkeley National Laboratory (LBNL), is the Department of Energy's oldest national laboratory, founded in 1931. Its Lighting Research Group is part of the Environmental Energy Technologies Division, one of 17 scientific departments. The following initiatives are indicative of current advancements, but also provide insight into future trends.

SOLID-STATE LIGHTING

For both the LRC and LBNL, one major goal is to increase the brightness and efficacy of LEDs. The LRC, with the University of California, Santa Barbara, and funded by the U.S. Department of Energy's Building Technologies Program and the National Energy Technology Laboratory, has developed a Scattered Photon Extraction (SPE) method that generates 30 to 60 percent more light output and luminous efficacy from typical white LEDs. By moving the phosphor away from the semiconductor and changing the shape of the lens geometry, backscattered photons that would typically be absorbed inside the LED are able to escape through the sides of the optics as visible light. Under certain operating conditions, SPE LEDs, currently available for licensing, can achieve over 80 lumens per watt, according to researchers.

A light therapy luminaire outfitted with blue LEDs used in the LRC's Alzheimer study.

IMAGE COURTESY DENNIS GUYON, LRC

LBNL is also working to increase the extraction efficiency—the light output and luminous efficacy—of LEDs by increasing the refractive index of the medium surrounding the LED die (the bare chip of semiconducting material). LBNL predicts that, by 2008, that 80-lumen-per-watt LEDs utilizing this method will be available in the marketplace.

In partnership with the California Energy Commission, LBNL is investigating an LED system to replace compact fluorescent lamps in tasklights. Using a luminaire provided by Luxo, the team demonstrated that three 3W LEDs achieved good beam control and optical distribution of light using less power than an 18W compact fluorescent. The resulting Arketto tasklight was introduced in 2005, and a new version—also using three 3W LEDs, but with Lumileds new Luxeon K2 product and an altered head shape—called Esol, will be released in June at Lightfair.

Additionally, LBNL is in the final stage of securing financing for a collaboration with the Indian government to help develop LED systems to replace fuel-based lighting, the main form of illumination used by the local population. This program, explains Steve Johnson, who heads LBNL's Lighting Research Group, "involves assembling the LEDs in India with die brought in from Taiwan, packaging them, and putting them into different light systems, such as a 3W lamp." The team also has plans to integrate photovoltaic capabilities. Johnson predicts the systems will be in place within the year.

SOLAR CONTROL

One of the most significant and well-documented projects delving into energy, daylighting, and shading controls is the daylighting mockup for the New York Times' headquarters ("Daylight! Daylight! Read All about It," June 2004). The building, currently under construction, will have a façade comprised almost entirely of glass, and LBNL—in collaboration with Anyhere Software, as part of a New York State Energy Research and Development Authority (NYSERDA)-funded commissioning study—developed a new luminance mapping tool to determine if the automated shading system operates in accordance with the *Times'* specifications when certain thresholds of glare are exceeded. Using automatically captured digital photographic images and Photosphere, free software created by Greg Ward Larson (President of Anyhere Software and author of Radiance, also developed at LBNL), researchers, lighting designers, and manufacturers are now able to measure and display accurate luminance values for each pixel in the image within one to two minutes, thereby making it possible to pinpoint glare and evaluate the visual environment. "With this software," says Eleanor Lee, sci-

entist and principal investigator in the LBNL's Building Technologies Program, "there is a new capability to evaluate visual discomfort in the field." While the software is currently at the R&D stage, Lee hopes it will be available one to two quarters from now.

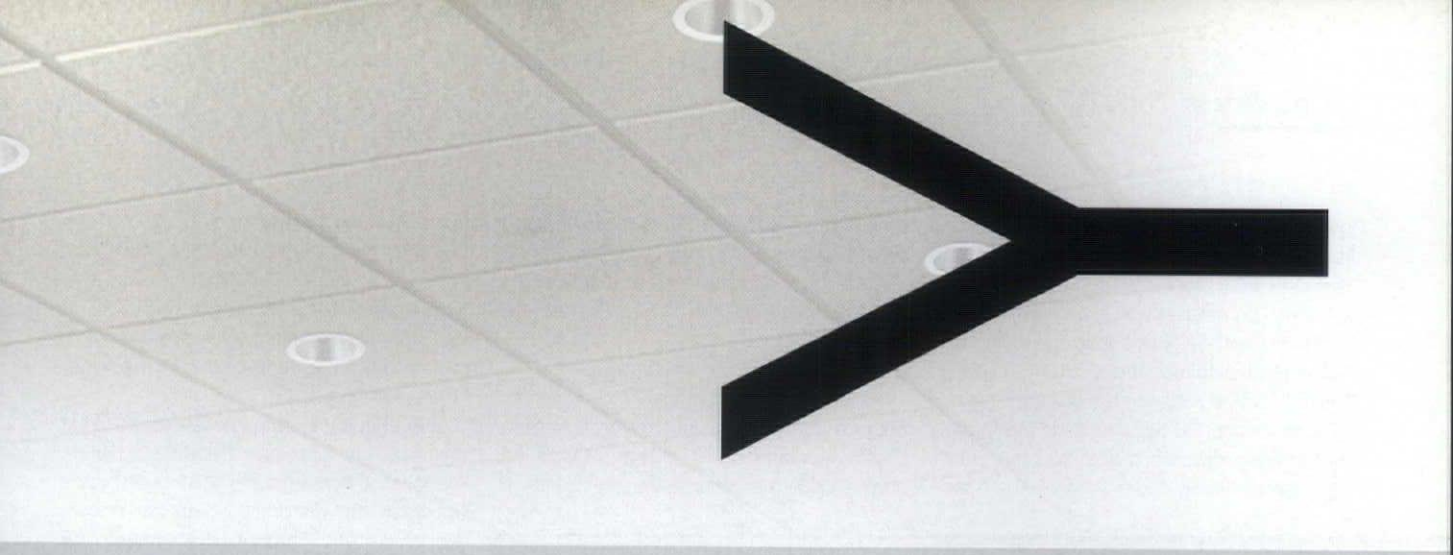
LBNL also sees promise in window technologies that can balance daylight and glare. Working with Sage Electrochromics' electrochromic (EC) windows, which switch from a clear to tinted state while preserving view, researchers have just completed a three-year field test program to evaluate their use in daylit spaces and investigate energy savings and visual comfort. "At the touch of a button, these switchable windows can control thermal loads and daylight levels," Lee explains. "With proper control, this technology could be the holy grail of window technologies for optimal energy efficiency and comfort." According to Lee, Sage Electrochromics is the only U.S. manufacturer currently offering EC windows and, while these products only allow for fully clear or fully tinted states, future iterations will have greater tuning capabilities.

The LRC has created a proprietary daylighting controls technology called Advanced Daylight Harvesting (ADH) that includes the DaySwitch, an inexpensive digital self-commissioning, auto-adjustable photosensor, and an integrated skylight luminaire, which distributes natural light supplemented by electric light on a control system to dim or switch off the lamps when natural light is sufficient. The DaySwitch is a simplified device that does not require a dimming ballast and can be applied to existing fixtures. With a recent award from NYSERDA, the LRC will ready the DaySwitch for commercialization. New York-based Dynamic Hybrids will manufacture the DaySwitch prototype.

CONTROLS TECHNOLOGY

To satisfy multiple building scenarios, LBNL is creating digital and wireless smart system prototypes. As Francis Rubinstein, principal investigator for LBNL's Lighting Research Group, explains, "It's hard to know even in new construction how to zone the lights ahead of time, so it's a real advantage to have the ultimate flexibility. Ours is a simple mantra: In the future, all lighting shall be dimmable and individually addressable." By combining DALI—a wired digital communications system that provides dimming and switching control of fluorescent lights on an individual ballast level—and an emerging wireless communications technology called ZigBee, researchers are prototyping an integrated lighting control system named the IBECS Control Framework that can individually address wired fixtures, sensors and switch inputs, and demand response signals. "When the price point is there," says Rubinstein, "we imagine virtually the entire U.S. commercial building stock of 60 billion square feet of space converting to dimmable lighting." This means saving billions of dollars a year with all the associated environmental benefits. The Framework will be released in October and, according to Rubinstein, commercial products using the Framework will be available in January 2007.

LRC researchers have developed a load-shedding ballast for commercial fluorescent lighting systems that, through a signal from the electric company or the building's ener-



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gy management system, reduces the current supplied to lamps by 33 percent and reduces light levels by approximately 35 percent. The ballast system can take on the building's entire lighting load, providing an automated, single control point. As Russell Leslie, LRC's associate director says, "People accept 30 percent dimming, especially during daytime, but if you tell them you are dimming for a reason, they can accept up to 50 percent." The load-shedding ballast will be manufactured by Osram Sylvania and is being tested in a Con Ed facility this spring.

LIGHT AND HEALTH

One of the fastest growing areas of research relates to health and human physiology, and development of lighting products and practices that respond to human biological rhythms is one of the LRC's core initiatives. The Light and Health program is led by Dr. Mariana Figueiro, whose work focuses on the response of the human circadian system—biological cycles that repeat approximately every 24 hours—to light.

LRC Researchers have developed what they call the Circadian Phototransduction Model that hypothesizes the mechanisms by which humans process light for the circadian system. Through this model, the quantification of different light sources as a stimulus to the circadian system can now be made, which is a significant step toward exploring how light can be used to adjust the body's rhythms. Studies have determined that light on the eye's retina is the primary synchronizer of these circadian rhythms to the 24-hour solar day, and that blue is the color to which the body best responds. Discovering that light treatments may help set the body's internal clock to match the solar day, the LRC applied its theory by exposing Alzheimer's patients, who tend to have erratic sleep patterns, to two hours of blue LED light in the early evening. In studies, the LRC was able to consolidate the patients' sleep to the nighttime.

LRC's next area of investigation is lighting intervention for the aging population, meaning a 24-hour lighting scheme that includes better light for vision, the circadian system, and nightlights to help reduce falls by introducing horizontal vertical lighting cues—for example, nightlights installed around a doorframe.

Yet another exciting study to be conducted this year will focus on the possible link between lighting and cancer. Studies have shown exposure to controlled light at night may suppress melatonin. This suppression has been associated with reduced growth rates of certain types of cancer, including breast cancer. The LRC will conduct a study with Harvard University during which day- and nightshift nurses will don a device called the Daysimeter—worn around the head to catch circadian light exposure at eye level. Data will be compared to see if there is any relationship between the impact of light exposure at night and melatonin levels. "We can't make a statement yet," Figueiro says, "but that's the step we are working on."

While the challenge for research institutions like the LRC and LBNL lies in keeping up with evolving technologies and choosing the most promising ones in which to invest time and money, the rewards for all are potentially enormous. With the way things are headed, the future looks bright.

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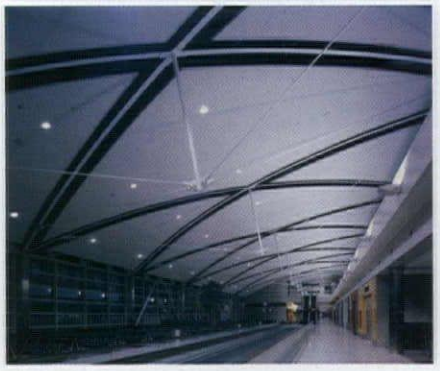

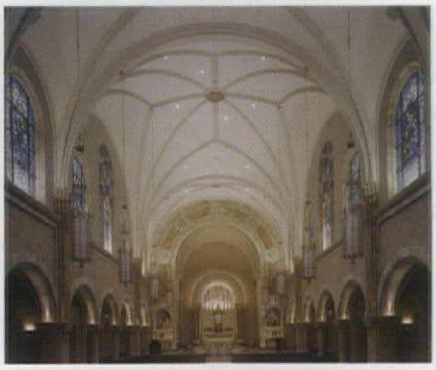

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EXCITING EXPERIMENTAL VISIONARY CREATIVE ORIGINAL INVENTIVE REVOLUTIONARY PIONEERING GROUND-BREAKING IMAGINATIVE COOL

Where does innovation come from? As the projects in our third annual Promising People, Projects, and Products issue demonstrate, the influences are as varied as the innovations themselves. Experimentation is not limited to a specific time or place; it can exist anywhere at anytime, from the world of academia to everyday practice and all points in between. Some investigations are born out of necessity, when actual projects demand new solutions to technical or design problems. Other endeavors start from theoretical beginnings. Regardless of the reason, the quest to explore new materials and forms, challenging existing practices, and finding efficient solutions is eternally integral to the design process.

The following five discussions—of projects and processes—are exciting examples of what can happen when all the right ingredients are in play. Although each has many inventive elements, specific components stood out for us as emblematic of trends afoot in the industry. These include themes of education, research, design and manufacturing partnerships, technique, and solar strategies. Solid-state lighting and LEDs are elevated from a pure color-changing spectacle to an energy-efficient solar-gathering device in Cloud-9's Hotel Habitat in Barcelona (page 40). Academy and practice unite in Virginia Tech's Solar Decathlon Competition entry, promoting interdisciplinary collaboration among students and manufacturers in an effort to create the energy-efficient home of tomorrow (page 46). In "Drawing Upon the Future," the technique of hand rendering reemerges with a new relevancy amid today's computer technology revolutions (page 48). Leading researchers and practitioners come together to prove K-12 classroom design has not been explored to its fullest potential where solar strategies and daylighting techniques are concerned (page 54). Finally, in the Garonne River project, site and technical requirements spur the creation of a new luminaire that exceeds performance expectations while making a poetic statement about landscape lighting (page 58).

The "ah-hah" moment when the proverbial light bulb goes on cannot be planned. Innovation happens when least expected, a combination of hard work and happy accident. Yet, no matter the specific area of investigation, there are elements that need to be present to promote creativity—imagination, curiosity, persistence, daring, and playfulness. These conditions must be encouraged to exist. So read on. We hope these projects begin the process. **A|L**

INNOVATION

LEDS

TECHNIQUE

RESEARCH

SOLAR STRATEGIES

DESIGN/MANUFACTURING PARTNERSHIP

EDUCATION

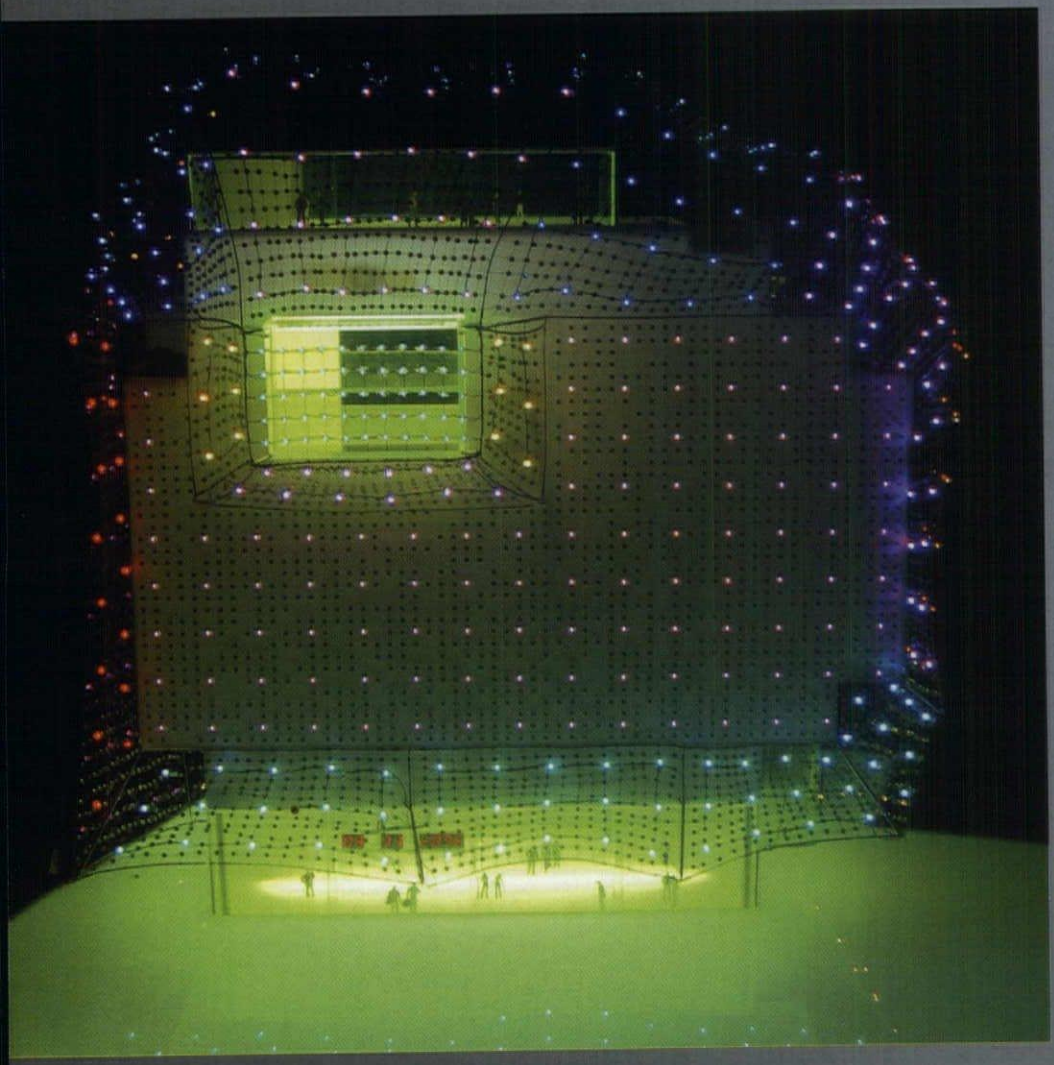
ELEMENTARY PARTICLES

AN LED DISPLAY HAS A LIFE OF ITS OWN.

AT FIRST GLANCE, BARCELONA'S NEW HOTEL HABITAT, WHICH IS CURRENTLY UNDER CONSTRUCTION AND EXPECTED TO BE completed by 2007, resembles the slew of design hotels that have sprouted in recent years in many major urban centers around the world. Its principal architects are a young, adventurous Barcelona-based collective called Cloud-9, which has invited other architects with similar attitudes toward integrating architecture with art, performance, and technology to trick out the 135-room hotel.

Enric Ruiz Geli, one of Cloud-9's principal architects, distinguishes Hotel Habitat from the rank and file of boutique hotels, referring to it as "cultural." Although the project uses design to attract guests, it takes the idea one step further by inviting artists to regularly create works within its public spaces, transforming a component of the building into an art gallery. When it opens, the hotel will become an ever-shifting panoply where visitors can come not only to bask in the high-end design, but also to get a taste of what is happening in contemporary art.

Its nod to the art world is only one facet of this innovative project. More remarkable is the stainless-steel strand mesh that drapes over the 11-story building, an orthogonal tower of stacked rectangles that cantilevers off its glass base and steps back to form a series of terraces toward the top.



This mesh, supported by a system of poles, houses 5,000 LED-loaded polycarbonate discs. By day, the building looks like an unhappy robot ensnared in a net of its own creation, but at night, when the discs light up, the hotel becomes something else altogether.

When speaking about this project, Ruiz Geli prefers the metaphor of a tree, in which the discs are like leaves. He expounds upon this comparison: "As Gaudi learned from the forms of nature, and as modernism learned from the image of nature, we learn from the behavior of nature. Nature is performative, and we like our architecture to perform." Of course, the irony is that in order to create an architecture that resembles nature, Cloud-9 has looked to and used technology. Not an outlying phenomenon, but a trend: the more technology evolves, the closer we come to matching the efficiency with which many of the natural world's systems perform.

By day, the hotel's 11-story form is obscured by a stainless-steel mesh curtain containing 5,000 LED-loaded polycarbonate discs (below).

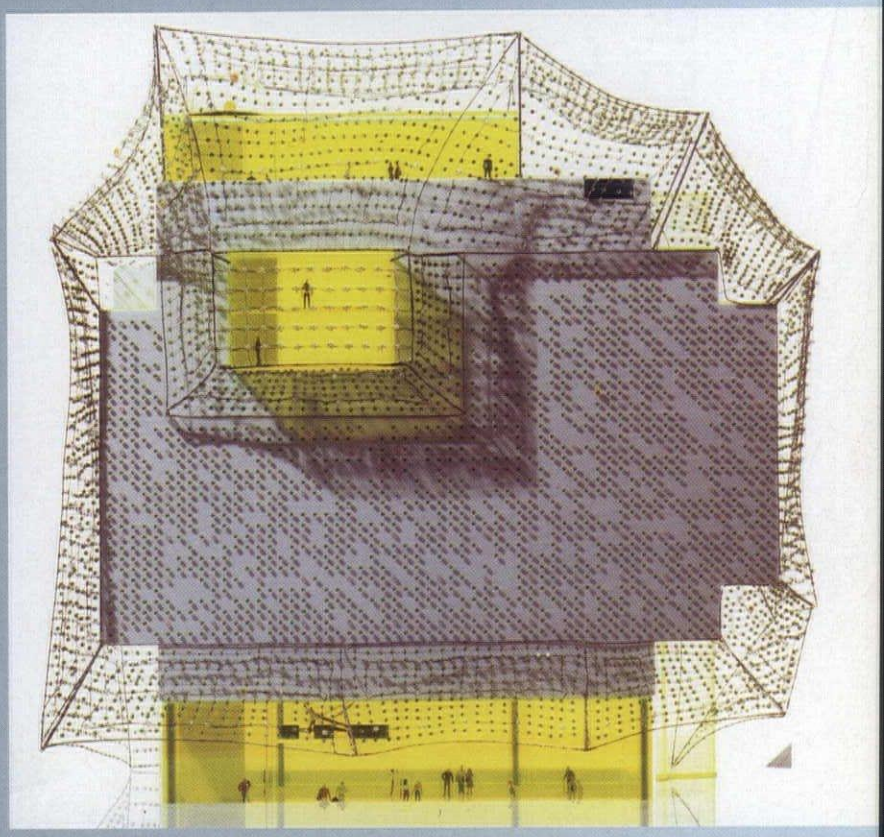
In fact, Hotel Habitat's "leaves" are performative, and in more ways than one. The discs, which cover the sun-exposed face of the building, act like their natural counterparts by producing enough shade to reduce energy consumption (in this case, associated with air-conditioning) by 15 percent. This canopy also creates a microclimate between itself and the building—a mild zone, somewhere in temperature between the sun-baked streets and the cooled interior. One has to imagine it will make the terraces and planted areas all the more enjoyable in summer.

Even more phenomenal is that each disc is completely autonomous. At night, when the LEDs "come alive," there is no universal switch that feeds them an electrical current, or system of wires in the steel mesh running to each unit. Rather, every disc is equipped with its own photovoltaic cell, battery, RGB LED, and central computer. The computers track the date and turn the lights on automatically at the pre-programmed time of nightfall. Furthermore, they measure the amount of electricity stored by the disc's battery during the day and, based on that information, activate a corresponding color of light. For example, at 10 percent energy, the LED will glow a less-energy-consumptive red; at 100 percent, it shines white; and in between is the delicate gradient of the spectrum. The result is a varied pattern of colored light, generating a nighttime aura around the somewhat humdrum structure.

This innovative system is fully self-functioning, without need for a human operator. Cloud-9 worked with Italian lighting consultants iGuzzini Illuminazione to complete the devices; however, the idea patent is owned by the architects. When the illuminated leaves reach the end of their life cycle, in about 10 years, it will not be a result of the LEDs, but the batteries. At that time, the entire leaf with all its components will be replaced, and with the constant progression of technology, there will surely be a next generation with a longer life span.

The leaves were also designed to be considerate of their surroundings. Situated at the edge of town, on the Gran Via, the major thoroughfare that connects central Barcelona with the airport, Hotel Habitat is located in a highly populated area. The light produced by the LEDs is relatively self-contained. Each polycarbonate disc is opaque green on the building side and transparent on the opposite side, so that no light shines into the rooms or illuminates anything around the hotel. As Ruiz Geli says, "The leaves don't light the street or the rooms, but themselves—like a firefly."

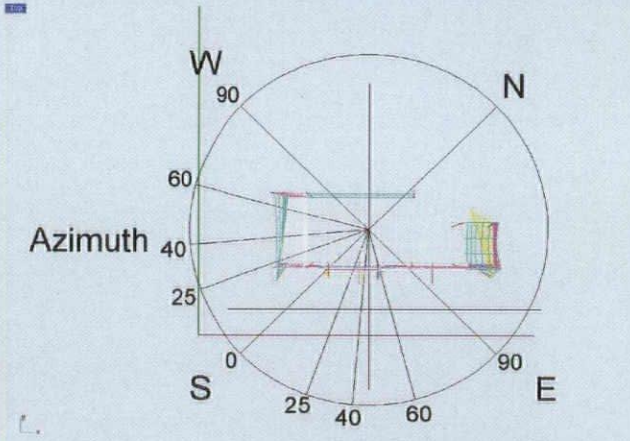
Visitors to the recent "On Site: New Architecture in Spain" exhibition at the Museum of Modern Art in New York may have seen an impressive model of the hotel, complete with 5,000 tiny LEDs illuminating in time to a clock that speeds its way through a year. In the model, the light pattern is based on one datum per month—an average of the amount of daylight the architects expect the building to be exposed to. In the actual building, however, this patterning should change every day as the electronic "leaves" receive varying amounts of sunlight, depending on the weather, position and intensity of the sun, and any accidental phenomenon.

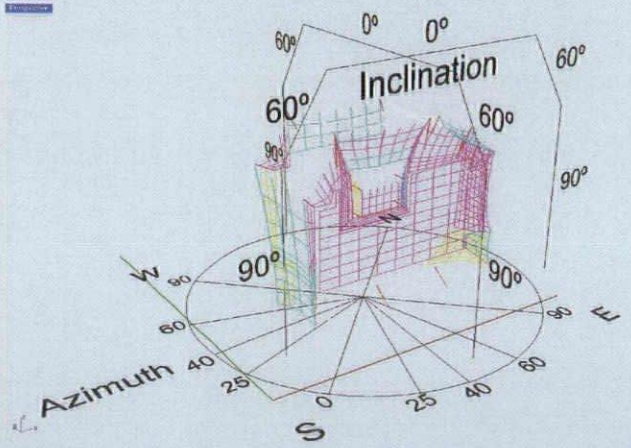


By night, when the discs light up, the hotel becomes a color-changing work of art, with each disc's hue depicting its stored energy level (facing page).

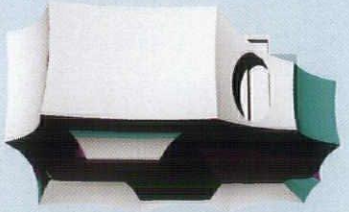
Ruiz Geli refers to this flow of light as a "map of energy," but its resonance goes deeper. The skin of leaves that wraps the building becomes a mechanical mirror of nature, and its lesson is one of randomness: day to day, the pattern of light evolves in a continuous performance of individually acting particles. Though guests may have to step back from the building to recognize its ever-changing façade, Cloud-9's enshrouding mesh of artificial leaves trumps any artistic statement that may be on display within the hotel: here you have a painting that changes every night, a representation of the prevailing light conditions at this location on earth, and an architecture that combines function, information, and expression in one tidy bundle. It is the best result one can expect from an adventurous experimentation with technology. **AARON SEWARD**

MESH MECHANICS: DIAGRAMMATIC SOLAR ANALYSIS AND DISC PROTOTYPE

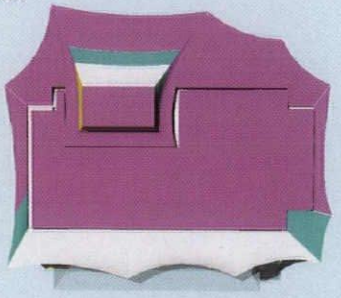




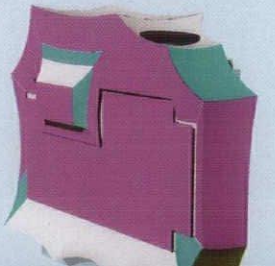
Top

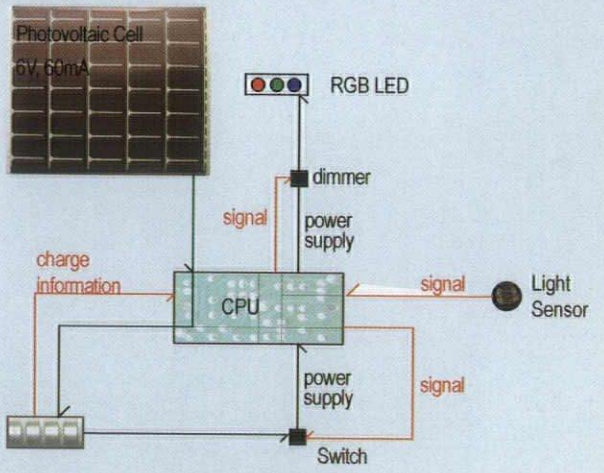


South-East

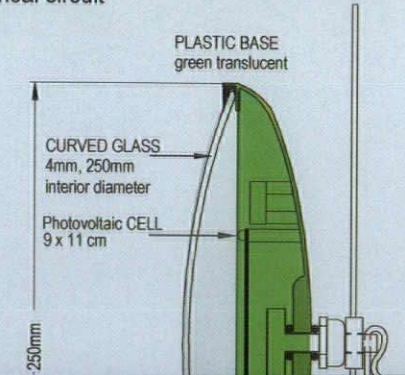


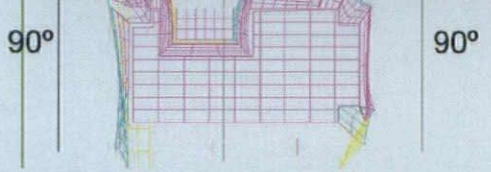
East

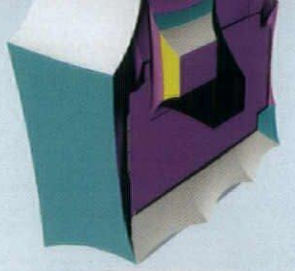




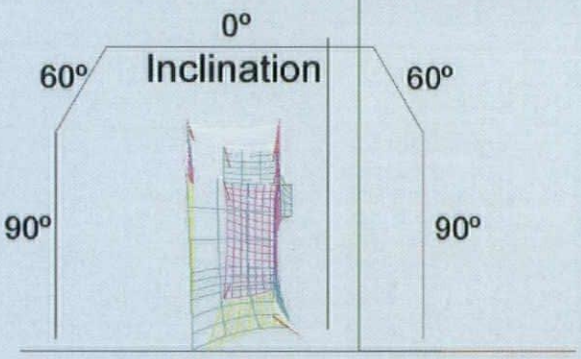
Electrical circuit



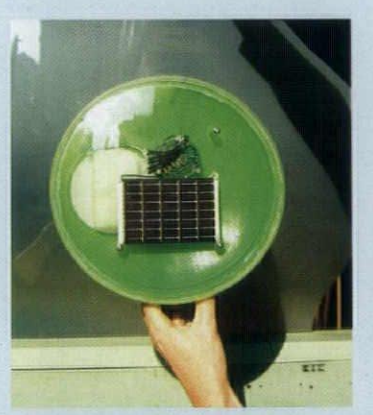


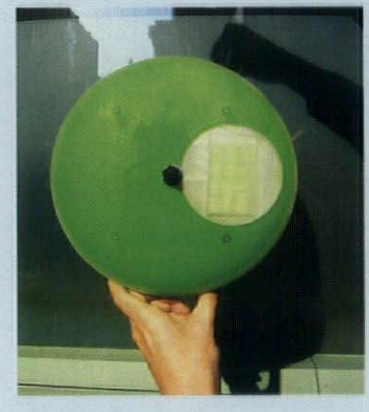


Detail prototype



West





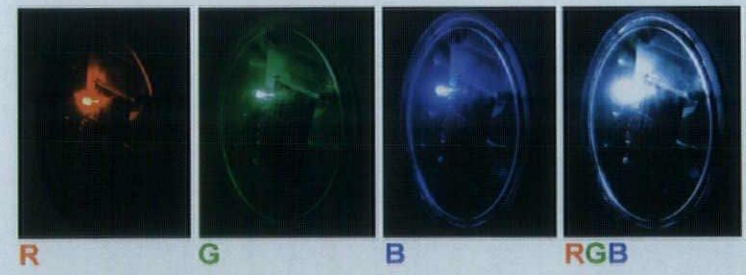
Stereolitography prototype

ANALYSIS SKIN FIELDS DURING THE MONTH OF **JUNE**

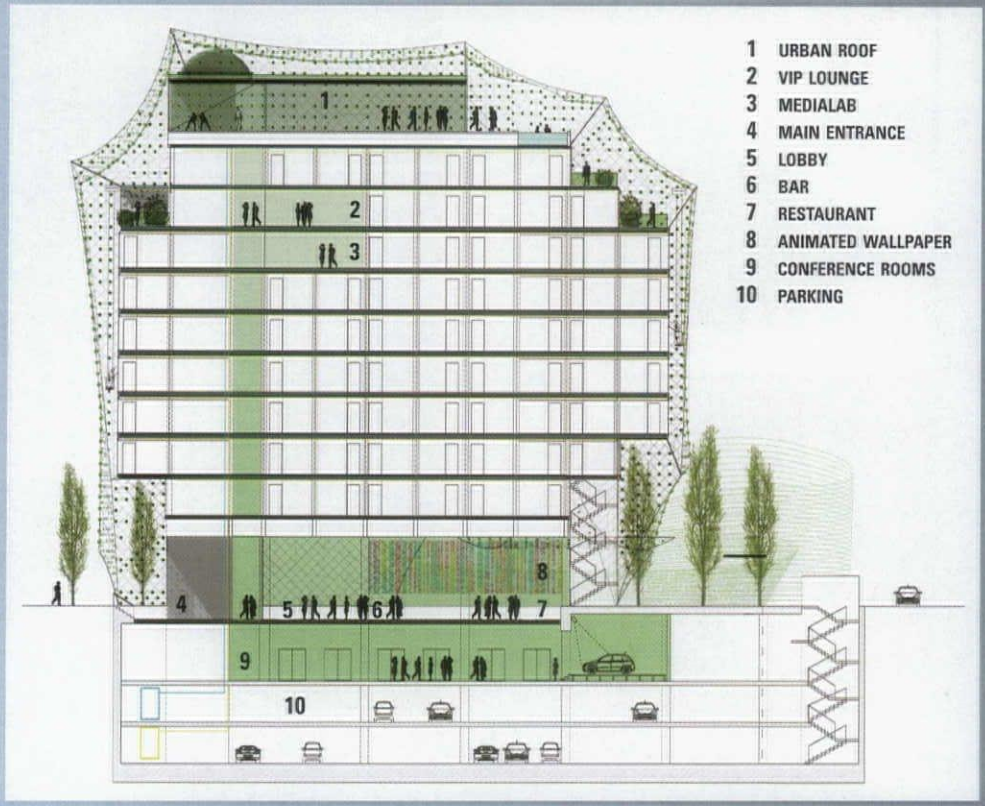
Based on the solar study by TFM:
Fields vary in anzimuth and inclination

total consume (Wh) LEDS		Colours
1,068	R,G,B	white
0,84	G,B	cyan
0,684	R,B	magenta
0,612	R,G	yellow
0,456	B	blue
0,384	G	green
0,228	R	red

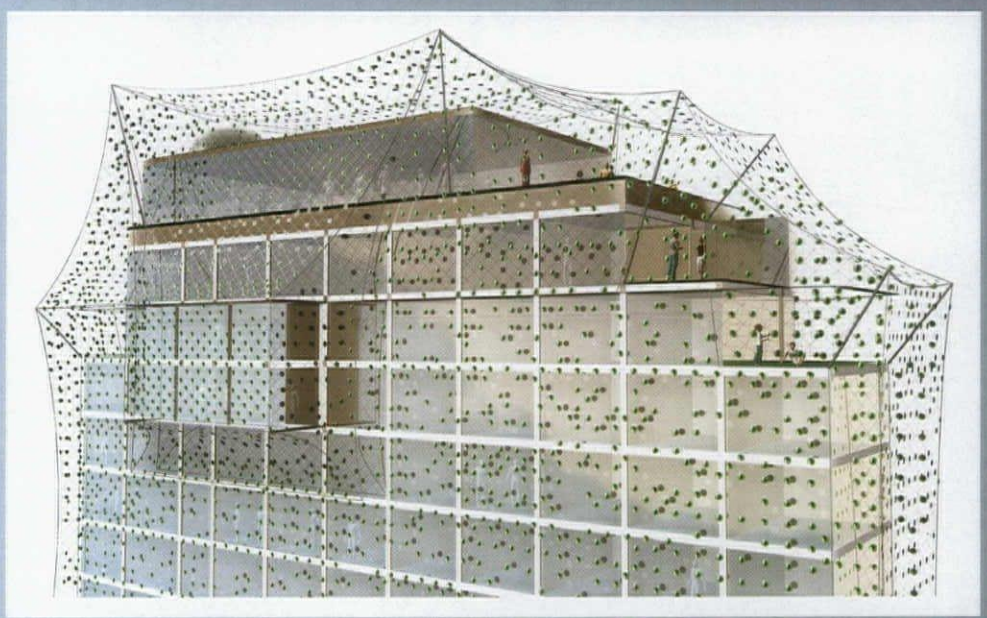
	Azimuth	Inclination 0° (horizontal)	60°	90° (vertical)
EAST	90°	-	1,216	0,884
	60°	-	1,2408	0,8584
	40°	-	1,22	0,8074
	25°	-	1,18	0,7093
SOUTH	0°	1,6096	1,1416	0,6152
	25°	-	1,18	0,7093
	40°	-	1,22	0,8074
	60°	-	1,24	0,8584
WEST	90°	-	1,216	0,884



Studies conducted on the sun's azimuth (its horizontal direction measured around the horizon) and inclination (the angular distance of the orbital plane from the plane of reference) to the mesh façade determine the amount of sun exposure the hotel will receive on each of its many faces (above left). The energy consumed translates to a corresponding color in the key (above), and is represented on a series of color-coded renderings (above middle). In the right-hand column, two diagrams show the components comprising each disc and its inner workings, while images of the device itself provide scale and color (above right).



The hotel contains a variety of public spaces (above). Resembling leaves, the discs mimic the function of their natural counterpart by producing enough shade to reduce the hotel's energy use by about 15 percent (below).



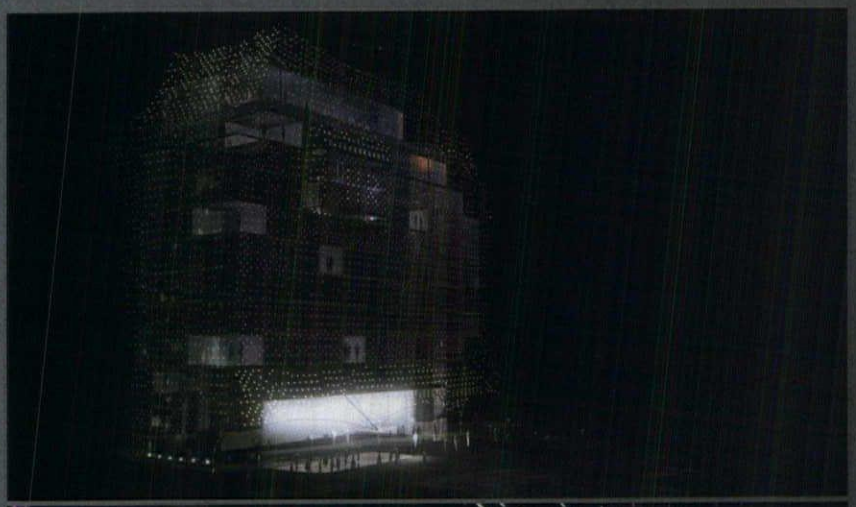
DETAILS

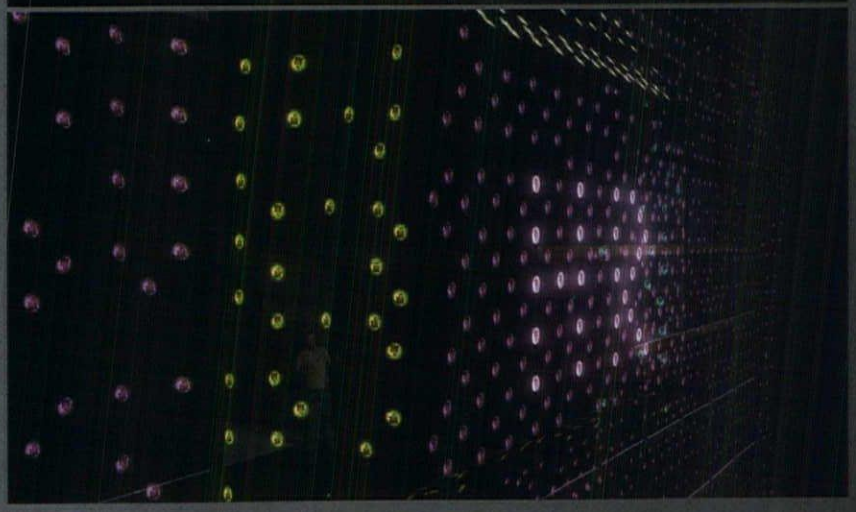
PROJECT Hotel Habitat, Barcelona
CLIENT Habitat Grupo Inmobiliario, Barcelona
ARCHITECT/INTERIOR DESIGNER Enric Ruiz Geli, Cloud-9, Barcelona
LIGHTING DESIGNER James Clar and Max Zinecker, Cloud-9
LIGHTING CONSULTANT iGuzzini Illuminazione, Recanati, Italy
COLLABORATING ARCHITECTS Acconci Studio, Brooklyn, New York; Ruy Ohtake, Sao Paulo, Brazil
IMAGES/RENDERINGS IK Studio, Girona, Spain

MANUFACTURERS	APPLICATIONS
BP Solar	Photovoltaics
iGuzzini	Polycarbonate discs integrated into building mesh
Industries BEC	LED-illuminated stainless-steel mesh

more **images** available at ARCHLIGHTING.COM

Light from the discs is relatively self-contained, thereby preventing light spill (above and below), but an opaque green backing prevents light from shining into guests' rooms (bottom).



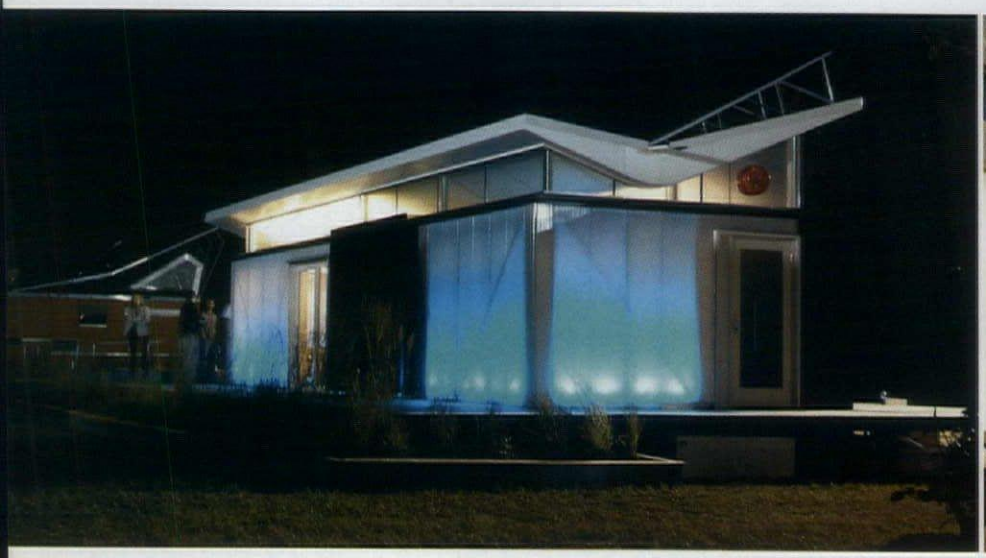


SOLAR LIVING

A fully integrated design process creates a seamless application of electric and daylighting solutions.

COLLABORATION BETWEEN STUDENTS, PRACTITIONERS, AND INDUSTRY IS RARE; BUT, AS EVIDENCED IN Virginia Tech's house for the Solar Decathlon Competition last fall, the potential for innovation when these partners come together is high. With this project, Virginia Tech committed to breaking down some of the traditional barriers between the classroom and the real world. For the team, innovation meant the synthesis of extensive research into a unified whole that could be implemented successfully toward a specific goal, but with the potential for more widespread purpose.

Held for the second time in 2005, the biennial Solar Decathlon competition is sponsored by the United States Department of Energy (DOE) with the goal of creating and further developing sustainable energy strategies for residential construction. The interdisciplinary nature of the competition supported such a goal, allowing students from design and engineering disciplines to work together to fulfill the quantitative and qualitative criteria outlined by the competition. Eighteen international student teams installed their entries on the Mall in Washington, where they were judged in 10 categories, ranging from architectural merit to power generation ("Solar Decathlon," Nov/Dec 2005). The Virginia Tech team members took the competition's mandate as a challenge to integrate sustainable strategies seamlessly into their competition entry, and in the process, created unconventional solutions with direct applicability. In doing so, their home won the Architecture, Dwelling, and qualitative Lighting contests, and was noted for its "clean and integrated" design solution.



The innovative wall and roof designs take advantage of some of the latest building materials technologies. LED arrays, located at the base of the walls in the air gap between two layers of polycarbonate sheeting, illuminate the walls from within. The V-shaped roof profile orients solar panels, and functions as a light diffuser and rainwater collector (above left). By day, light also enters the house through clerestory windows (above right).

The theme for the Virginia Tech entry was "No Compromise: the Integration of Technology and Aesthetics." According to Joe Wheeler, assistant professor of architecture, who served as the lead project advisor, "Every decision involving quantitative criteria was measured in terms of its contribution to spatial quality." This played out most directly in the form of the house's roof, which is imbued with multiple functions. The V-shaped profile correctly orients solar panels, and functions as a light diffuser and a rainwater collector, while creating a lofted spatial experience inside. The roof is literally an inversion of the traditional residential roof profile, a move that carries symbolic weight as much as it offers inherent functionality.

The initial design for Virginia Tech's entry was the result of a school-wide competition intended to gain interest in the project. This "internal" competition established the unique roof shape and helped assemble a team of nearly 80 students spanning seven disciplines (architecture, industrial design, interior design, landscape architecture, building construction, and electrical, mechanical, and structural engineering). A materials research class, taught by Wheeler and specific to the competition, provided much of the raw material for the project and established initial contacts with more than 75 different industry members. The involvement of manufacturers meant that students

were able to experiment with the latest technologies, and allowed the teams to create projects that far exceeded the $5,000 stipend provided by the DOE.

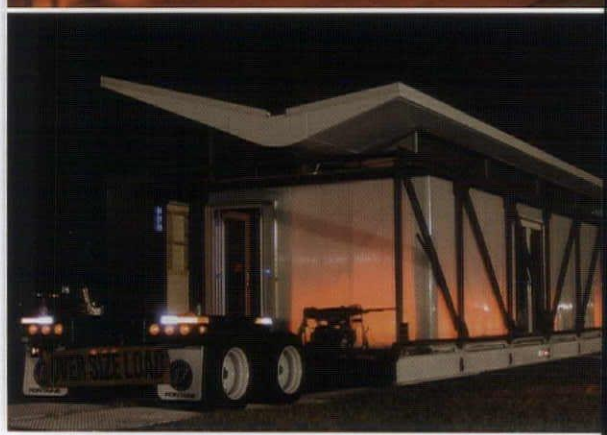
Designed with a full integration of lighting solutions, architecture serves as the link between daylighting and electric lighting, allowing each formal element to serve double duty. Lighting designer Andrea Hartranft, a senior associate at Philadelphia-based C.M. Kling and Associates and a colleague of Wheeler's, served in an advisory capacity on the project, helping the team to refine its electric lighting scheme, particularly techniques for uniformly uplighting the angular ceiling. During the day, light enters the house in two modes: directly through south, east, and west clerestory windows, where it then bounces off a fabric ceiling bathing the main room with light; and through translucent wall panels, which create an interior glow. These polycarbonate panels, filled with aerogel, a clear insulating material, provide significant thermal ratings relative to the amount of light transmitted. The entire wall assembly has a resistive value of R-22 and above, with the typical residential wall ranging from R-12 to R-24.

At night, interior electric lighting takes the place of the sun's rays. A strip of T5 dimmable fluorescent fixtures, located on a light shelf just below the clerestories, illuminates the fabric ceiling to provide an ambient lighting condition, and is also supplemented with low-voltage tasklighting. On the exterior of the light shelf, an additional fluorescent fixture highlights the outer edge of the roof, defining its unique form at night. LED arrays, located at the base of the walls in the air gap between the two layers of polycarbonate sheeting, illuminate the walls from within, providing an evening glow that adds to the interior ambient light. In addition, software driving the LED arrays allows users to control the wall and change its colors on demand, making for an interesting visual for viewers both inside and out.

While the color-changing aspect of the wall is not "necessary" it is playful, and therefore, memorable. As a result, the unique wall assembly has been used since the competition, most notably in a meditation pavilion built as part of the ABC show "Extreme Makeover: Home Edition," which attracted an estimated 25 million viewers. According to Wheeler, calls about the wall system have been so frequent, that they are considering manufacturing and selling it.

Gary Steffy, a Michigan-based lighting designer who served as one of the judges for the lighting contest, was impressed by the integration of architecture and lighting. "It was a seamless application that could only have been achieved by working with the architecture from day one." **ZACHARY R. HEINEMAN**

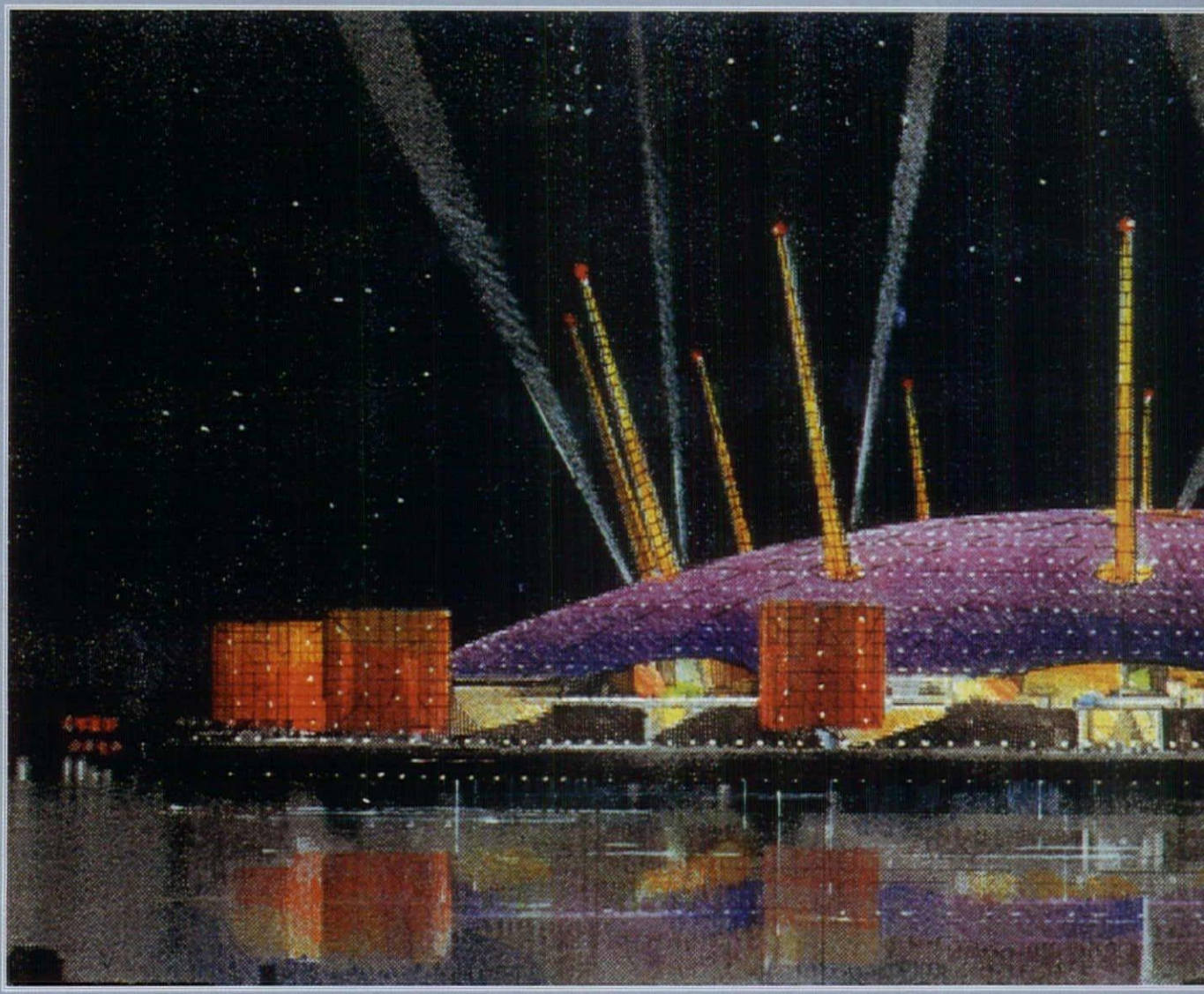
Architecture serves as the link between daylighting and electric lighting solutions. The result is the creation of a spacious-feeling interior, despite being 590 square feet (below). The color-changing aspect of the wall adds a playful lighting element and allows user interaction (center). Projects were constructed offsite and then transported to the Mall in Washington (bottom).



DETAILS

PROJECT Virginia Tech Solar Decathlon House, Washington
DESIGN TEAM Multidisciplinary student team at Virginia Tech, Blacksburg, Virginia
FACULTY ADVISOR Joe Wheeler
IMAGES Courtesy of Virginia Tech
PROJECT SIZE Overall footprint: 800 square feet; floor plan: 590 square feet
PROJECT COST $275,000 (in-kind donations of materials and equipment); $100,000 (financial contributions)
LIGHTING COST $25,000 (in-kind donations of materials and equipment)

MANUFACTURERS	APPLICATIONS
Cabot Chemical Co.	Translucent aerogel insulation in polycarbonate walls
Color Kinetics	Color Cast LED lighting system for translucent wall assembly
Elliptipar	Interior dimmable fluorescent F305-T5 fixtures lighting the interior curved fabric ceiling
GE Plastic	Polycarbonate wall panels
Glass Dynamics	Insulated glass
Häfele	Monorail, cable low-voltage lighting systems, and undercounter puck lighting
Lithonia	T5 fluorescent fixtures at outer roof edge
Lutron	Dimmers, dimmable ballasts, daylight and occupancy sensors
MechoShade	Reflective white ceiling stretch fabric
Spore	LED-illuminated house number and doorbell



DRAWING UPON THE FUTURE

Does the tried and true art of sketching have staying power among new technologies?

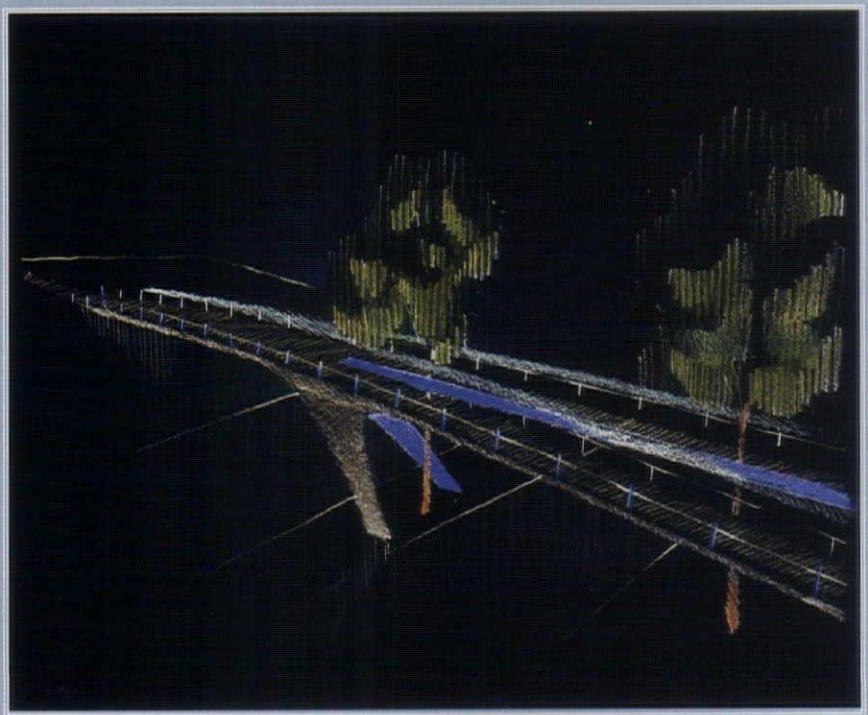
FEW WOULD DENY THAT TECHNOLOGY IS A BEAUTIFUL THING. AMONG architecture and design professionals, who are increasingly reliant on computers to explore and depict the intricacy of their work, that fact is well established. This being an issue dedicated to innovation and the future, it may seem a digression to celebrate the art of hand rendering when there is so much exciting technology to consider. Many would argue, however, that the relevance of drawing skills to successful design is timeless, and that the ongoing subordination of pencil and paper to fancy computer software is a tragedy in the making.

"Sketching is really missing in lighting design education and practice," says Larry French, a principal of San Francisco-based lighting design firm Auerbach Glasow. "It's a dying art." He is not alone in his lament. Jonathan Speirs, whose U.K. firm Speirs and Major Associates produces hand-drawn renderings that could easily appear in a fine art gallery, agrees: "Architecture students are thrown into computer programs, because to be employable today, you need to know CAD. They are spending less time on freehand drawing, and more time

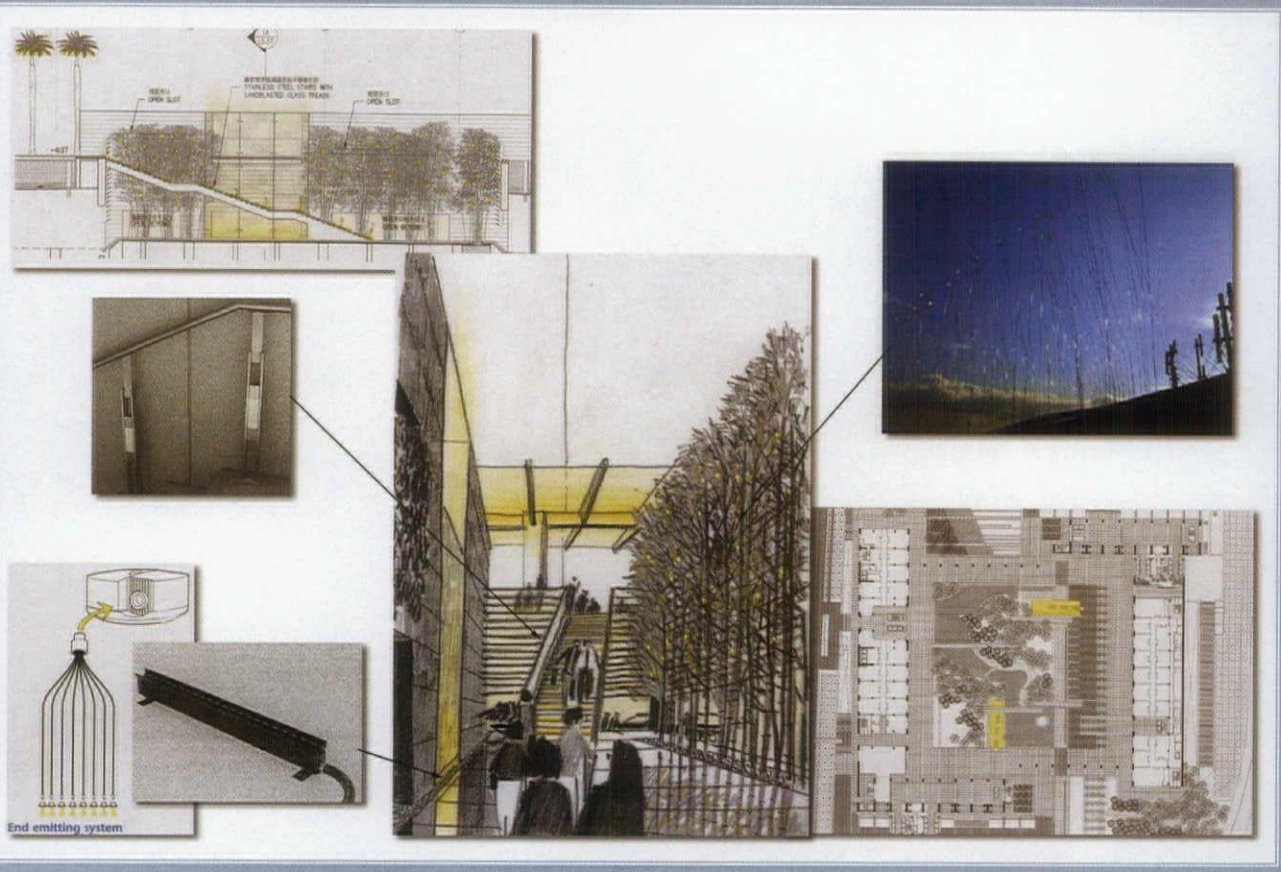
SPEIRS AND MAJOR ASSOCIATES,

LONDON AND EDINBURGH

"The ability to sketch is important for us," says Jonathan Speirs, noting that his firm studies an applicant's sketchbook as part of the interview process. Unlike other firms that use hand rendering for in-house meetings only, Speirs and Major incorporates its drawings—which are striking and memorable—throughout the presentation process. "If you want the client to sign off on that killer idea, you have to have a great way of presenting it," says Speirs. Amazingly, most of the drawings take very little time, such as the crayon sketch of the Lorenskog Bridge in Norway (right), which Speirs says required 10 minutes. Here, line weight, thickness, and color communicate the idea. His partner, Mark Major's 3-foot-long drawing for the Millennium Dome in England, however, was a day's project (above). It formed one of about 25 presentation panels.



RENDERINGS THIS PAGE COURTESY OF SPEIRS AND MAJOR ASSOCIATES



AUERBACH GLASOW, SAN FRANCISCO This assembly of sketches and product images for a large mixed-use project in Guangzhou, China, was presented to a non-English speaking client. A small amount of strategically placed yellow pencil goes a long way to clarify the designers' concept. Notes principal Larry French, "There is something conceptually loose about the hand that adds the human element. The designer has touched it."

on the computer, which in my opinion, is to the detriment of the students." While Speirs willingly admits his shortage of CAD skills may influence this bias, he still maintains "a sketch is a fantastically good way to communicate an idea."

Indeed, argue both French and Speirs, what hand-drawing skills provide the designer is the practical ability to express a concept—quickly, fluidly, with an architect or a perspective client, in the middle of a meeting, or anywhere else for that matter. "If you have to say 'Hold that thought, I'll be back in a day,' and rush back to your office to work something up, the moment is lost," says Speirs, who also feels that the ability to communicate ideas this way "helps you, as the lighting designer, fit into the camp of the architect."

The importance of the sketch goes beyond its usefulness in the meeting room: the act of putting pencil to paper, for many architects and designers, facilitates the creative process and distillation of ideas, which can be thwarted in the hyperrealism and rigid methods imposed by the computer. Derek Porter, who is both a practicing lighting designer and director of the lighting MFA program at New York City's Parsons the New School for Design, sees sketching as a good exercise toward a better visual understanding of the world. "I believe there is a cognitive connection between eye and hand relationship and coordination, and seeing and understanding form, shape, subtlety of surface, and so on," says Porter, who was trained in the fine arts.

Like French and Speirs, Porter has observed an evolutionary move away from sketching in design education; however, a coexistence of computer and hand is recognized in the programming at Parsons, with hand drawing emphasized in the first year. "Just as we try to balance professional practice and theory, we also try to balance hand drawing and technology," explains Porter. "We're always looking at these dualities and how they play into one another." With many architectural and design programs having moved away from drawing technique instruction, the future of hand rendering in design school may be about teaching future practitioners where, when, and how to use this skill as a complement to the computer technology that has transformed the drawing delivery process.

For Speirs, the importance of sketching is trumped by another critical skill designers must possess—the ability to imagine. "Before you put pen to paper, you need to know what you are drawing," says Speirs. "You have to visualize it in your mind." No matter how advanced technology interfaces become, the ability to conceptualize, envision, and create still remains the domain of the designer and the distinguishing feature that will always make the touch of the human hand necessary in the design process. **EMILIE SOMMERHOFF**

more **drawings** available at **ARCHLIGHTING.COM**

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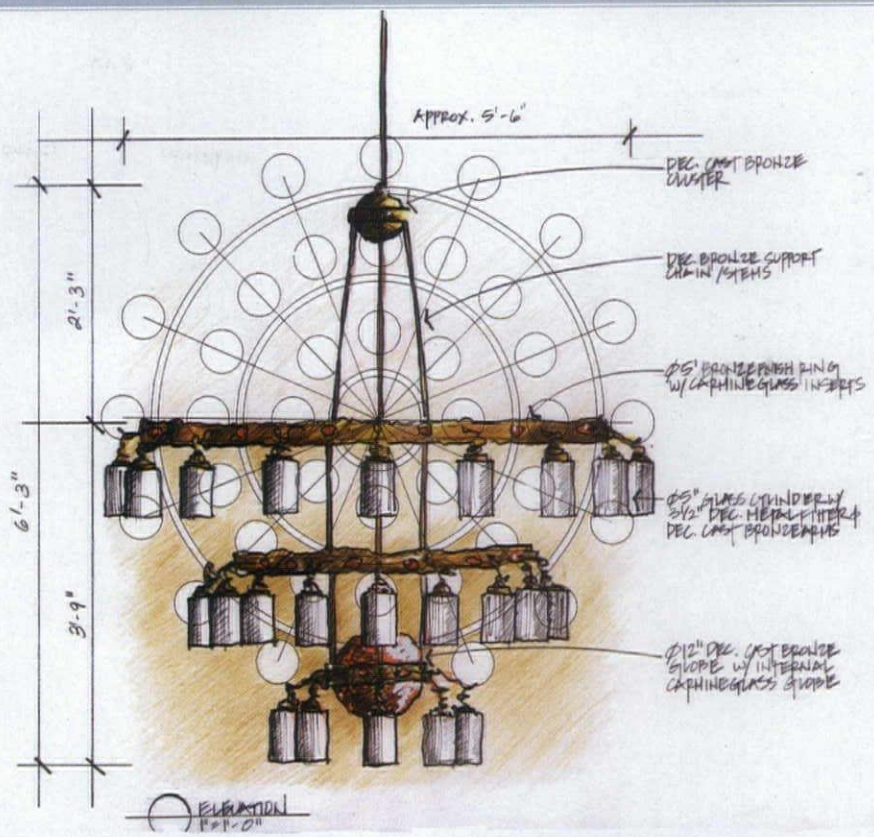
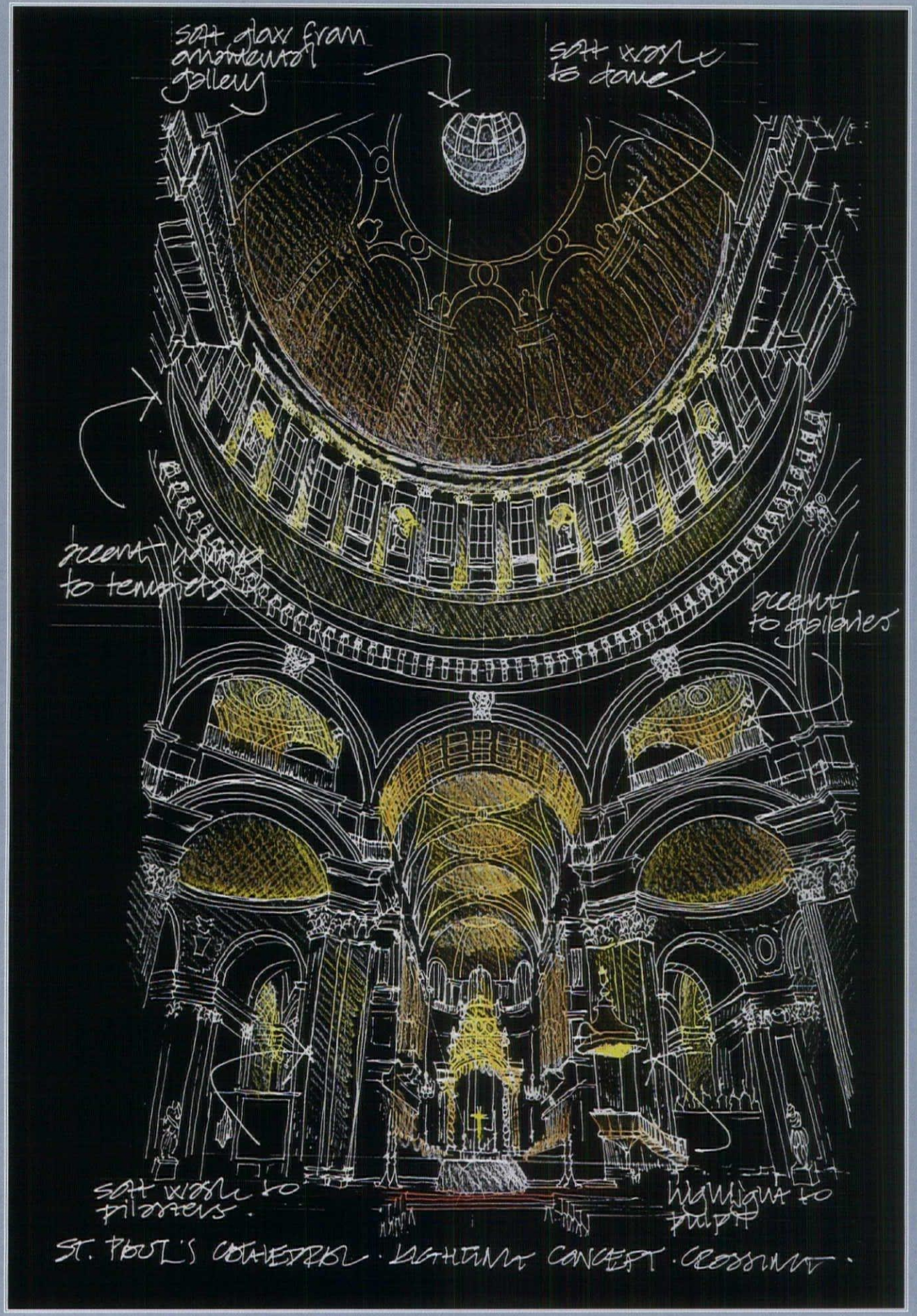


FISHER MARANTZ STONE, NEW YORK "People don't talk with a pencil anymore," says Charles Stone. While his firm has mostly moved away from hand drawing except for in-house communications, somehow a sketch seems appropriate for the historic reproduction of a 1928 chandelier for the McCarter Theatre at Princeton University in New Jersey. The project was competed in 2003.

STEVEN HOLL ARCHITECTS, NEW YORK For Steven Holl, his identifiable watercolor drawings have become part of his brand. In this poetic rendering, morning light is depicted entering Pratt Institute's Higgins Hall basement auditorium, located in Brooklyn, New York.

RENDERINGS THIS PAGE COURTESY OF FISHER MARANTZ STONE (TOP); STEVEN HOLL (BOTTOM)


soft glow from amenities gallery
soft wash to dome
accent to galleries
soft wash to pilasters
highlight to pulpit
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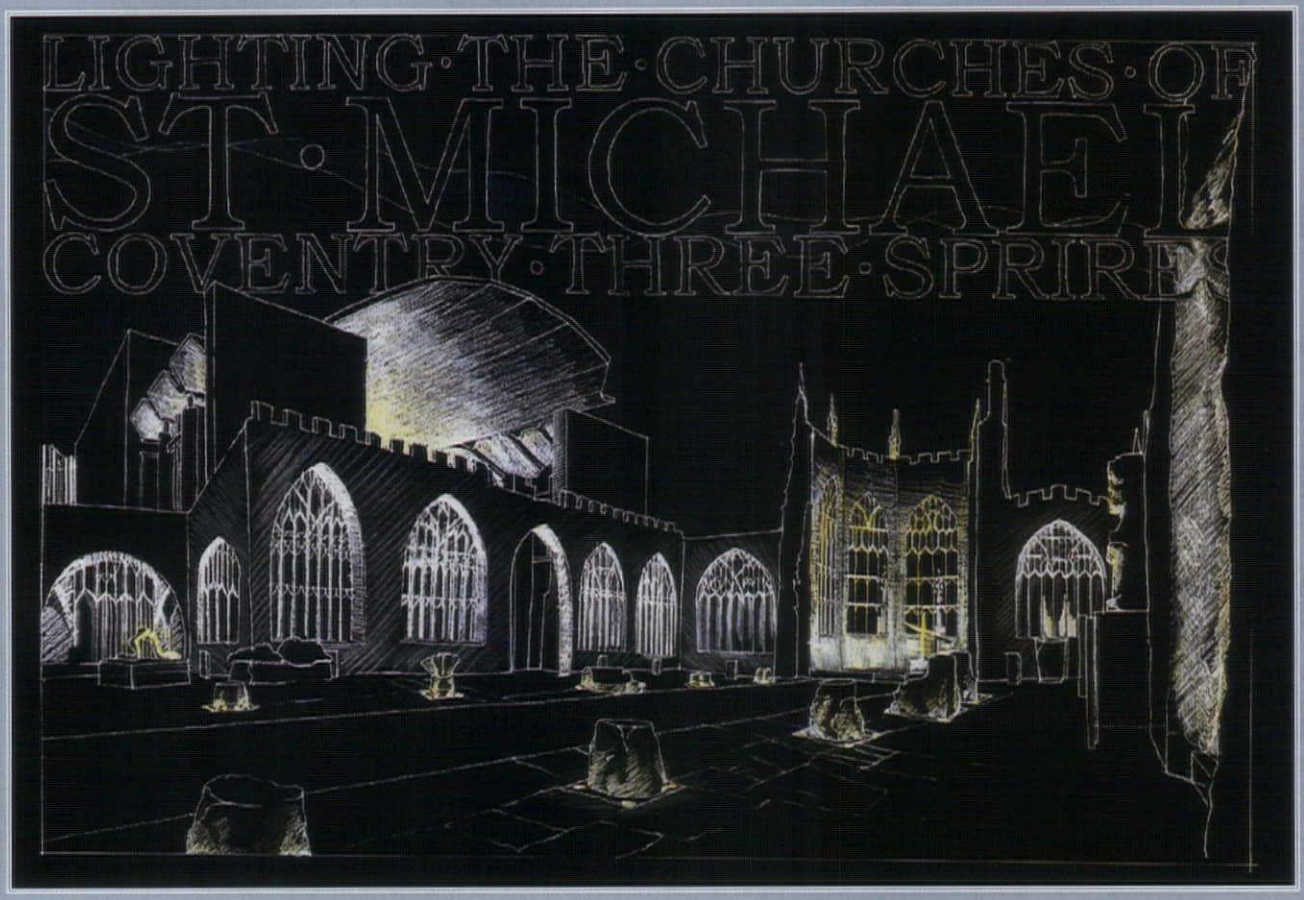
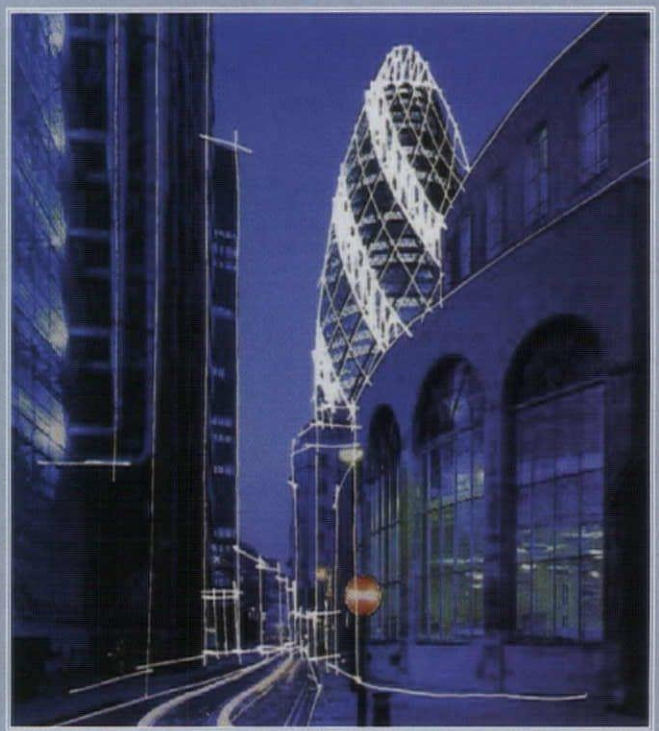


SPEIRS AND MAJOR ASSOCIATES, LONDON AND EDINBURGH **"Ultimately, it comes down to how you communicate an idea with a very few lines," says Speirs. These drawings seem much more complicated than "a few lines," however. The firm's sketch for St. Paul's Cathedral in London (facing page) shows the brightness hierarchies, depicting how the light levels drop off as the dome rises before celebrating the oculus of the crown. The sketch for the Coventry Cathedrals (above) demonstrates the contrasting lighting approach for the ruined cathedral versus the new one behind it. A line drawing superimposed on another image shows the firm's intention to express the spiral atria of the Norman Foster-designed Swiss Re headquarters with internal lighting only (below right). Finally, a sketch for the city of Newcastle, England, and its haymarket area establishes one aspect of the major urban lighting strategy.**



RENDERINGS THIS PAGE COURTESY OF SPEIRS AND MAJOR ASSOCIATES

A LESSON IN DAYLIGHTING

The key components of the Mount Angel high-performance classroom prototype are a skylight with automatically adjusting louvers and a specially designed apparatus called the "halo," which hangs below and helps reflect light (above). Throughout the testing period, the mockup functioned as both a working lab and a classroom (below). Seen from directly below, the skylight and halo have a sculptural quality (facing page).

Three of the Northwest's experts on energy efficiency prove what daylight can do.

AS SUSTAINABILITY AND ENERGY EFFICIENCY HAVE COME TO OCCUPY AN EVER-GREATER role in mainstream architecture, no building type has embraced these principles more than schools. Maybe it is a result of the reported higher test scores that come when students learn in naturally lit classrooms, or the reduced operating expenses that ease the burden of constricted education budgets. No matter the motivation, the Northwest is now dotted with elementary, middle, and high schools that offer better learning environments and significantly reduced operating expenses through sustainable high-performance design.

Recently, a trio of the Northwest's foremost experts on energy-efficient design resolved to build a full-scale mockup of a K-12 classroom: G.Z. Brown, professor of architecture at the University of Oregon and director of the Energy Studies in Buildings Laboratory in Portland and Eugene, Oregon; Mike Hatten, principal of SOLARC Architecture and Engineering; and Heinz Rudolf, principal with BOORA Architects and designer of several nationally renowned LEED-rated Northwest schools. Responding to utility company and lighting designers' doubts that a high-performance classroom could be constructed using available light and outside air so that no electric lights, heating, or air conditioning would ever be needed during the day, the three came together to create a classroom that adeptly employed these principles. They also wanted to prove that such a space could be built and priced at a lower cost than the current standard construction rates for a regular K-12 classroom.

RETHINKING THE SKYLIGHT

Their approach starts with a wide skylight in the middle of the room. But this is no ordinary skylight. "In order to meet the required light levels on overcast days you need a large opening," Brown explains. "But that means the rest of the time, it's too big." As a result, the skylight, constructed of polycarbonate, is outfitted on top with a succession of integrated louvers that automatically adjust based on sensor readings, opening and closing in relation to the amount of available sunlight, so that a minimum interior light level of 20 to 40 footcandles (a range chosen by the team because it represents existing national and international standards) is maintained at all times during daylight hours.

Another issue of concern was the distribution of light from the center to the perimeter areas of the classroom. A specially designed apparatus called the "halo," a rectangular-shaped fixture that hangs below the central skylight, addresses this. Each of its four sides consists of translucent cellular plastic that reflects a portion of the light from above onto the ceiling and walls. "The edge of the classroom gets two sources of light: from the skylight, called the sky component, and reflected light off the halo and ceil-

For the small percentage of time when a K-12 facility might operate outside of daylight hours, a high-efficiency luminaire is integrated into the skylight / halo system. Ceiling fans provide air circulation to aid in overall cooling (left). The light sensor (above) adjusts the louvers to maintain an overall light level of between 20 to 40 footcandles throughout the classroom.

ing," Brown explains. "The middle of the room gets light reflected around the room and light that penetrates through the halo."

Part of what Brown, Hatten, and Rudolf hoped to illustrate with the prototype was that a classroom could be lit during the day without any electric light. The team based this premise on the assumption that classrooms are primarily occupied only during these hours, but because there are times when K-12 facilities are used at night, Brown and his team decided an electric source was also needed to round out the halo's functionality. "What contributes to the cost of a lighting system is the number of fixtures that the wires must travel to," Brown continues. "So we used one big light, put it in the middle of the room, and shined it toward the ceiling. We light the whole space with just that one fixture, a 450W HID pointed upward."

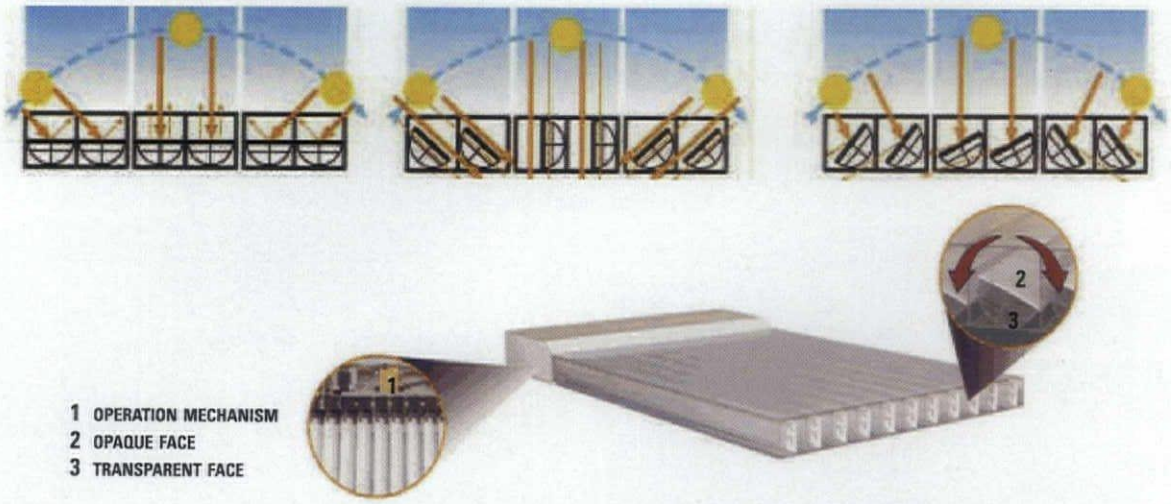
THEORY INTO PRACTICE

The classroom that Brown, Hatten, and Rudolf envisioned has been built on the Mount Angel Abbey campus in Saint Benedict, Oregon, about an hour's drive from Portland. Although the team always intended for its idea to move from model to full-scale mockup, it owes its speedy realization to happy circumstance. During a visit to the Energy Studies in Buildings Laboratory in Portland, architect Kent Duffy, principal at SRG Partnership, saw Brown studying a model of the classroom. Intrigued, Duffy asked about using the prototype classroom concept for a new academic building consisting of classrooms and offices SRG was designing at the seminary. The Mount Angel Abbey Academic Center is currently under construction, slated for completion by end of summer 2006. Meanwhile, the full-scale mockup remains available for testing purposes and is housed in a warehouse at the school.

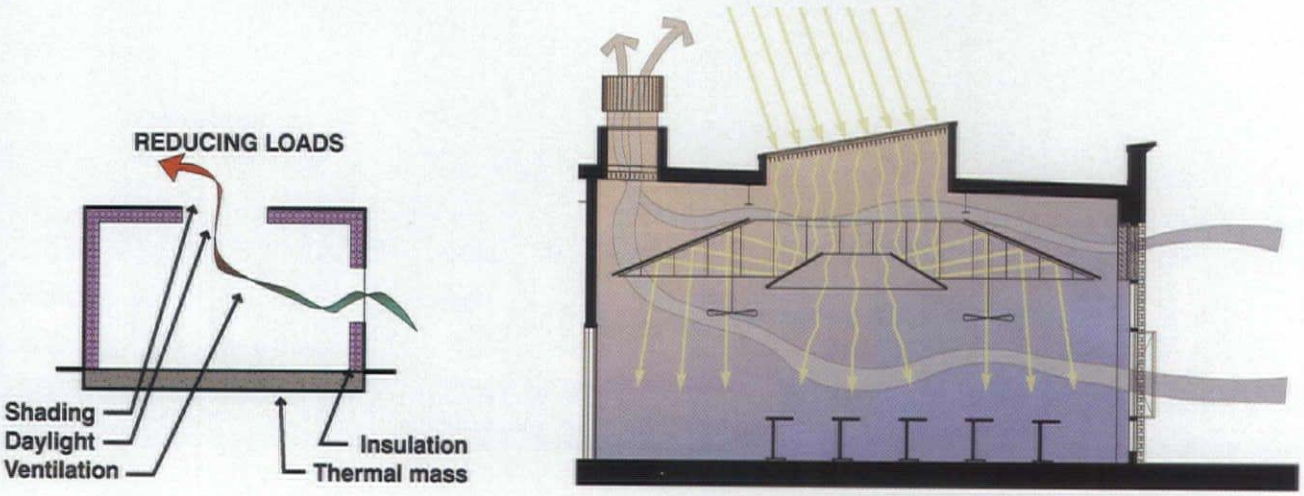
The results of the Mount Angel prototype are impressive. "We're looking at some fairly phenomenal Energy Use Index numbers," Hatten says of the seminary building's classrooms, based on monitoring of the prototype. "We're projecting 28,400 BTUs per square foot annually. The base-case code-compliant classroom would be 73,200. That's 62 percent better than code." Brown believes that with additional insulation, energy savings could be even higher: as much as 70 percent better than code requirements.

FROM THE GROUND FLOOR UP

Although the classroom mockup is complete, Brown and Hatten believe there is still opportunity for further experimentation. For



The louvers integrated into the skylight glazing panel adjust, based on sensor readings, for optimum solar control (above). The skylight and the classroom windows allow light and air to enter the space, enabling for natural ventilation (below).



example, the current version is designed to meet weather conditions specifically west of the Cascades, where the climate is moderate. Ultimately, it is hoped a modified configuration could be adapted to the range of temperatures east of the mountains, or perhaps another climate altogether. "It is likely to require some aspect of supplemental heating and/or cooling," Hatten says. The classroom layout is also geared specifically for single-story structures, but a version of the design could be adapted to two-story buildings using light shafts between the upper and lower floors.

The efforts of design experts like Brown, Hatten, Rudolf, and Duffy will continue, as more and more institutions embrace the opportunity for enhanced human performance and energy efficiency that comes with sustainable schools. The Mount Angel prototype is merely one step in a longer journey, but it is also something not to be forgotten anytime soon: the project proves that even in the Northwest, it is entirely possible to light, heat, and cool classrooms using only the natural resources of sun and wind. **BRIAN LIBBY**

A freelance writer living in Portland, Oregon, Brian Libby's focus is on architecture and film.

DETAILS

PROJECT High-Performance Classroom Prototype, Saint Benedict, Oregon
PROTOTYPE DESIGN TEAM G.Z. Brown, professor of architecture, University of Oregon, and director of the Energy Studies in Buildings Laboratory in Portland and Eugene, Oregon; Mike Hatten, principal, SOLARC Architecture and Engineering, Eugene; and Heinz Rudolf, principal, BOORA Architects, Portland
PROTOTYPE SIZE 900 square feet
WATTS .5 watts per square foot
PHOTOGRAPHER Jamie Meyers Forsythe, Portland, Oregon

MANUFACTURERS	APPLICATIONS
SKYLIGHT SYSTEM	
CPI	"Control Light" integrated louver assembly
INTEGRATED LUMINAIRE FOR EVENING USE	
Crescent	MSF Series T5 ministrip
Philips	Silhouette Series T5HO fluorescent
Lithonia	Indoor high-bay HID luminaire

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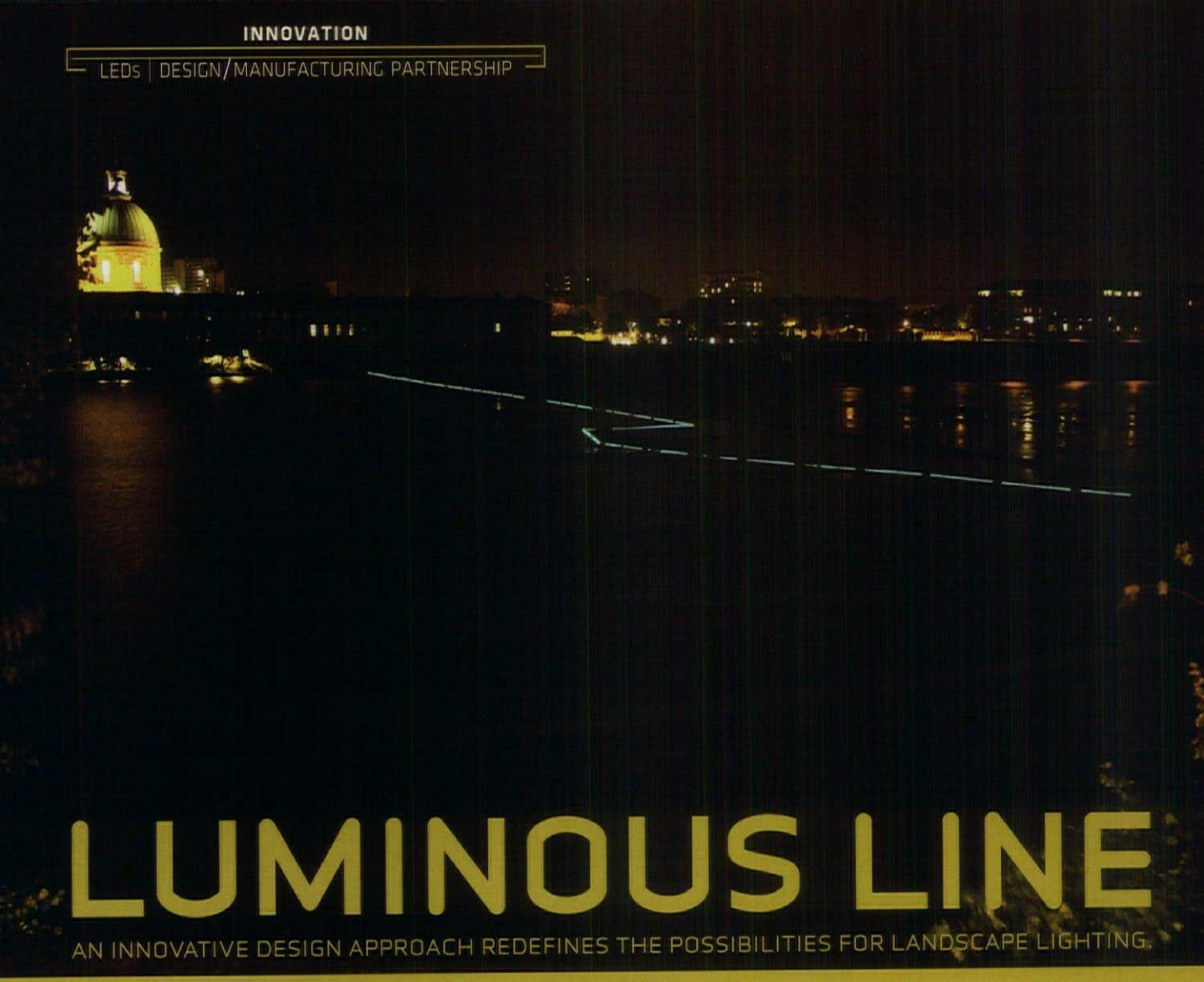


LUMINOUS LINE

AN INNOVATIVE DESIGN APPROACH REDEFINES THE POSSIBILITIES FOR LANDSCAPE LIGHTING.

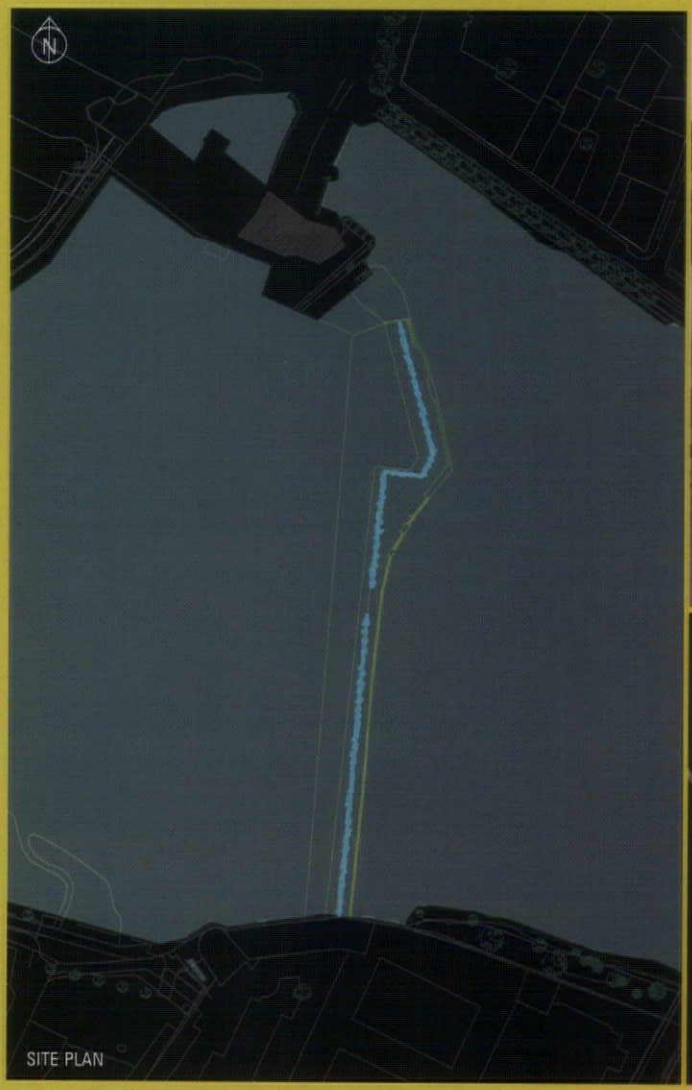
SIMPLICITY DOES NOT ALWAYS IMPLY A LACK OF COMPLEXITY. SUCH IS THE CASE WITH the recently completed illumination of the Bazacle Causeway on the Garonne River in the city of Toulouse, France.

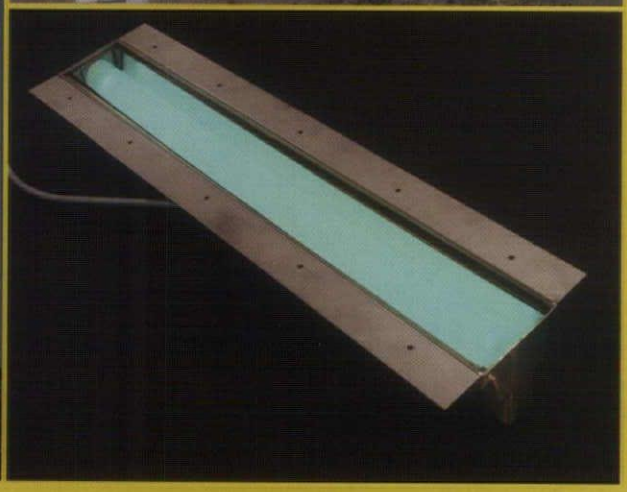
This particular scheme—a luminous line of light submerged in the river—was conceived by lighting designer Roger Narboni and his firm Concepto, based just outside of Paris. One of approximately five commissions that will be completed by the end of 2006 as part of a larger lighting master plan for Toulouse, Concepto is no stranger to landscape lighting scenarios or master plans. In 2002 Narboni and a team of engineers and communication specialists were selected through a competition to create a set of lighting guidelines for the city, in which their winning proposal focused on the illumination of the Garonne. The city's goal in implementing the master plan is to create a nocturnal image by highlighting its rich architectural heritage in an efficient and ecologically sensitive way. Officials have allocated close to 1.3 million euros per year (from 2004 to 2006) just for lighting. Distinguishing itself from other illuminated building and streetscape projects, the causeway lighting design is the only one to directly address the Garonne.

Prior to the master plan, the city had no real lighting scheme to celebrate important monuments and spaces, or to create a nighttime experience. "Especially the Garonne," Narboni says, "it was completely out of mind, and it wasn't a place where people would go at night because it was so dull." The causeway location is thought by historians to be the original river crossing point. Once a jagged series of rocks that marked a natural elevation change, they have given way to a man-made fortified concrete causeway with a set height difference of 15 feet. Narboni's idea was to symbolize this spot. "When you look at the map of Toulouse," he says, "it was obvious that this was the important thing to do." Rather than illuminating the riverbanks and neighboring buildings, Narboni realized the luminaire fittings could be recessed within the 886-foot-long causeway, the width of which was extended slightly to accommodate a trench to house the 265 new fixtures that are connected end-to-end. This meant that the illumination would come from the river, an exciting and redefining proposition.

When the team started to research available fittings that would provide an extremely luminous light, and be visible from 980 feet away, they found nothing. Additionally, because the causeway is an active walkway/work area for technicians from the nearby hydroelectrical plant during the summer months, a low-voltage source was necessary. As a result, Narboni considered LEDs. "When you are working in low-voltage, the cables become big very quickly. If we had used a normal fitting that consumed 30 or 40 watts, the wire would have been five feet in diameter." A fitting that would only consume two watts was needed. The designers met with eight companies before partnering with Targetti-Extérieur Vert.

The principal difference with these custom-designed luminaires is that they emit light horizontally, rather than vertically, toward the horizon line. Internally, each of the fixtures is fitted with a translucent luminescent lateral emitting bar and aluminum


SITE PLAN



reflector, lit at each end by one high-intensity blue 1W LED. The approximately 8-inch-wide, 32-inch-long polycarbonate cylinder is treated with a transparent resin for waterproofing and strength. The cylindrical shape and a mirror on the underside increase the reflectivity and ensure an even spread of light. The fixture is wet-listed with an IP68 rating and can be fully submerged in water. Low-voltage power cables run underneath the luminaires in the concrete, with the transformers located 650 feet away on either side of the river. "The idea was to use the cylinder like an optical fiber, but we did not know if it was good enough in terms of the luminance, so we made a prototype," says Narboni. "This two-watt consumption gave such an amount of light, it was incredible. We could not have thought that the lighting would be so intense." Because the light emission is at an angle of five degrees horizontally, the luminous line can be seen from the riverbanks and neighboring bridges, without causing glare. "It's quite revolutionary for this kind of product," states Narboni, and in fact, the company will debut a family of products around this original design at Light + Building 2006.

This seemingly simple gesture of a luminous line redefines the role of illumination in a landscape setting. "It was a fantastic project, a human adventure," says Narboni. "Because we started without knowing the end—did we have the best idea?" And the answer is yes, for unlike other riverfront landscape lighting approaches, which often light buildings, bridges, and monuments surrounding the water, in this instance the very place itself, the Garonne River, becomes the star. **ELIZABETH DONOFF**

The illuminated presence of the Bazacle Causeway provides the Garonne River with a new identity (facing page). Conditions proved a challenge and workers had to wait for the river flow to be halted upstream in order to access the site (top right). The blue-green LED color selection (above right) is the result of a palette Narboni often uses, and of readily available LEDs. Conveniently, the environmental study reports confirmed that fish and river-life react well with this color, which "produces a no-stress reaction."

DETAILS

PROJECT Bazacle Causeway, Garonne River, Toulouse, France
LIGHTING DESIGNER Concepto, Bagneux, France
TECHNICAL DESIGN Beture Infrastructure, Maisons-Alfort, France
COMMUNICATION Agence MC3, Toulouse, France
INSTALLATION ENGINEERS AMEC SPIE, Toulouse, France
CIVIL ENGINEERS SPIE Batignolles, Cergy-Pontoise, France
PHOTOGRAPHER Roger Narboni, Bagneux, France
PROJECT SIZE 886 linear feet
PROJECT COST approximately $600,000 (500,000 Euros)
WATTS 2W per fixture

MANUFACTURERS	APPLICATIONS
Targetti-Extérieur Vert	Custom recessed-troffer LED luminaire in causeway

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Planning for Daylight

BY MATTHEW TANTERI

INTRODUCING DAYLIGHTING INTO THE TRADITIONAL DESIGN PROCESS

SOMEWHERE AT THE BEGINNING OF THE DESIGN PROCESS, THE FIRST QUESTION invariably asked by the client of the daylighting consultant is "What is it that you do anyway?" The query stems not from doubt that the daylighting specialist imparts a vital contribution to the final product, but more from a desire to understand how these services mesh with the typical process of project design and construction. The intent of this article is to flush out a logical, albeit idealized, sequence of daylighting tasks within the phased process of architectural services.

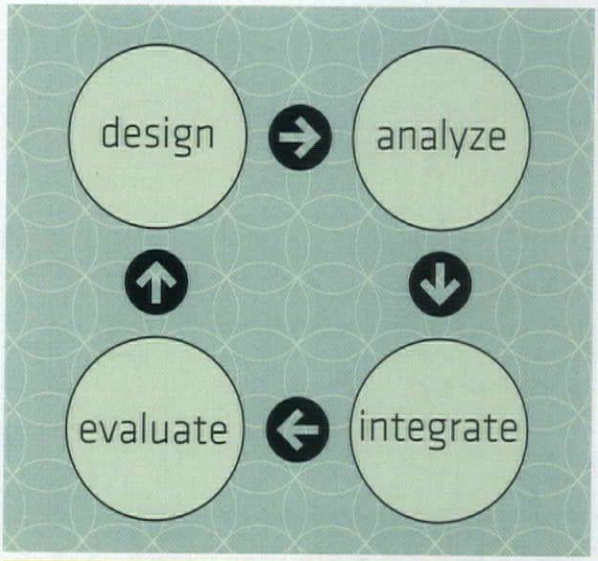
Successfully daylighted buildings don't just happen. They result from the integrative effort of a multidisciplinary team: the owner, architect, mechanical engineer, structural engineer, curtain wall consultant, daylighting consultant, lighting designer, and sustainable design consultant, among others.

PLANNING STRATEGIES

Planning for daylight begins with site selection, the orientation of the building on that site, and the shaping of building form. It continues with the optimization of fenestration, interior finishes, electric lighting, and control systems; and concludes with on-site calibration and commissioning of control systems, end-user training, and third-party evaluation. The goal is a daytime illuminance distribution that meets predefined programmatic requirements, such as occupancy period, space function, and target illuminances, for the greatest time period, through the sole use of light flux from the sun, sky, and ground. To achieve this, a diverse array of building components must coalesce: apertures, glazing, shading devices, interior partitions, surface finishes, electric lighting, HVAC system, and controls.

INVESTING IN PERFORMANCE

The daylighting process is "front-loaded," requiring in-depth knowledge of the site and a substantial investment of thought and effort early in the design process. This translates into an initial increase in design and engineering fees, but does not necessarily mean higher construction or equipment costs. Informed decision-making on how the parts come together can raise the performance level of the "whole," without having to rely on expensive materials or complex daylighting devices. For example, control of the fenestration area, location, and glazing light-to-solar heat gain ratio can improve the distribution of daylight into the interior of a space, so that it has minimal impact on a building's cooling load. The result: a downsized HVAC system that costs less to purchase, operate, and house. Conversely, if the climate favors a passive solar heating strategy, the careful selection of glazing may be used to maximize a building's solar heat gain when needed, and reduce building heating load. Similar optimizing efforts involving alternative components can lead to other amenities: the elimination of perimeter heating systems, higher ceiling heights that allow increased views, and an overall space that more efficiently guides daylight flux into its interior. Add to this reduced building energy use and lifetime costs, along with the recent flood of statistical studies documenting how daylighting increases productivity, learning, and sales, and it is no wonder these environments are now becoming coveted by owners, occupants, and developers.



THE PROCESS Daylighting design can be structured into a linear sequence of phases and steps. However, as shown above, the evolution of a design, the refinement of its parts, and their integration with the whole building is best understood as an iterative process.

THE PROCESS

Daylighting design is an iterative process where intermediate analysis leads to a successive refinement of the design concept. With this in mind, the following table summarizes a logical sequence of daylighting-related tasks that can be incorporated

TERMS

EFFECTIVE APERTURE Measure of the light-transmitting ability of a glazed window aperture. Product of glazing visible transmittance and the ratio of window-to-wall area.

LIGHT-TO-SOLAR HEAT GAIN Ratio of visible light transmitted to solar heat gain. A value below one means the glass transmits more heat, less light; above one means more light, less heat. Spectrally selective glazing has a high LSG value (≥1.25).

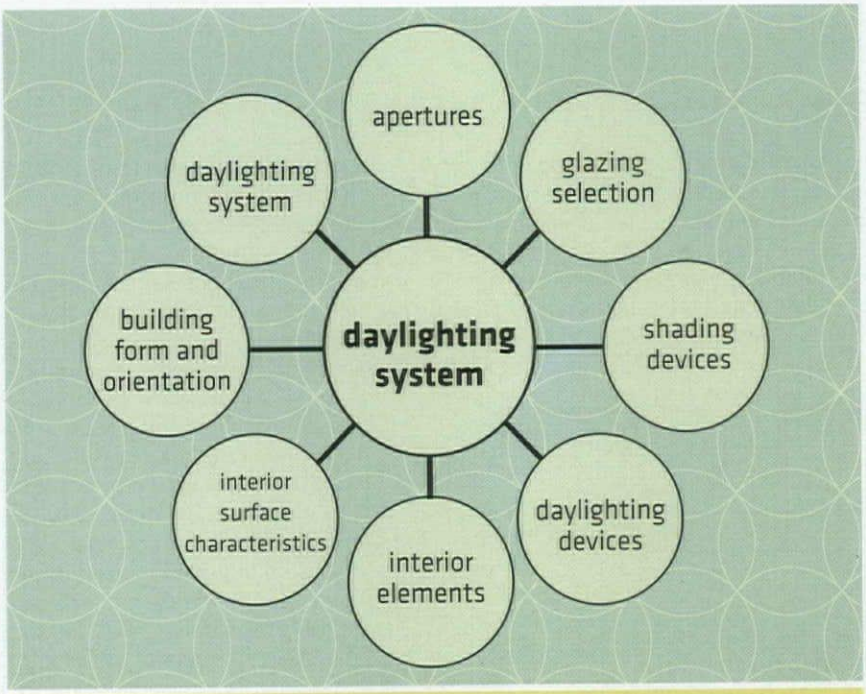
LUMINOUS FLUX Rate of flow of radiant energy; measured in lumens.

TARGET ILLUMINANCE Established minimum illuminance based on space function, task, and occupants' age; measured in lux or footcandles.

DAYLIGHT FACTOR Interior horizontal daylight illuminance expressed as percentage of horizontal daylight illuminance available to an unobstructed site.

DAYLIGHT AUTONOMY Percentage of occupied time per year when target illuminance can be maintained by daylight alone.

VISIT ARCHLIGHTING.COM FOR A COMPLETE GLOSSARY.



THE PARTS **A daylighting system consists of an extensive network of integrated building parts, as shown in the diagram above. Each possesses a unique set of parameters that affect other parts and the overall performance of the building as a single entity.**

within the phased process of typical architectural design and construction services:

PROGRAMMING PHASE

- Establish all criteria guiding daylighting and electric lighting design, such as sustainability guides, rating systems, energy/construction codes, energy mandates, and comparative base-building models.
- Assist in selection of site and development of initial building massing, fenestration, and orientation.
- Assess daylight available from sun, sky, and surround for site latitude, obstructions, and predominant sky condition.
- Establish space-by-space programmatic requirements. Include the occupancy period/function/task/area; target illuminance; target daylight factor; and lighting power limits.
- Establish target daylighting autonomy factors that quantify how much electric lighting energy may be saved using available daylight. This step combines the previous steps of the Programming Phase to set a benchmark for the Schematic Design Phase evaluation of daylighting strategies.

SCHEMATIC DESIGN PHASE

- Assist in space planning based on programmatic requirements and building envelope, orientation, and apertures.
- Develop general daylighting and shading concepts and strategies for each room that meet target illuminance requirements while minimizing heating and cooling loads.
- Analyze selected daylighting options using available physical scale models or simple evaluation methods and graphical techniques. Tools may include sun angle calculator, dot charts, no-sky plot, nomograms, or spreadsheet calculations for daylight factor and effective aperture.

DESIGN DEVELOPMENT PHASE

- Develop working daylighting and solar shading strategies for different parts of the building as the design evolves. Implement shading strategies to block, filter, or redirect sunlight. Fine-tune fenestration strategies to maximize available daylight, provide views, and control heat and glare.
- Coordinate the lighting zones of the daylighting plan with the electric lighting plan. Research and select control logic and control systems for dimming/switching electric lighting in response to available daylight.
- Develop advanced daylight devices such as double façades, skylights, light shelves,

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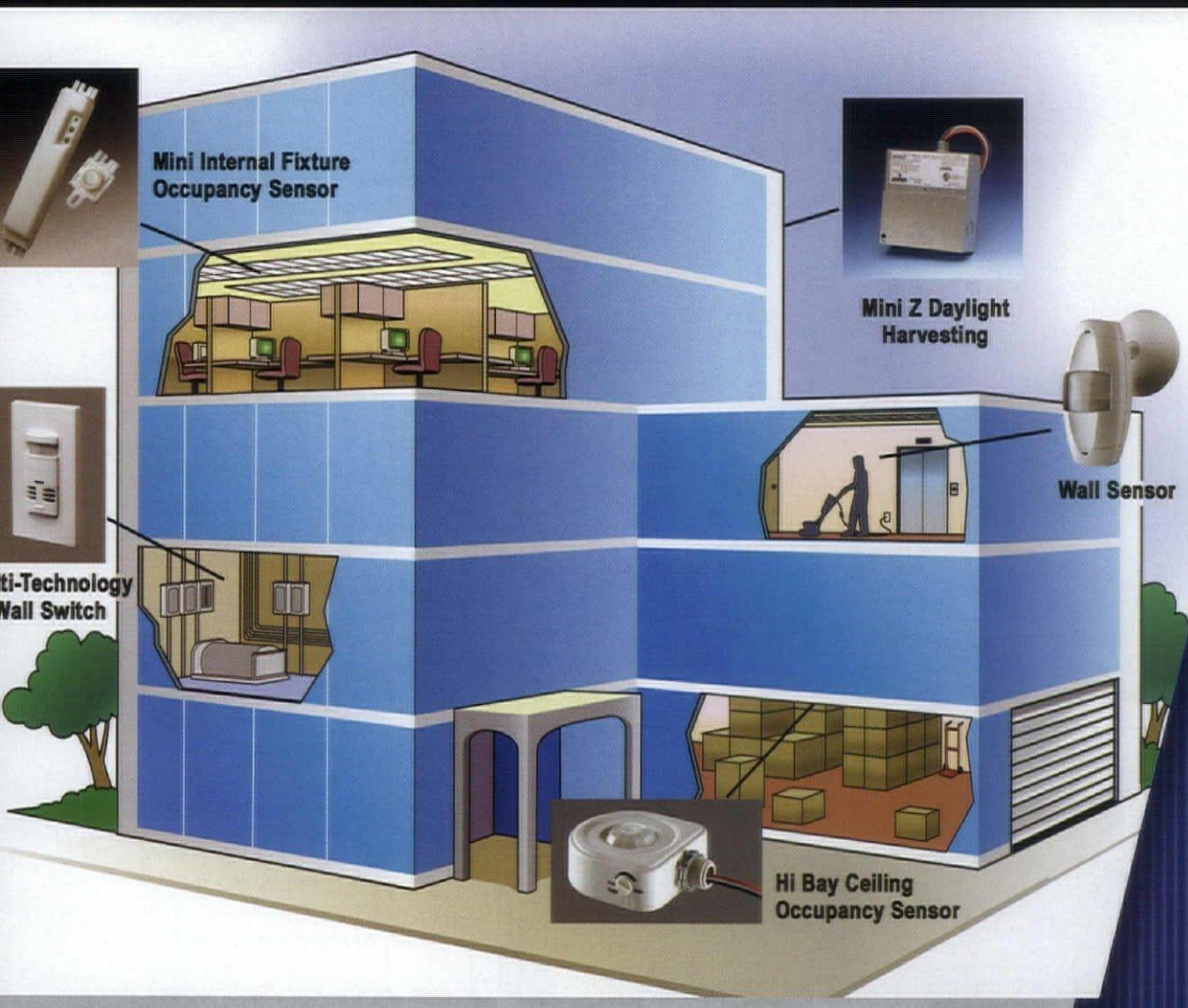

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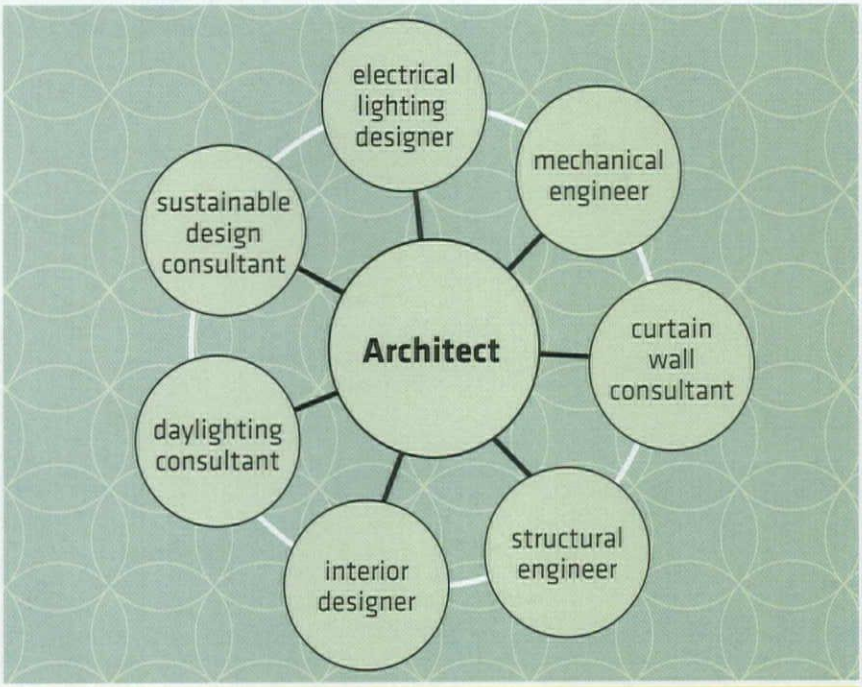

THE PLAYERS **Successful daylighting designs result from a multidisciplinary team with the architect playing a central role. Information may be exchanged around the outer circle of players, but it must channel through the architect and inform the building process to become part of the building.**

light pipes, heliostats, and apertures with sunlight-redirecting/rejecting glazing.

- Use advanced tools and techniques such as computer modeling to: simulate daylighting characteristics for specific times and sky conditions; determine boundaries of daylight zones and optimize photosensor placement; and calculate daylight autonomy factors.
- Use energy analysis software to evaluate the thermal impact of all daylight-related system components on the building. Refine decisions to optimize performance.

CONSTRUCTION DOCUMENT PHASE

- Provide glazing specifications for daylighting-related glass, describing the visual characteristics of the glazing system. Coordinate glazing types with drawings.
- Review, make recommendations, and contribute to all drawing and specifications related to the daylighting systems, such as windows, interior roller shades, light shelves, skylights, exterior shading devices, interior materials, and paint finishes.

COMMISSIONING AND POST-OCCUPANCY

- Assist in the commissioning and calibration of lighting controls.
- Provide a user manual that documents the operating features of the daylight system, as well as the maintenance requirements for sustained performance.
- Explain operation and maintenance requirements of the daylighting system to the owner, building manager, and occupants.

High-performance buildings have daylighting strategies that are inseparable from their site and architectural design. The level of performance they achieve is a result of unifying these elements in the earliest phases of the building design. A logical progression of tasks can be tailored to fit into typical architectural design and construction services. The role of the daylighting consultant is to provide these essential services, and thereby, guide the entire project team closer to a well-daylighted building.

Matthew Tanteri is principal of Tanteri + Associates, a consulting practice offering award-winning daylighting design and evaluation services. An adjunct professor in the lighting MFA program at Parsons the New School for Design, he teaches the studio course, "Natural and Technological Light," and the lecture series, "Daylighting and Sustainability."

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Prototypes on Parade: LEDs Inspire New Products

More than any other light source, LEDs have a special place in the heart of designers and researchers intent on pushing the boundaries of our interaction with the built environment. The R&D community's appreciation for this controllable, long-living, low-profile source means solid-state lighting is finding its way into experimental and unexpected, but ultimately fitting, applications. Though still in their beta-testing beginnings, the following three ventures demonstrate the critical role LEDs in specific, and light in general, have in realizing today's contemplations of what tomorrow holds for our built experience: a work pod that enhances communication and ideas sharing; a surface tile that promises users immediate affirmation from their surroundings; and a building system that allows occupants space-age control of their environment. Simultaneously quirky and constructive, challenging and inspired, projects like these bode well for the future. **A|L**

THEME: COMMUNICATION

project Digital Yurt

designer James Ludwig, director of design for Steelcase, Grand Rapids, Michigan

Designed to foster communication and community in public spaces, the Digital Yurt, an experimental work environment from Michigan-based office systems manufacturer Steelcase, employs the unique controllability of LEDs to broadcast to those on the outside the activity inside.

The prototype, 10 1/2 feet in diameter, is based on a traditional yurt—a circular, portable tent used by nomadic peoples of central Asia as a communal living and meeting space. "People knew which yurt had the greatest number of occupants and hence the most going on, because it had the brightest fire," says James Ludwig, Steelcase's director of design and the creative force behind the Digital Yurt. "We tried to recreate that effect."

As people enter the structure, a motion sensor on the ceiling signals RGB LEDs located behind the backrest to increase in brightness and to change in color temperature from 6500K (cool) when unoccupied, to 3000K (warm) when occupied by nine or more people. The "cloud," a ring-shaped pendant that hangs from the ceiling above the pod, is also illuminated with sensor-driven LEDs. It oscillates between light and dark with growing intensity and frequency as the Digital Yurt receives more occupants, similar to the effect created when clouds pass by the sun. The acoustics are designed to keep conversation in and noise out, while a 1-1/2-inch opening, located at eye level, runs around the perimeter of the pod. It allows those inside to see out and those outside to see in, particularly to observe the changing lighting effects.

Though there are not yet plans for mass production, Steelcase is currently producing a limited number of the prototypes for testing and observation in various settings, including learning and healthcare environments, airports, and offices. **JENNIFER BRITE**

THEME: INTERACTION

project Trace Tiles

designer Natalie Woolf, at the Royal College of Art, London

The Trace Tile system elevates the idea of a responsive environment to the next level. Developed at London's Royal College of Art (RCA) by Natalie Woolf, the surface and floor tiles react to pressure by triggering—via an analog system and a robust electronic network—the LEDs located beneath the surface material. Light radiates out from the point of contact, glowing for a short while before fading. Its depth of spread (greater or lesser) and reaction time (faster or slower) can be customized to suit the project. Current iterations of the device feature blue LEDs, but Woolf expects future versions to make use of other colors in the LED spectrum.

While the system is still in the prototype stage, its list of possible applications is both practical and playful. In healthcare environments, Trace Tiles could be used to encourage physical movement, or to monitor the nighttime ambulation of children and the elderly. Its low-level illumination also enables patients or caregivers to move around without turning on overhead lights and potentially disturbing others. In urban spaces, the system could provide improved safety by lighting the pedestrian's path, or to one approaching, by indicating the amount of activity in a public space with degree of brightness, since as more people enter or traverse an area, the number of illuminated LEDs and the corresponding light levels grow. The tiles' lingering luminosity also means users can write or draw on the surface, just for the fun of it.

"Natalie believes that recognizing one's presence in a space—by being illuminated in this case—contributes to a feeling of being included," says the RCA's intellectual property manager. Indeed, Trace Tiles promise an immediate, almost organic reaction from one's surroundings, as if the light were another being, recording and engaging, even embracing, those with whom it interacts. **EMILIE SOMMERHOFF**

THEME: CONTROL

project LED Future Tiles

designer The Alliance for Solid-State Illumination Systems and Technologies, at the Lighting Research Center, Troy, New York

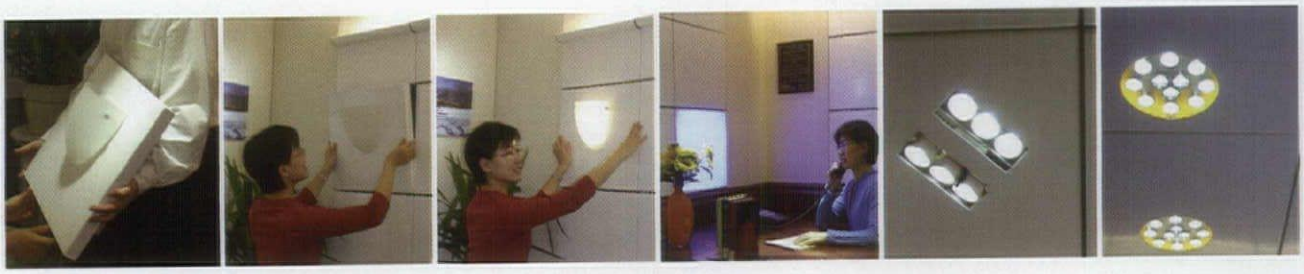
photographer Dennis Guyon

At the Rensselaer Polytechnic Institute's Lighting Research Center (LRC), researchers have constructed a typical office, but with one significant difference: the modular panels that make up the walls and ceiling contain LEDs, sit on an electrical grid, and are interchangeable. Thus, users can create a "tunable" lighting environment on command. This prototype—developed through the LRC's Alliance for Solid-State Illumination Systems and Technologies (ASSIST), an industry group created to advance the use of LEDs—will challenge, perhaps even redefine, traditional notions of building infrastructure.

"Going through a building exercise, you don't know what you'll do within the space, but the builder makes you decide where the lighting will go," explains Dr. Nadarajah Narendran, the LRC's director of research and head of its Solid-State Lighting Program. But most clients change their mind after the fixtures have been installed, so good lighting becomes a futile pursuit. Rather than repairing holes, rewiring, or adding additional fixtures, the LRC proposes its reconfigurable electronic infrastructure as a solution.

By making the building's structure an electrical grid, users have the freedom to move the panels from wall to wall, or wall to ceiling, depending on mood, activity, or where light is needed. The panels, removed from the grid with a simple push, can house both lighting fixtures and audio/visual technologies, and respond to a central control system.

"We're working with a 125-year-old building infrastructure. We need to nurture this new technology, enabling it to become part of the existing infrastructure." Without it, Narendran jokes, "it's like building concrete chairs in your living room." **SALLIE MOFFAT**



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5th ANNUAL ACE.al AWARDS BALLOT

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HOW THE PROGRAM WORKS

1. Take a few minutes to review the list of manufacturers.
2. Circle the manufacturers that meet or exceed your standards, as indicated in voting criteria.
3. Of the companies you've selected, indicate your choices for Most Innovative, Most Respected, and Most Specified.
4. Fax your ballot page to 646-654-5816 no later than July 7, 2006.

VOTING CRITERIA

Select the manufacturers who have provided you and your projects with:

- Product Durability
- Exceptional Customer Service
- Superior Value
- Advanced Designs

METHODOLOGY

The ACE.al ballot and manufacturers list runs in the April/May and June issues of *Architectural Lighting*, each reaching the complete 25,000+ nationwide circulation. In addition, e-mail campaigns are conducted to ensure the broadest base of response. Ballots are provided and collected at Lightfair and other industry conferences. *Architectural Lighting* also does random sampling, consults with industry experts, and the list of nominated manufacturers is subject to review by an in-house publishing team.

Results will be announced in the November/December 2006 issue.

Official Ballot Form

AL architectural lighting 5th ANNUAL ACE.al AWARDS

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Circle the manufacturers that meet or exceed your standards, as indicated in voting criteria.

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Altman Lighting
Ambiance Lighting Systems
American Florescent
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Amerlux
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B-Light
Baldinger
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B-K Lighting
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Boca Flasher
Boyd Lighting
Bruck Lighting Systems
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PRODUCT GALLERY

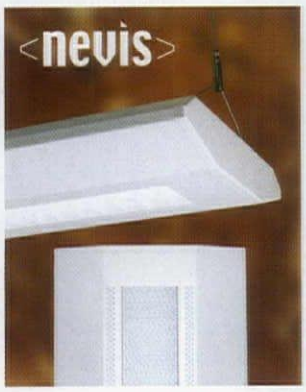
Alanod

MIRO optical surfaces are fast replacing anodized aluminum in luminaire design, worldwide. MIRO-SILVER with a total reflectivity of 98 percent is especially effective in saving energy. In commercial office lighting, combining louvers made with MIRO-SILVER plus T5 lamps can achieve a remarkable 85 lumens per watt. This permits designers maximum design flexibility. For more information, visit www.alanod.com/opticaldata. **CIRCLE 201**

Brass Light Gallery

ADA-compliant wall sconce, available in both incandescent and compact fluorescent, from Brass Light Gallery. Designers and manufacturers of architectural lighting since 1974. Academic institutions, hotels/resorts, clubs, hospitals, assisted-living facilities, restaurants, and offices. Superior construction and quality finish options. Made in the USA. Visit www.brasslight.com, call 800.243.9595, or contact commercial@brasslight.com. **CIRCLE 204**

Alera Lighting



Nevis is a unique new shape with planes, angles, and flowing lines that taper exquisitely into a superbly narrow edge. Multiple lamp, housing, and shielding selections provide aesthetic and performance versatility. For low-ceiling applications, Nevis Plus Liso delivers excellent ceiling uniformity when mounted 12 inches to the bottom of the housing. **CIRCLE 202**

Con-Tech Lighting

Con-Tech Lighting introduces Saturna AroTech 20W PAR20 ceramic metal halide track fixture. Offers unparalleled versatility and power in a compact design, yet energy efficient, utilizing an Aromat miniSlim electronic ballast. Front reloading, lockable precision aiming adjustment, and 358-degree horizontal rotation provide maximum flexibility. Ballast housing provides integral on/off switch for convenient power. **CIRCLE 205**

Bartco Lighting

The XLS290 LED display luminaire is based around 11 1/2-inch-length modules and incorporates either six or eight high-output LEDs. Each module integrates a dedicated 9W driver that produces 35 lm/W, while minimizing heat generation and prolonging lamp life (50,000-hour expectancy). Up to 12 LED modules join together electrically via quick-connects and mount inside a 1 3/8-inch-diameter aluminum extrusion. The housing is available in a variety of anodized and powder-coat finishes. A clear acrylic lens redirects light from the LEDs, maximizing distribution for display-case applications. **CIRCLE 203**

ERCO

ERCO introduces the new Grasshopper projector for outdoor use. The Grasshopper will utilize the new 20W metal halide lamp technology, as well as newly refined 1W high-powered LEDs. The Grasshopper is ideal for lighting signage, building façades, and outdoor foliage. Available now. **CIRCLE 206**

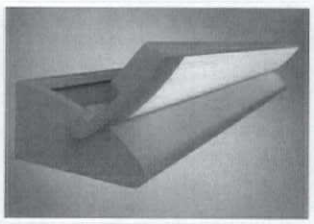
Estiluz

The Paris wall sconce has a 7 1/8-inch-diameter white hand-blown cased opal glass shade. This simple architectural sconce is the focal point for any space. This item is also available as a single- or triple-lamp pendant, as well as a floor lamp. CIRCLE 207

Leviton

Leviton's miniZ offers a versatile, cost-effective, code-compliant, self-contained approach to daylight harvesting. Leviton's new miniZ Intelligent Daylight Management System combines occupancy sensing, daylight harvesting, and flexible lighting control functionality in a single, compact, easy-to-install package. MiniZ meets a wide variety of commercial lighting needs, from basic switching to multi-zone daylight harvesting. CIRCLE 210

Focal Point



The art of light for healthcare. Focal Point's new medical brochure details how we offer the right combination of lighting solutions to transform your space into a modern medical masterpiece. From patient reading lights to lighting for common areas, Focal Point's designs blend compelling modern elements with the practical needs necessary in a hospital environment. CIRCLE 208

Leviton

The Acenti Collection of dimmers, switches, and receptacles re-imagines residential electrical devices. An uncluttered control surface and a contoured wall plate create a clean transition to walls. Features include a one-touch Dim/Bright bar that allows users to set precise light levels, control from multiple locations, an electronic on/off switch with a return-to-neutral position, a ground fault circuit interrupter, and a surge-protected receptacle. For more information, visit www.leviton.com/acenti. CIRCLE 211

Kim Lighting

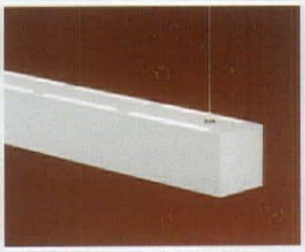
Wall Commander offers two sizes of energy-efficient, building-mounted luminaires for up, down, or simultaneous up/down high-output illumination of outdoor or large indoor spaces. Its area-lighting optics are ideal for perimeter, egress, security, and way-finding. Downlight only versions satisfy light trespass concerns. E-mail: marketing@kimlighting.com. Visit Kim Lighting online at www.kimlighting.com. CIRCLE 209

Lightolier

Vetro luminaires from Lightolier feature clean lines and elegant proportions. Machined aluminum outer housings contain electrical components. Hand-blown triplex glass provides an even spread of illumination along the length of the primary glass element. Narrow cylinders, wide cylinders, cones, optional decorative outer glass elements, and a wall-mount version allow for total design flexibility. Visit www.lightolier.com. CIRCLE 212

PRODUCT GALLERY

Litecontrol



The Mod²Family is the latest generation of an "industry standard" Mod fixture design from Litecontrol. Mod² represents an evolution in design and performance. Mods are now available in a small fixture cross-section for suspended, surface, and wall applications. For more information, visit us at www.litecontrol.com or call 781.294.0100. Litecontrol is an employee-owned company, located at 100 Hawks Avenue, Hanson, MA 02341. **CIRCLE 213**

Luraline

Luraline's Helÿs collection features a versatile, modern design enhanced by extraordinary durability and energy efficiency, making it ideal for interior and exterior commercial and residential spaces. Offered in pendant, ceiling, wall, and post-mount configurations, with a choice of incandescent or energy-efficient compact fluorescent or HID lamping. A full palette of painted and metallic finishes is available. Custom colors on request. For more information, call 800.940.6588, or visit www.luraline.com. **CIRCLE 216**

Lithonia Lighting

Unique, sleek, and expressive in unexpected ways, the OMERO Architectural Outdoor Family of area, wall-mounted and bollard luminaires from Lithonia Lighting takes outdoor lighting to the forefront. The distinctive designs, signature accents, and uncompromising performance of the OMERO Outdoor Family complement any environment. With versatile mounting options, multiple performance optics, and an entire family of cohesively designed products, the OMERO Architectural Outdoor Family provides another choice from Lithonia Lighting. For more information, call 800.279.8041, or visit www.lithonia.com/omero. **CIRCLE 214**

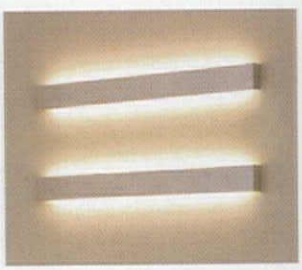
MechoShade

The ultimate in motorized drapery systems—WhisperTrak. Whisper-quiet operation and clean monochromatic design. Available in either straight or curved lengths up to 59 feet. A 15-channel IR remote offers five preset stop positions and group control settings. Integrates with home and building automation systems. Five year warranty. Contact MechoShade Systems at 718.729.2020. **CIRCLE 217**

Lumiére Lighting

The architectural steplights are available in 5-inch or 7-inch round or square forms and feature several fascia designs, including Open with diffused lens, Cross/Guard with diffused lens (pictured), Eyelid with diffused lens, and Louvered with clear lens. Transitional styling with no visible fasteners provides seamless integration in indoor and outdoor applications. Available with multiple lamp options including LEDs. **CIRCLE 215**

OCL

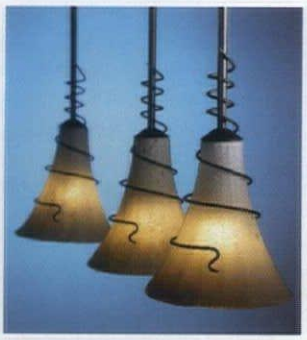


The Illusion is sleek and unobtrusive. Accenting modern building interiors with its clean lines, and simple shape, the Illusion radiates an elegant glow from both sides of the luminaire. Two energy efficient T5 or T5HO lamps spread the light evenly along the length of the fixture. For more information, visit www.ocl.com, or call 314.863.1895. **CIRCLE 218**

Pathway Lighting

Pathway the Lighting Source announces its latest innovation in architectural pendant lighting. Solerio SERIES 2P3 suspension system combines steel rod and cables in an architecturally pleasing double-shade design. Frosted glass shades and milk glass interior feature a soft uniform glow and good downlight performance. Pathway Lighting Products, Old Saybrook, CT 06475-0591; Tel: 800.342.0592; www.pathwaylighting.com. **CIRCLE 219**

Sea Gull Lighting

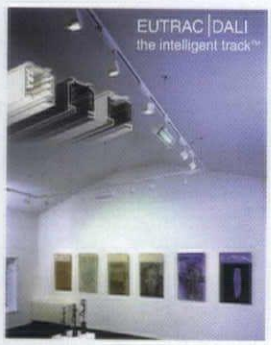


Ambiance Transitions by Sea Gull Lighting. A 120V line-voltage system provides a transformer-free system of decorative pendants, rail, and mono-point systems that allow you to design with light. The collection shown is offered in an antique bronze finish to complement a less contemporary environment. For more information on Ambiance Lighting Systems, visit www.seagulllighting.com. **CIRCLE 222**

Precision Architectural Lighting

A contemporary specification-grade aluminum fixture available in perimeter and suspended configurations, P.A.L.'s new indirect/direct Luminata II linear fluorescent series enhances the appearance of offices, libraries, schools, and hospitals. The fixture offers 2-, 3-, or 4-lamp profiles, using T8 or T5HO lamps. An optional isolation reflector yields up to 43 percent downlight. Installation features include simple joint connections, plug-in wiring, and modular T-bar mounting. Single-piece lengths up to 12 feet require only two mounting points. Fixtures are available in a variety of colors in a baked-on powder-coat finish. **CIRCLE 220**

Selux



The EUTRAC|DALI Intelligent Tracklighting System offers adapters that can accommodate virtually any manufacturers' tracklighting fixtures. The specification-grade 2-circuit/2-neutral track system includes a digital bus option for integration with DALI and other digital protocols. EUTRAC LightComposer software/hardware interface enables control of individual light fixtures for custom dimming and automations. Please visit Lightfair booth #3103. **CIRCLE 223**

Prescolite

As a division of Hubbell Lighting, Prescolite designs and manufactures high-performance downlighting, track, and surface lighting products. Literature, detailed specifications, and pricing information is available online at www.prescolite.com, or call 888.PRS.4TEC. **CIRCLE 221**

Sirius Lighting

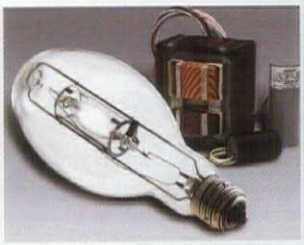
Sirius Lighting is proud to showcase the latest in exquisite glass pendants: the CRIS series. These geometric pendants feature 57 layers of optical dichroic coatings for beauty and performance. The coatings appear silver when off, but spring to life when energized, emitting a beautiful iridescent blue/pink glow. **CIRCLE 224**

PRODUCT GALLERY

Square D Clipsal

The Square D Clipsal wall-mounted keypads with Dynamic Labeling Technology can control up to eight lighting functions from a single keypad. Each button displays editable text or graphics to indicate the room or custom-designed lighting scene it controls. Independent timers are also built into each button, so lighting can activate automatically. For more information, visit www.squaredlightingcontrol.com or call 888.SQUARED. CIRCLE 225

Venture Lighting



Venture Uni-Form Natural White pulse-start metal halide lamp and ballast systems produce wide, full-spectrum lighting over indoor or outdoor areas. They mimic the high color rendition of natural sunlight, enhancing any commercial, industrial, or institutional space, grounds, or roadway. E-mail venture@adlt.com or visit www.venturelighting.com. CIRCLE 228

Sternberg Lighting

The new PRAIRIE-RD continues with the renowned tradition of a popular design. A clear lens on this luminaire will provide type III or type V light distribution, up to 250W metal halide or high pressure sodium with internal glass refractor. New STAR-SHIELD and OPTI-SHIELD NIGHTSKY roof or louver optic systems, conforming to dark sky ordinances, are also available. For more information or a free catalog, call 800.621.3376, fax 847.588.3440, or e-mail info@sternberglighting.com. CIRCLE 226

W2 Architectural Lighting

Bridging function and design, W2 ARCHITECTURAL LIGHTING has introduced "Precision Modules," upscale specification-grade multiple recessed spotlights that feature independent, adjustable, and aimable elements that pull down and lock-in for superlative wall-washing, accent, spot, and perimeter lighting. W2 ARCHITECTURAL LIGHTING, a new division of W.A.C. Lighting, is a manufacturer and designer of specification-grade products for commercial lighting applications. See us at Lightfair booth #2429, call 866.788.2100, or visit www.W2LIGHTING.COM. CIRCLE 229

2thousand degrees

Presenting the EMBARCADERO COLLECTION from 2thousand degrees. Six new table lamps and three new large fabric pendants comprise the line. All feature refined electric components and attention-to-design detail. Like Madison (shown), all pendants are tailored with designer fabric, utilize a glass diffuser, are available in up to three colors, and feature incandescent or energy-efficient compact fluorescent lamping. Visit www.2thousanddegrees.com, or call 800.522.5315. CIRCLE 227

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Impacts on the Industry

An industry's evolution is influenced by numerous factors, both internal and external. What current developments and trends do you see as having a significant impact on the lighting industry?

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RISING COSTS

JAMES BENYA, PRINCIPAL | **BENYA LIGHTING DESIGN**

While there are a lot of interesting product developments and trends in design, I'd like to address the trends in cost management. The specific trend I see is the lighting designer being held more accountable than ever before for the cost of the lighting, and the resultant need for greater diligence than I have ever experienced in my career.

From my experience, the costs of construction are presently inflating at a 10 to 20 percent annual rate. In part this is due to the U.S. and world economies, which are not nearly as rosy as we're being told, and in part due to the demands of Asia's astounding growth. I have been involved in at least 10 major projects in the last four years in which significant scope reductions occurred after schematic design to compensate for cost. One major project was put on hold for three years while new funding sources were found; another was reduced in size 20 percent to accommodate rapidly escalating costs. Almost every project seems to discard desirable architectural details and finishes to maintain cost these days.

While many of us might be tempted to blame LEED and other influences, the real culprits are energy costs, rapid economic growth in China and India, and the burden of war on the world's economy. Most recently, I have seen LEED initiatives on projects dropped, largely to save the costs of LEED documentation fees and to settle for a less sustainable but affordable building, but only after the structural steel bid package came in, like, 40 percent over budget.

For decades, we lighting designers have lived with the notion that good lighting is seen as a luxury. When the cost of basic building materials rises, the money allotted for lighting drops. In good times, lighting often gets the budget it needs to do the job right. Otherwise, the lighting budget is seen as something that can be cut to pay for the now-inevitable overruns in other aspects of the building.

COLOR

NANCY FREHLING, VICE PRESIDENT AND OWNER | **OGGETTI LUCE**

Color! Everyone is liking, and responding to, color. Even when we offer an item in white, the customer prefers it in color. Red is hot, also greens and orange.

TECHNOLOGY AND CODE ADVANCEMENTS

CRAIG DILOUIE, PRINCIPAL | **ZING COMMUNICATIONS**

Commercial Buildings Tax Deduction ■ energy codes ■ lighting automation ■ energy efficiency ■ upgrading existing T8 systems ■ daylighting ■ distributed control ■ fluorescent dimming ■ nonresidential construction rebound in 2006 ■ efficiency legislation and regulations ■ energy-saving T8 lamps and high-efficiency ballasts ■ upgrading high-bay HID installations to fluorescent, electronic fluorescent, and HID ballasts ■ colored and white LEDs ■ manufacturers moving production overseas ■ Asian manufacturers making inroads here ■ commoditization ■ light pollution legislation ■ smaller landscape fixtures ■ cut-off and full cut-off outdoor fixtures ■ T5 and T5HO systems ■ outdoor lighting included in interpretation of the Life Safety Code in some states ■ metal halide tracklighting ■ pulse-start lamps and ballasts ■ the Light Right Consortium ■ the Lighting Research Center's ASSIST program ■ Heschong Mahone's daylighting studies ■ in-ground burial fixtures ■ user dimming control ■ renewed consolidation ■ construction and materials inflation ■ fixture and component price increases ■ continual advances in aligning the Internet toward project management ■ indirect lighting ■ LEED ■ sustainable design ■ home lighting automation ■ IES-RP-1 ■ ceramic metal halide lamps ■ and an ongoing drive toward smaller, smarter, and more colorful fixtures—to name a few!

EMERGING MARKETS

WILLARD WARREN, LIGHTING CONSULTANT | **WILLARD L. WARREN ASSOC. LIGHTING AND ENERGY CONSULTANTS**

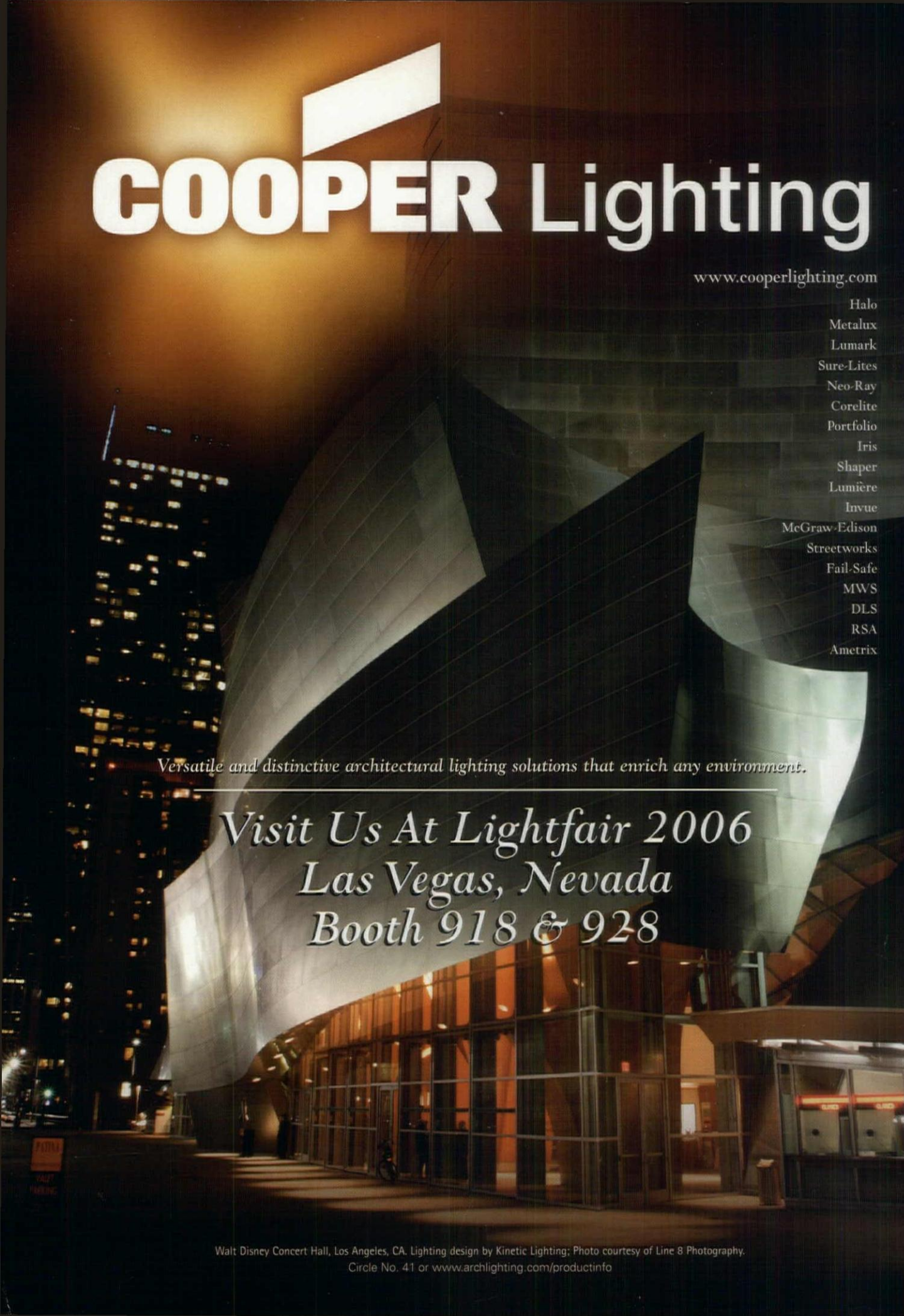
Our conservative and inbred domestic auto industry is losing market share to the nimble, mostly Asian, car companies. Though much smaller, our lighting industry is also vulnerable. Look at the evidence; no more cheap fuels, new and more stringent energy codes and non-polluting regulations, emphasis on LEED criteria and sustainability, and very little basic research being done to respond to these trends (See "The State of Lighting Research," March 2006).

Someday, our government will make energy conservation and basic research priorities. Until then, the China Association of the Lighting Industry (CALI) will gain market share above their already $6 billion in U.S. lighting sales, mostly in residential fixtures, commercial down lights, small exterior luminaires, and lamps and ballasts. American lighting manufacturers have some choices:

- Automate plants to reduce labor content and hope that the cost of shipping from Asia will protect their market share.
- Increase off-shore manufacturing and reduce employment in the U.S.
- Sponsor research that responds to visual needs, not product development, and change the game.
- Develop products that are easier to install and correct the imbalance between material and labor, which has now grown too much.

When LEDs become efficacious enough to be used for general lighting, the Asian market will have no trouble displacing troffers with task ambient designs incorporated into the office furniture.

While we have more suppliers of niche lighting products than in the car industry, we have a few very large conglomerates, and the parallels are there.



Walt Disney Concert Hall, Los Angeles, CA. Lighting design by Kinetic Lighting; Photo courtesy of Line 8 Photography.

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