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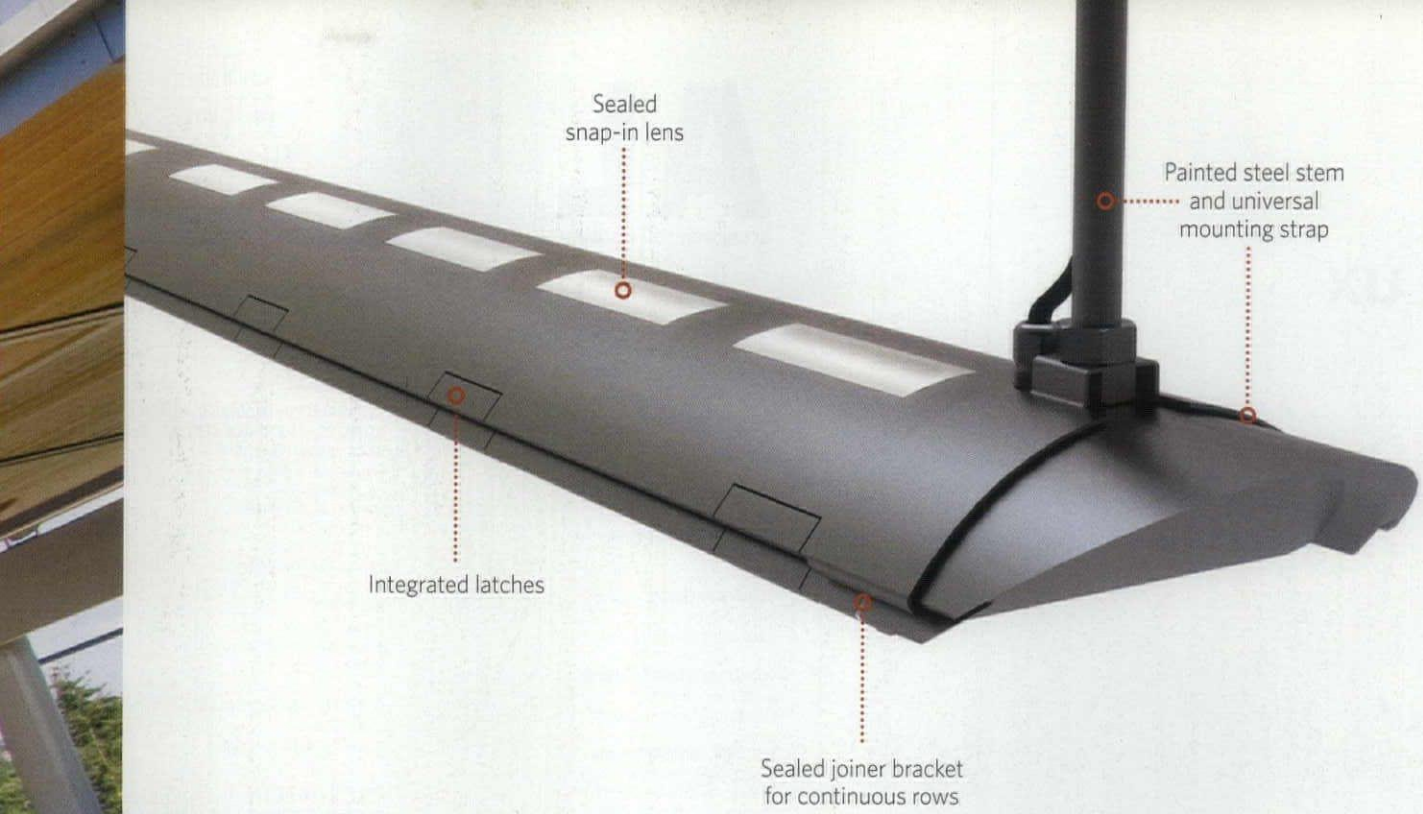

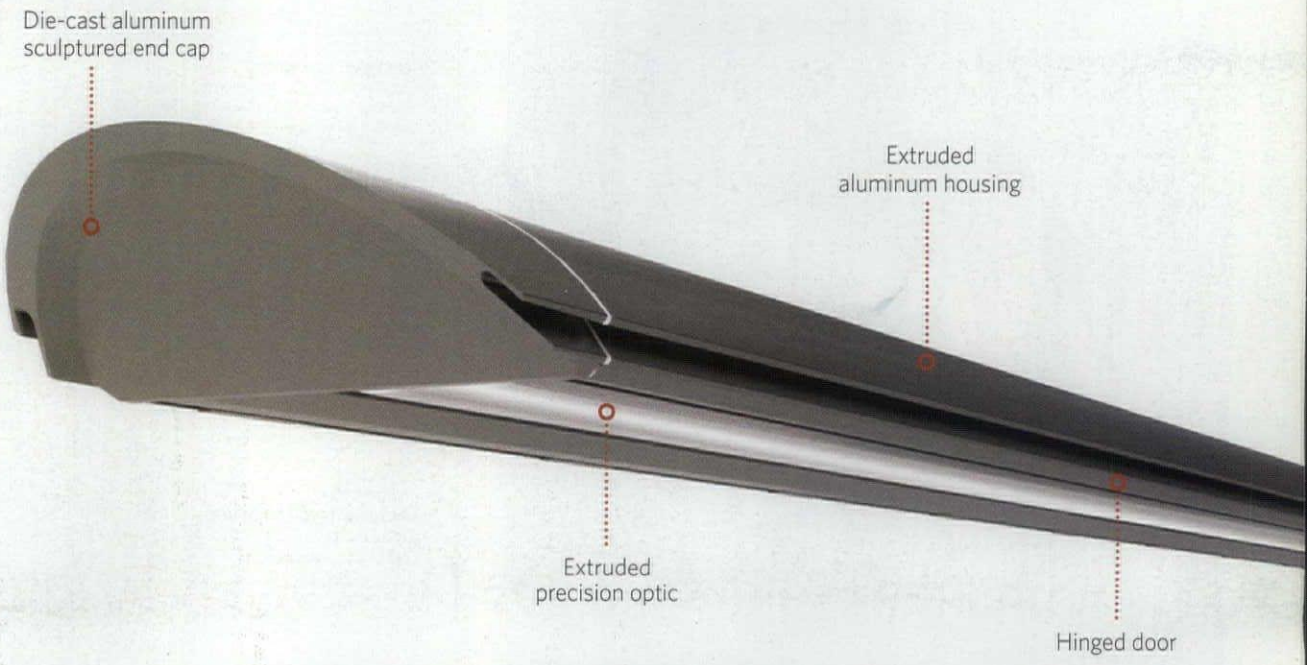

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VOL 24, NO 7

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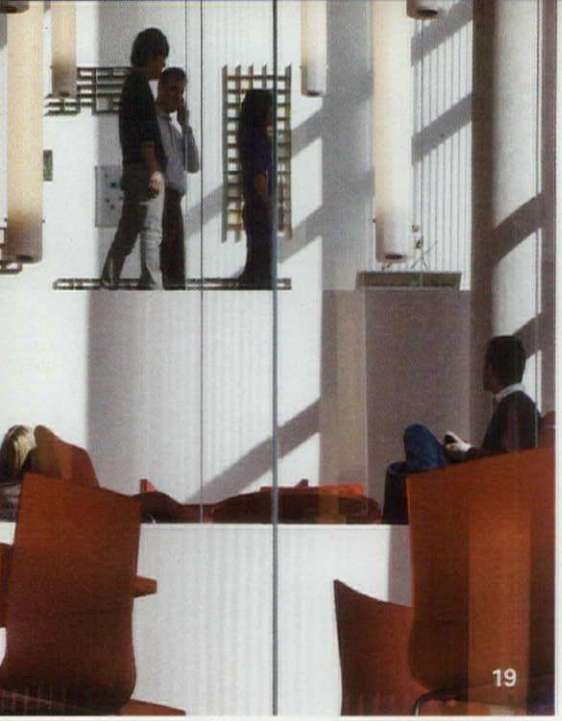

NOV/DEC 2010

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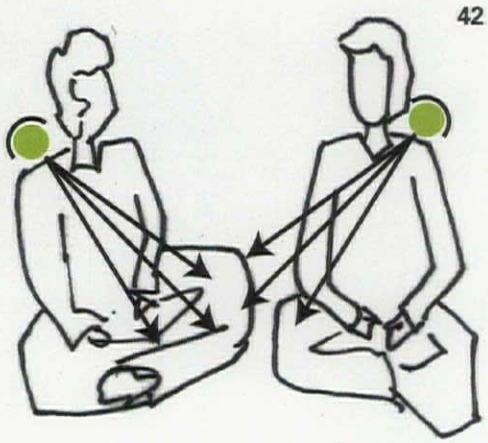

BACK

Cover: "Liquid Bricks," one of the student projects from the Light as Material catalyst class at the University of Minnesota School of Architecture.

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Credentialing Conundrum

What makes someone qualified? An education? Work experience? Membership in a professional organization? Proficiency on an exam? Depending on your role in the lighting profession, your opinion may vary.

Ever since the Texas House Bill 2649 incident in May 2009, which threatened lighting designers' ability to practice in the state of Texas if they were not licensed, the issue of what constitutes a lighting designers' qualifications has been at the forefront of discussions within the industry. The International Association of Lighting Designers (IALD), with input from the Professional Lighting Designers' Association (PLDA), has formed a task force to investigate the establishment of a credentialing system. Chaired by Australian lighting designer David Becker, the six-person task force is still in the early stages of evaluating the issues behind this heated topic.

In discussing this issue, it's important to understand the difference between licensing versus credentialing. Licensure is administered by boards regulated at the state level. A license to practice one's profession generally exists to support health and safety issues. In the architectural profession, for instance, graduates must complete a period of internship and pass a registration exam in order to obtain licensure. Credentialing, by contrast, is a way for a profession to set standards for knowledge and performance without the legal and liability ramifications associated with licensing. As the National Organization for Competency Assurance (NOCA) explains in *The NOCA Guide to Understanding Credentialing Concepts*, "Credentialing is the process by which an entity, authorized and qualified to do so, grants formal recognition to, or records the recognition status of individual, organizations, institutions, programs, processes, services or products that meet predetermined and standardized criteria."

This is not the first time the profession has grappled with the issue of credentialing. The National Council on Qualifications for the Lighting Professions (NCQLP) exam was established in 1991 to create a testing format that would acknowledge an individual's baseline competency to practice lighting. The exam carries with it the title of Lighting Certified (LC), and although the exam was originally set up with the intent to provide lighting designers with a way to distinguish themselves, somewhere along the way everyone and anyone, particularly those in the employ of lighting manufacturers, began to take the exam. No one can really say why the LC exam veered from its original course, but over the past several years it has been a serious bone of contention between lighting designers and lighting manufacturers, especially when it comes to the issue of who can, and should, offer design services. On average, about 200 people a year take the NCQLP exam (at the end of 2009, nearly 2,000 people had successfully completed the exam), but lighting designers question the meaningfulness of the designation if it is open to nondesigners.

At the IALD Enlighten Americas Conference in Westminster, Colo., in early October, Becker and credentialing consultant Judith Hale presented a status report on the task force's activities to date. Feedback from the industry indicates that the lighting profession is at a crossroads and there needs to be a clear definition of what and who a lighting designer is. The lighting design community has suggested that credentialing would validate the profession and elevate it.

And that leads to the larger question surrounding this issue: If implemented, what does credentialing accomplish? Why do lighting designers feel it is important to distinguish their services from the services of, say, a lighting manufacturer, or anyone else professing to offer lighting design services? What is unique about how a lighting designer goes about his or her work? (Designing with an unbiased set of product offerings certainly has something to do with it.)

At its core, the issue of credentialing is not so much about the criteria involved for evaluation, but about the lighting profession defining its own sense of worth. The time has come for the lighting design community to get over its collective inferiority complex. The body of work created over the past 50-plus years speaks for itself, as do the long-term partnerships between lighting designers and architects, in which lighting designers have earned respect for their design and technical skills.

Addressing the issue of qualifications by adding another label or exam—and the additional paperwork and expenses that come with that—isn't the way to go. Many lighting designers are members of the IALD, a professional organization built around the mission of design. If the lighting design profession wants to clarify its role and value, it would be better served to rejuvenate the IALD's efforts for its acronym to be recognized and valued in the way the letters "AIA" signify an architect. The IALD's ongoing effort to grow its membership would only increase its value: Greater numbers carry more weight.

As the lighting design community addresses the issue of credentialing, lighting designers shouldn't loose sight of what they have accomplished or how far the profession has come in the past half-century. Decisions made today probably will not impact practitioners in the later stages of their careers, but it is of vital importance that senior designers lend their experience, expertise, and institutional memory to figuring out a solution. However the design community decides to proceed with the issue of credentialing, this issue needs to stop serving as a stumbling block for future generations and the longevity of the lighting design profession.

ELIZABETH DONOFF
EDITOR

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"The Structure of Light: Richard Kelly and the Illumination of Modern Architecture" was on display at the Yale School of Architecture Gallery, Aug. 23–Oct. 2, and drew on Kelly's archive of papers and architectural drawings at Yale.

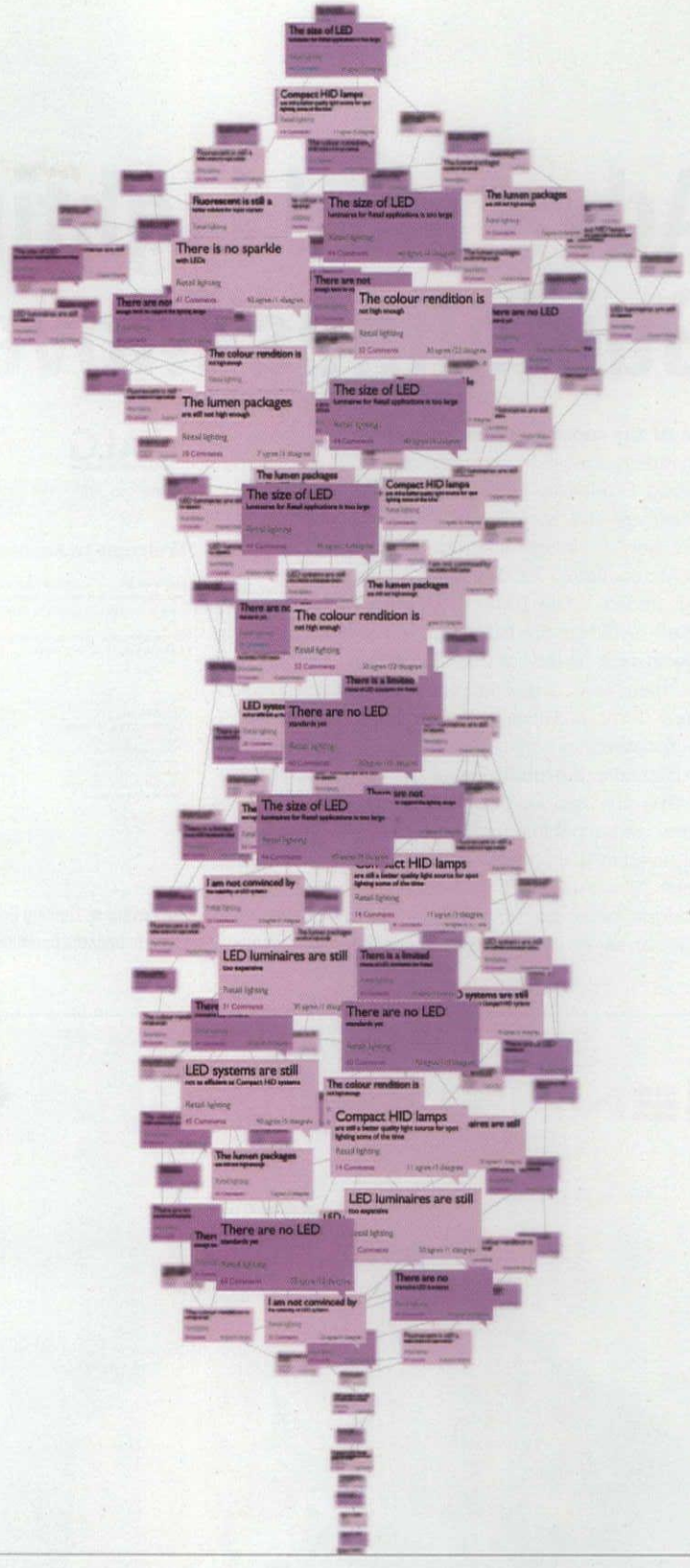
Kelly Celebrated at Yale

Richard Kelly is arguably one of the greats of modern lighting design. Leading architectural historians and lighting designers gathered at the Yale School of Architecture in New Haven, Conn., on Oct. 1–2 to celebrate his influence during a two-day symposium that was the culmination to the exhibit "The Structure of Light: Richard Kelly and the Illumination of Modern Architecture," curated by Dietrich Neumann, Brown University professor of history of modern architecture.

It was a homecoming of sorts for Kelly and his work. Kelly, who died in 1977, graduated from the Yale School of Architecture in 1944, and the exhibit drew on materials from his archive donated by his family to the school. The exhibit did a good job of providing a context for his work, in particular the influence of Stanley McCandless, who taught at Yale's School of Drama. However, the final section—Architectural Lighting Today—was less successful in accurately portraying the wealth of work in today's lighting design.

The symposium sought to give Kelly's work a context. The second-day discussion of Kelly's collaboration with architect Louis Kahn on the Yale Center for British Art—held at the museum—was outstanding. Jules Prown, the center's first director, recounted behind-the-scenes details from the building's construction, which was completed after Kahn's death. While it would have been preferable to have extended an invitation to a larger portion of the lighting community, the exhibit and symposium were still an excellent introduction to Kelly for those not familiar with his work. **ELIZABETH DONOFF**

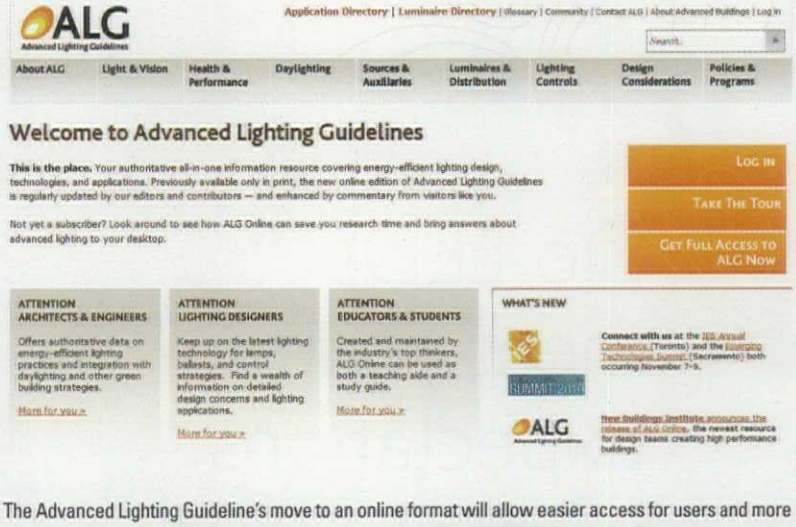
WILLIAM SACCO, YALE PHOTO + DESIGN



“Do LEDs meet your expectations in retail projects?”

Advanced Lighting Guidelines Moves Online

One of the most valuable resources for lighting information has received a major overhaul. The Advanced Lighting Guidelines (ALG), a compendium of lighting terminology and applications maintained by the nonprofit New Buildings Institute (NBI), has been completely reformatted for the Web. This is the ALG's first major update since 2003. Every section has been reworked to reflect the latest lighting technologies, and subjects such as daylighting and lighting controls now have their own dedicated chapters. Lighting professionals Terry McGowan, Naomi Miller, Leslie North, and Konstantinos Papamichael were tasked with the rewrite under the guidance of the NBI's Barb Hamilton. The first two levels of information are accessible for free; additional information is available via subscription, tiered at price points for individuals, students, and groups. "The ALG sets itself apart from other lighting resources with its timely and direct information," McGowan says. "It effects the way people design." **ED**



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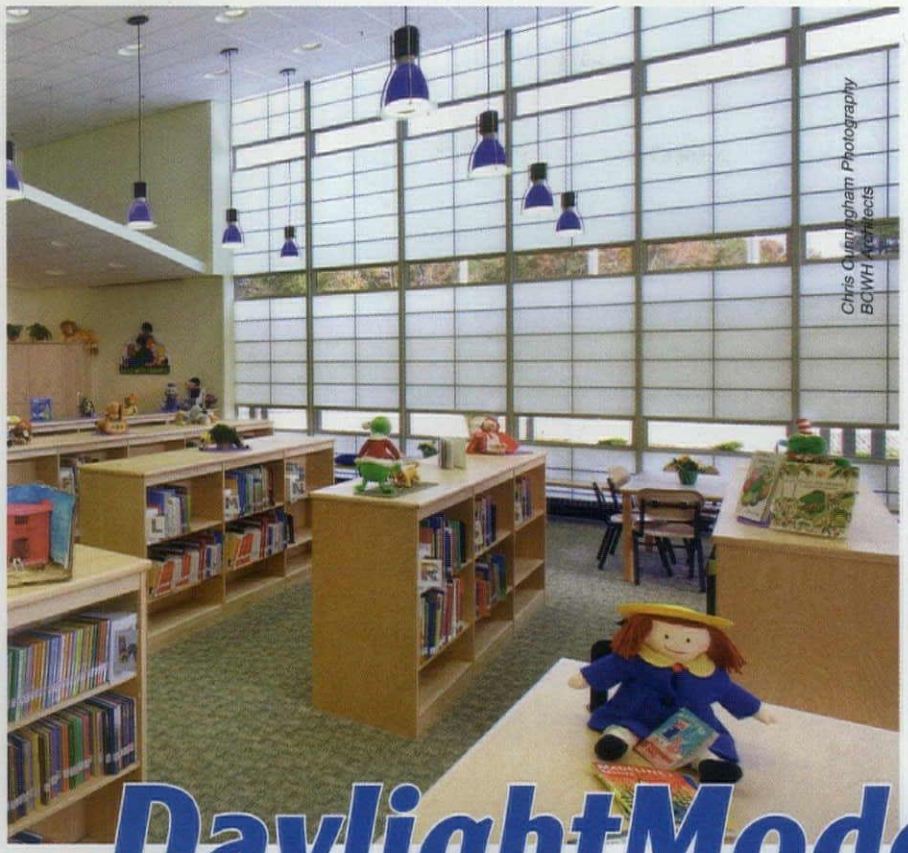
IALD Conference: More Than Just Design

More than 300 members of the lighting community gathered in Westminster, Colo., on Oct. 7–9 for the International Association of Lighting Designer's Annual Enlighten Americas Conference. The meeting's theme "It's All About the D. Design," opened with a terrific keynote address by Paola Antonelli, senior curator of Architecture and Design at the Museum of Modern Art. Antonelli inspired attendees to think about design in the broadest of terms. "It's one of the highest forms of human creativity," she noted. But given the challenges the lighting profession continues to face, seminars and the town-hall-style meeting were not afraid to cover a range of serious topics including everything from credentialing to energy poverty to economic recovery. Networking and educational opportunities abounded with opportunities for student attendees to mix with professionals and manufacturers, whose support of the event continues to be strong. ED

COURTESY IALD

Lighting professionals and students gather for the IALD's Annual Enlighten Americas Conference to discuss the industry's most pressing issues.



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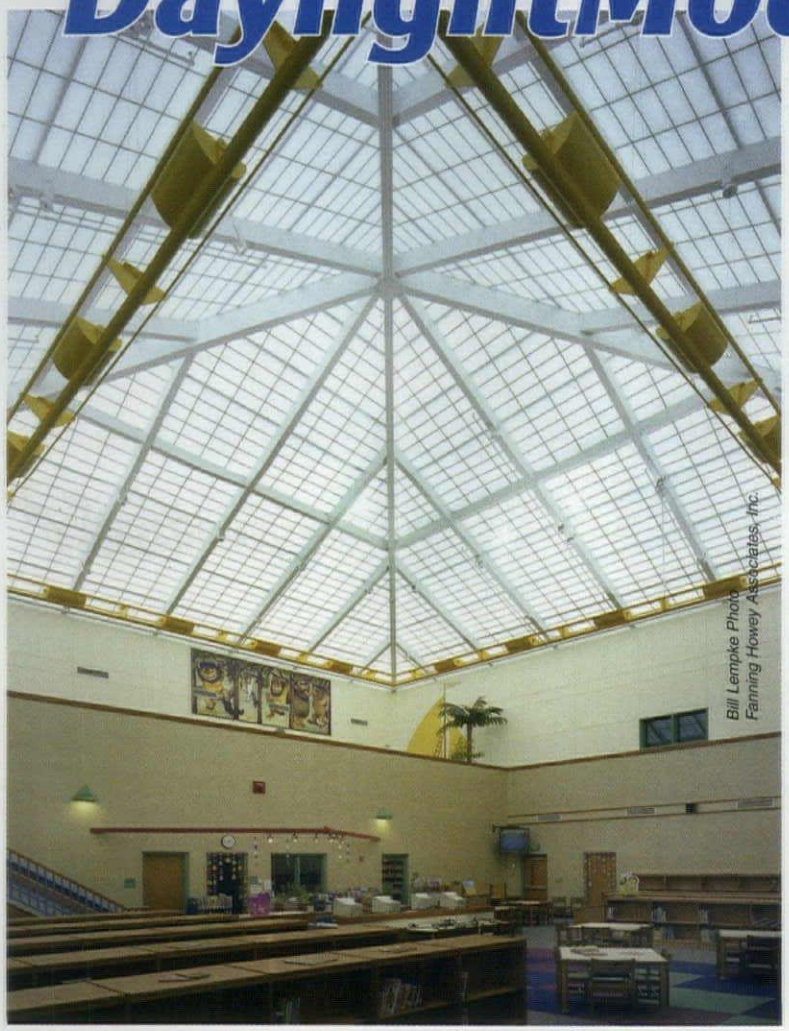

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Chromatic Scale

BARNARD'S GLASSY DIANA CENTER BRINGS COLOR AND LIGHT TO MANHATTAN'S UPPER WEST SIDE

Barnard College's new Diana Center is an exploration of light, glass, and transparency. The linear building is sectionally organized via a series of double-height atria (above) that provide a visual connection through the building, starting with the café at ground level and finishing with the architecture and art gallery on the top floor.

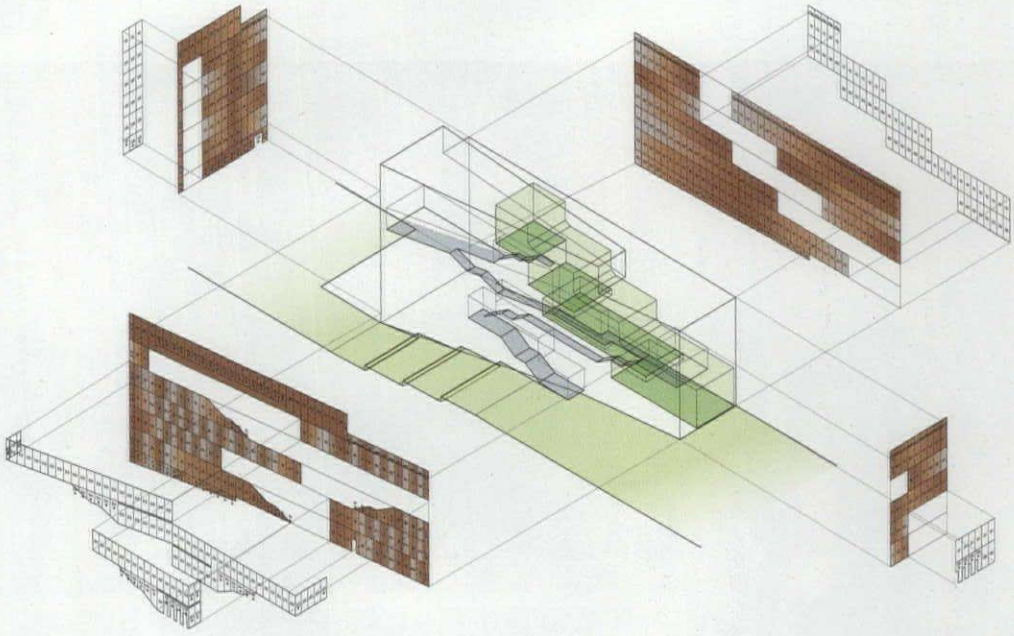
Last winter, Barnard College opened its first new building on campus in over a decade. Against an overcast sky, the terra-cotta red Diana Center looked matte and boxy. New York–based architects Weiss/Manfredi Architecture/Landscape/Urbanism's wish that the double-layered glass façade would change hue when hit with sunlight seemed whimsical as the sky darkened. A recent visit (in October) to the multiuse building promised a more chromatic display, but once again hopes were dashed by gray weather. And even on clear days, the deep rusts and orange reds described by the architects turn out to be a bit chalky. Promising phenomenon, in this case a richly saturated glass façade, is a risk.

The design of the LEED Silver–certified Diana Center represents a tension between conceptual desires and actual performance. Some things work, some don't. At eight floors (six above-grade and two below) and 98,000 square feet, the building is a substantial addition to the campus, as it hosts a laundry list of programs: student center offices, art and architecture studios, classrooms, a library, a café, a black box theater, and an ovoid event space. At the same time, it is a rather modest piece of university architecture. Located on Manhattan's Upper West Side along the west side of Broadway and across the street from Columbia University's main (Morningside Heights) campus, the center actively engages the city; its glazed façade comes right to the sidewalk edge. However, it is visually dominated by Columbia's newest construction across the street. The 188,000-square-foot Northwest Corner Building by Spanish architect Rafael Moneo towers over the Diana Center with its op-art façade made up of large panels patterned with diagonal louvers.

Compared to Moneo's robust engineering, the Weiss/Manfredi design is a delicate study in glass. The building is an experiment in transparency and it finds its place in the cannon of glass architecture, from Mies van der Rohe's Friedrichstrasse skyscraper project to Frank Gehry's expressively fritted, iceberg-like IAC Building, downtown, in Chelsea. Weiss/Manfredi used the glazed façade—its chromatic variables and optical illusion fritting—to reflect the building's program on the surface, but manages to avoid any functionalist heavy-handedness.

The Diana Center sits prominently on Barnard's campus overlooking Broadway, connecting this academic enclave to the city beyond (this page). The building's curtain wall is composed of 1,154 clear and etched color integral glass panels with a frit pattern that aids in the modulation of daylight (facing page).

EXPLODED AXONOMETRIC VIEW OF THE BUILDING



The Diana Center's curtain wall is composed of 1,154 clear and etched color integral glass panels. Frits gradate across the surface, modulating daylight and visibility. For architect Marion Weiss, the texture softens the boundary between inside and outside. "We tend to perceive glass as hard, but we liked the idea of chroma being brushed across the façade," she says. "The vertical frits are biased towards one side, and, like a curtain, offers a sense of domesticity."

Weiss' description implies that what is seen of the interior from Broadway is a performance—and it is. A number of the Diana Center's public spaces face onto the street in a series of double-height atria that rise in tiers beginning with the café at ground level, followed by a dining room, then a study lounge, and finish with the architecture and art gallery on the top floor. Inside, there's a visual connection between the diverse programs. The lighting design by the Brandston Partnership communicates the importance of these spaces. In the evening, custom pendants hung in linear arrays on each level illuminate the public areas. Four 28W T5 fluorescents in each 56-inch-long translucent acrylic fixture gives off an atmospheric glow, while a single 39W PAR30 metal halide lamp provides directional downlight. A building-wide lighting control system is programmed so that the atria lighting remains uniform.

"This building is part of the campus, part of the school environment," explains Brandston partner and lighting designer Chou Lien. "There is a need to create a visual connection between the activities that take place in the building and the neighborhood. The lanterns provide visual penetration at night. We used the fixtures to unify the building and to create an artistic sequence." Lien's design is successful when viewed from the sidewalk, but on the inside the pendants verge on overwhelming the spaces that they are meant to accentuate. The Brandston team constructed mock-ups and worked hard to get the fixture detailing to transcend straightforward practicality. "When the functional property diminishes, that's when then the fixture begins to look like a piece of art," Lien says of the back and forth between designer and manufacturer.

The Diana Center is narrow, which allows daylight all the way into the building from both the east and the west. But this leaves the public spaces feeling taller than they are wide. The pendants are centered between floors, so, when looking up through the atria, a field of glowing rods punctuates the view. Looking down from the top floor art gallery into the study area below, the effect is heightened by a backdrop of carpet in shades of burnt orange and deep red. Additionally, the grid pattern established by the pendants is picked up in the hallways and event space lobby, but rendered in semi-recessed 18W compact fluorescent downlights equipped with hand-blown white opal glass diffusers. The fixture density aims for an artistic reading, but winds up being fussy, and, in the case of the dark-blue lower-level lobby outside of the black box theater, overly bright. This fussiness is surprising, because the offices, studios, and classrooms are lit functionally and economically. In fact, the double-sided mini-strip fixtures (each with two T8 lamps) used in the architecture studios are elegant in their utilitarian restraint. Each fixture is hung delicately from stainless steel cable, not rods, to reduce the number of vertical elements in the space.

The western edge of the Diana Center faces Barnard's campus and is more overtly expressive than the street façade: glazed stairwells run up the side of the building and the senior architecture studio cantilevers precariously off of the corner. A terraced, bollard-lit courtyard extends Barnard's Lehman Lawn from the main gate to Milbank Hall. In the stairwells, the design team took a simpler approach to the pendants. Similar to the custom fixtures in the public atria, here the 12-inch-long translucent acrylic cylinders are equipped with 18W compact fluorescent lamps and provide ample illumination without cluttering the sightlines. The restraint pays off.

Weiss/Manfredi designed the western face of the building to integrate it with the rest of the campus. The architects see the exposed stairs as vertical versions of the diagonal pathways that crisscross campus quads. (And in this vein, lounge areas at the landings encourage chance meetings.) The brick and concrete halls that surround the Diana Center capture Barnard's history in their detailing—the iron-and-glass greenhouse on top of Milbank, or the modernist library, Lehman Hall—and the Diana Center's glazed circulation directs the visitors' eye to the richness of the campus. Ultimately, it is not the views into the Diana Center that amaze, but the views out. **MIMI ZEIGER**

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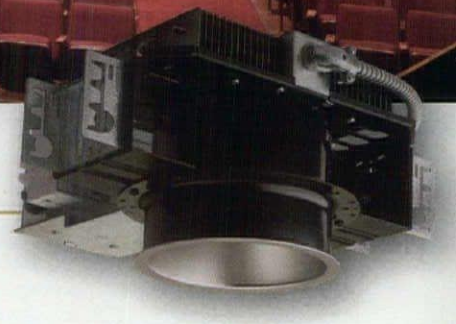

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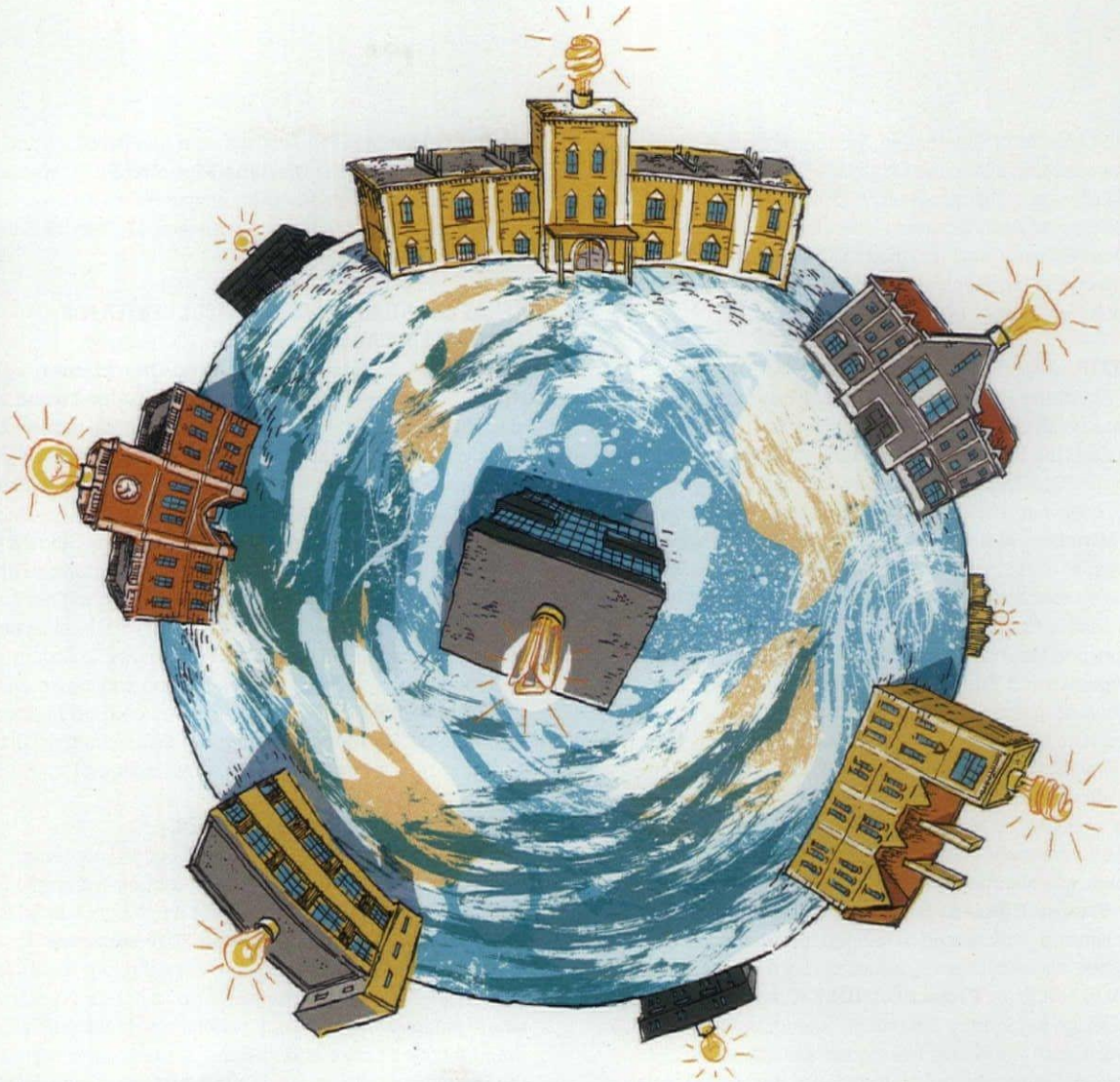

PAUL HOPPE

On the Scene

UPDATES ON THE LATEST ACTIVITIES FROM ACADEMIC LIGHTING PROGRAMS

Students and faculty at the 11 lighting programs worldwide that offer either a degree or a certificate in lighting, according to the parameters outlined by the International Association of Lighting Designers (IALD) Education Trust (See "IALD Education Trust Lighting Education Program Survey," Nov/Dec 2007, p. 21–26), have been extremely busy during the 2009–2010 academic semesters. Here, we present a snapshot of some of the milestone achievements within the lighting programs at U.S. academic institutions. Visit archlighting.com for a review of all the programs, including those outside the U.S.—Ryerson University, Toronto, Canada; the Bartlett School of Graduate Studies, University College, London; HAWK, University of Applied Sciences and Arts, Hilderscheim, Germany; Hochschule Wismar, University of Technology, Business, and Design, Wismar, Germany; and KTH, Royal Institute of Technology, Faculty School of Technology and Health, Handen, Sweden. These activities illustrate the diversity of lighting education today. **ELIZABETH DONOFF**

PARSONS THE NEW SCHOOL OF DESIGN,

newschool.edu/parsons/lighting-design

Student achievements of 2010 graduates: **Matthew Reifsteck** presented his thesis project "Architectural Applications for Digital Lighting Specifically Adapted to Museum Art Lighting" at the 2010 Light Symposium in Stockholm. **Francesca Bastianini** received a Richard Kelly Grant in support of her ongoing research regarding lighting for homeless populations (see page 42). **Stephen Kaye** received the Velux Award, an international student competition for theoretical daylighting applications. His project was selected from more than 700 submission and was based on his thesis, which examined daylighting interventions for subterranean public spaces. **Antonia Peon-Veiga** was one of eight finalists for the Targetti Light Art competition. Her work, selected from more than 800 submissions, was based on work she created in a light art elective.

Faculty achievements: **Linnaea Tillett** spoke at the 2010 Lighting Symposium in Stockholm. **Craig Bernecker** spoke at the 2010 IALD Enlighten Conference in Denver, Colo. He presented initial research findings by Parsons students and future planning for the elective "Lighting for Developing Countries." Bernecker also continues to serve as the educational facilitator for Lightfair, where he works with the Conference Advisory Committee to develop the conference program. At Lightfair 2010 he taught a two-day course, Intermediate Lighting, and the seminar "Lamp and Ballast Basics." **Matthew Tanteri** was designated an IES Fellow for his advancement of daylighting through education and practice and for

the art and science of illumination. Tanteri was also a symposium participant accompanying the exhibition "The Structure of Light: Richard Kelly and the Illumination of Modern Architecture," at the Yale School of Architecture in New Haven, Conn. His essay titled "Two Skylights" was included in *The Structure of Light: Richard Kelly and the Illumination of Modern Architecture*, edited by Dietrich Neumann.

PENN STATE, *www.engr.psu.edu/ae/index.asp*
Student Activities: Ph.D. student **Michael Royer** received the 2010 Jonas Bellovin Scholar Achievement Award from the Nuckolls Fund for Lighting Education. Ph.D. student **Andrea Wilkerson** received the 2010 Thomas M. Lemons Scholarship, a University Graduate Fellowship, and an IALD Future Educator Fellowship. M.S. student **Minchen Wei** was awarded an IES Young Professionals Scholarship to attend the 2010 IES Annual Conference. Wei was also one of the editors of the book *Green LED Lighting Technology*, and was responsible for the chapters on signal lighting, road lighting, LED packaging technology, and OLEDs. Fourth-year students **Tony Esposito** and **Yuduo Zhao** both received the Robert J. Besal Fund Scholarship from Acuity Brands Lighting for the 2010–2011 academic year. Fifth-year student **Leland Curtis** received a Robert J. Besal Fund Scholarship for the 2010–2011 academic year, as well as a Philadelphia IES Section Scholarship. Fifth-year student **Patrick Morgan** received the Martin Dougherty Scholarship.

Department/Faculty Activities: The Architecture and Engineering Department was awarded the **Department of Energy Innovation Hub for Energy Efficient Buildings Research Grant**, which includes lighting work related to integrated design tools, innovative technologies, and public policy issues that can lead to better energy efficiency in buildings. **Project CANDLE** (Create an Alliance to Nurture Design in Lighting Education), a program with an IALD Grant to Enhance, supported five students to attend the 2010 IALD Annual Conference and nine students to attend Lightfair 2010. **Kevin Houser**, **SA Fotios**, **Rick Mistrick**, and **MP Royer** published several scientific papers in the IES journal *Leukos*. **Houser** also made several presentations at industry events including the LED Show, the Taiwan Solid-State Lighting Conference, and Lightfair. **Mistrick** completed major enhancements to the Daysim software that allow designers to evaluate daylighting system performance with new, annual daylight analysis metrics. He also worked with Lawrence Berkeley National Laboratory to test new programs developed for Radiance. This work was presented at the 2010 IES Conference in Toronto, Nov. 7–9.

RENNSSELAER POLYTECHNIC INSTITUTE'S LIGHTING RESEARCH CENTER (LRC), *www.lrc.rpi.edu*
Aaron Smith, an LRC master's student, has developed a sustainable lighting technology called the Blind Minder, which has the potential to reduce energy consumption by reminding people to open their blinds and use daylight from a window instead of using electric lighting. The product is ready for the first stage of trial testing. **Yiting Zhu**, Ph.D., is the first graduate of Rensselaer Polytechnic Institute's doctoral degree program in architectural science with a concentration in lighting. This doctorate degree is the highest available in the field of lighting and a first-of-its-kind in the lighting industry. Zhu's graduate research focused on solid-state lighting, with an emphasis on advancing phosphor technology to improve the color quality and efficacy of white LEDs. Zhu has accepted a position with the LRC as lead research specialist and manager of technology testing and evaluation. **Sara Nonaka**, a graduate student pursuing her M.S. in Lighting, was selected to receive one of five 2009–2010 national scholarships from the Besal Lighting Education Fund. Faculty member **Mariana Figueiro**, Ph.D., was awarded tenure making her an associate professor. She also received the Rensselaer Polytechnic Institute's James M. Tien '66 Early Career Award for Faculty.

TEXAS CHRISTIAN UNIVERSITY (TCU), CENTER FOR LIGHTING EDUCATION, *demt.tcu.edu/centers.asp*
In 2009, after 35 years of service, **Fred Oberkircher**, founding director of the center, retired and **Laura E. Prestwood** was named the new director. Oberkircher was instrumental in recruiting Prestwood to TCU in 2002 to ensure the continuation and growth of the program. During the Fall 2009 semester, **Mary Cheek**, a junior majoring in interior design and minoring in lighting for visual presentation, received an IALD Education Trust Student Activity Stipend to attend the 2009 IALD Enlighten Conference in Sonoma, Calif. During the **2010 Spring semester**, lighting minors enrolled in "Special Problems in Lighting" worked with local domestic violence shelter, SafeHaven of Tarrant County, to design a lighting solution for their affiliated resale store and parking lot. During the **2010 Fall semester**, lighting minors enrolled in "Lighting for Visual Presentation" designed a lighting installation for the TCU Megalith. The project culminated in a light show on Nov. 11.

UNIVERSITY OF COLORADO–BOULDER,
http://ceae.colorado.edu/dept/?i=grad-building-systems
Todd Gibson, a master's student in lighting within the Building Systems Program, was a recipient of the Robert J. Besal Fund Scholarship Award. During the **Fall 2010 semester**, the lighting program hosted LightPlay at the IALD Enlighten Americas 2010 Conference, held in Westminster, Colo., a lighting design charrette where students create design projects under the guidance of practitioners. Thirty students from all over the country visited the University of Colorado's Boulder campus to work on their projects. This year the students created videos that explored different aspects of light. The videos were presented during the president's opening reception at the IALD Conference. Eight students received scholarships from the IALD Education Trust to attend the IALD Enlighten Americas 2010 Conference. The first Litecontrol Scholarship was awarded to **Heidi Kasemir**, a senior undergraduate student.

UNIVERSITY OF NEBRASKA AT LINCOLN,
http://engineering.unl.edu/specialty-units/durhamschool
Eric Rushenberg received a Besal Lighting Education Fund Scholarship for the 2010–2011 academic year. **Giang Nguyen** received the 2010 Jules Horton International Scholar Award from the Nuckolls Fund. Starting Fall 2010, **Yulia Tyukhova** will begin her M.S. in Architectural Engineering with a lighting focus with support from a Fulbright Grant. She received her B.S. and M.S. in lighting engineering from the Moscow Power Engineering Institute Technical University. **Tyukhova** along with **Andrew Wiese** received stipends from the IALD Education Trust to attend the 2010 IALD Enlighten Conference. Faculty member **Clarence Waters** was promoted to a full professor. The University of Nebraska at Lincoln received a 2010 Nuckolls Fund Grant for $50,000 to develop and deliver a project called "Lighting Across the [Design] Curriculum." This is a series of teaching modules, from both teaching and learning perspectives, that are purposeful in the development of curricula across the disciplines within the building industries at the University of Nebraska, Miami University, Kansas State University, and the University of Texas at Austin.

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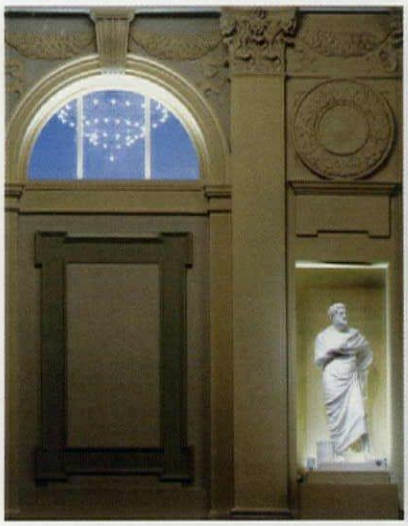
Project Boston Symphony Hall Clerestory and Statuary Lighting, Boston **Architect** Ann Beha Architects, Boston **Lighting Designer** Horton Lees Brogden Lighting Design, Boston **Acoustician** Acentech, Cambridge, Mass. **Photographer** Peter Vanderwarker, West Newton, Mass. **Manufacturers** Altman Lighting, Kurt Versen, Philips Color Kinetics



Boston Symphony Hall

NEW CLERESTORY AND STATUARY ILLUMINATION ENHANCES A CELEBRATED PERFORMANCE SPACE

Boston Symphony Hall, home to one of the most highly regarded symphony orchestras in the world, was designed by the architecture firm McKim, Mead and White, and completed in October 1900 exclusively for the Boston Symphony Orchestra. For more than 100 years, the hall has been the setting for magnificent musical performances; in 1999, the building was designated a U.S. National Historic Landmark. Aiding the symphony in achieving this distinction—as well as assessing master-plan, renovation, and restoration strategies since 1997—has been Boston-based Ann Beha Architects (ABA). The latest step in the building's evolution includes the reintroduction of daylight in the main performance hall along with statuary illumination at the perimeter.

Daylight originally entered the hall through 14 semicircular clerestory windows along the sidewalls. Exterior photos from the 1920s show a system of wooden panels on pulleys that were most likely used to dim the space when required. But in the early 1940s, due to bomb scares during World War II, these windows were covered over permanently. In 2008, as part of their ongoing work at the hall, architect Pamela Hawkes of ABA proposed reopening the clerestories and replacing the glass so that natural light would once again illuminate the hall during the day. The architects installed a new exterior shutter system for light control and completed a series of daylight studies to be sure that people sitting in the upper balcony would not be subject to excessive glare during afternoon performances.

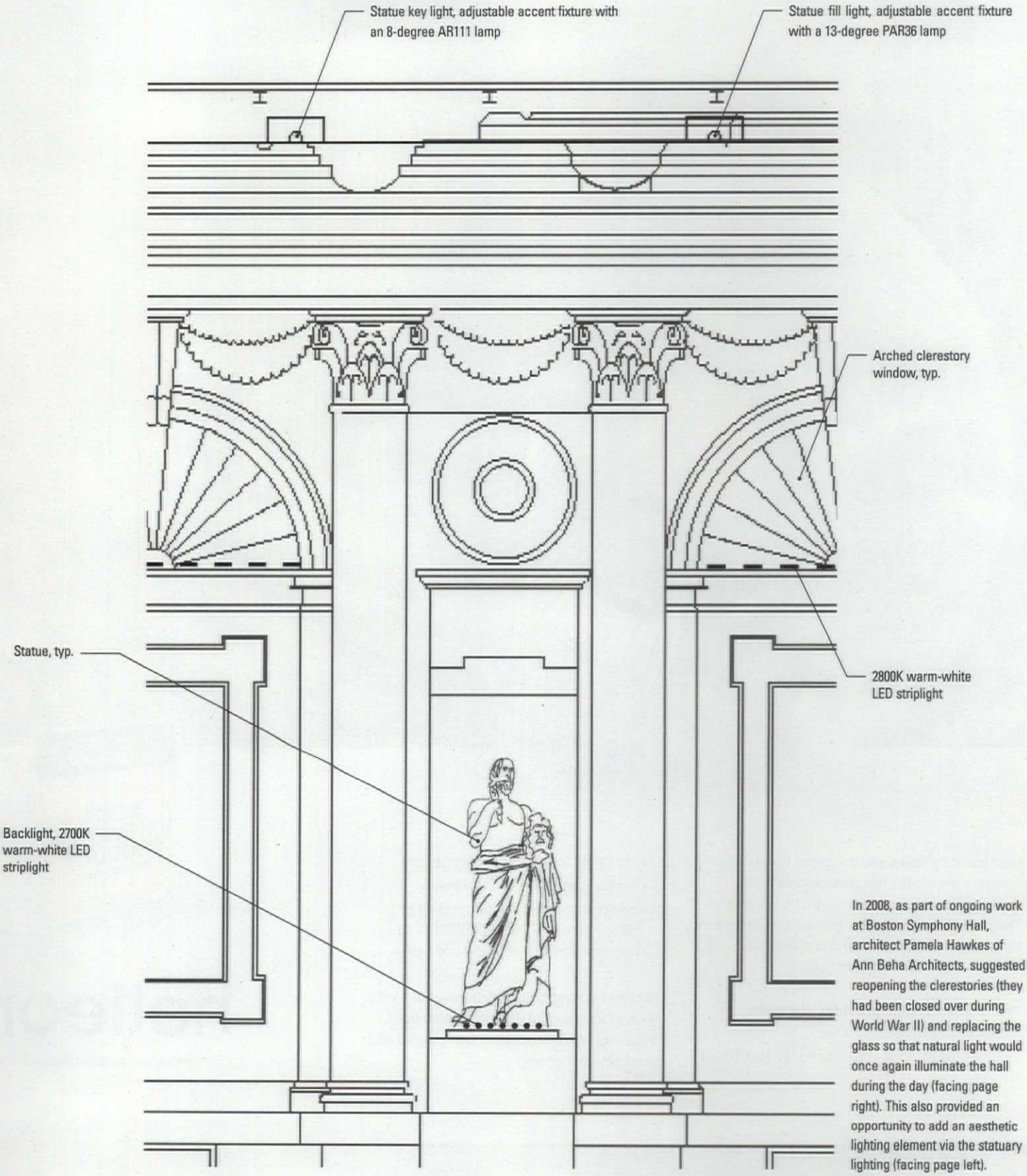
Reopening the clerestories also provided an opportunity to add an aesthetic lighting element to the space, and ABA called upon Carrie Hawley at Horton Lees Brogden Lighting Design's Boston office for assistance. Hawley suggested uplighting inside the windows to highlight the detailed trim of the arches. Since these spaces are difficult to reach, LED strips were chosen for their long life, low profile, and ability to dim. Four-foot-long, 2800K LED lightstrips were mounted at the base of each window, away from the glass to conceal it from view. A 2-inch-high wood fascia, painted to match the surrounding trim, was added along the sill to mask any fixture brightness from audience sightlines.

Flanking each clerestory window are display niches that house 16 Greek and Roman plaster statue replicas. Installed at the time of the building's completion in 1900, the statues are a reference to William Tudor's 1819 letter in which he deemed Boston the "Athens of America." (Tudor was a prominent Bostonian who founded the *North American Review* and the Boston Athenaeum.) The client also was interested in relighting the statues. "No one was satisfied with how that was [previously] done," Hawkes says.

Three layers of light were needed to provide ideal figure modeling of the statues: key light, fill light, and back light. The key light is oriented to the audience side, to maintain a consistent direction of light from the audience's perspective when looking toward the stage, and uses an 8-degree spot AR111 lamp. The fill light hits the stage side of the statues, using a PAR36 lamp with a 13-degree beam spread. And striplights of 2700K LEDs are hidden behind the plinth of each statue, uplighting the niches and successfully backlighting the forms. Each key and fill light was placed at a steep 25-degree angle from horizontal and a 34-degree angle from vertical on either side of each statue, and each was individually focused. Lighting scenes were established to balance the visual presence of the newly illuminated statuary in the hall. Custom collars were developed to achieve the necessary angle adjustability without cutting off the beam of light, and bronze-colored reflectors were chosen to blend in with the ceiling and minimize fixture visibility. Adjustable accent fixtures were located in the ceiling coffers and can be relamped from the attic above.

Boston Symphony Hall is one of the finest acoustical concert spaces in the world. For that reason Hawkes and Hawley worked closely with the acoustical consultant and the Boston Symphony Hall staff to ensure that the renovations did not alter the Hall's sound. "It was nice that the client took a risk to add something special to such a revered space," Hawley says, adding that the most challenging aspect of the project was blending the different fixtures and light sources together to create the desired result. And it's worth it, as the century-old architecture of a treasured venue is revealed. **JENNIFER BICKFORD**

ELEVATION VIEW OF CLERESTORIES AND STATUARY



In 2008, as part of ongoing work at Boston Symphony Hall, architect Pamela Hawkes of Ann Beha Architects, suggested reopening the clerestories (they had been closed over during World War II) and replacing the glass so that natural light would once again illuminate the hall during the day (facing page right). This also provided an opportunity to add an aesthetic lighting element via the statuary lighting (facing page left).

COURTESY HORTON LEES BROGDEN LIGHTING DESIGN

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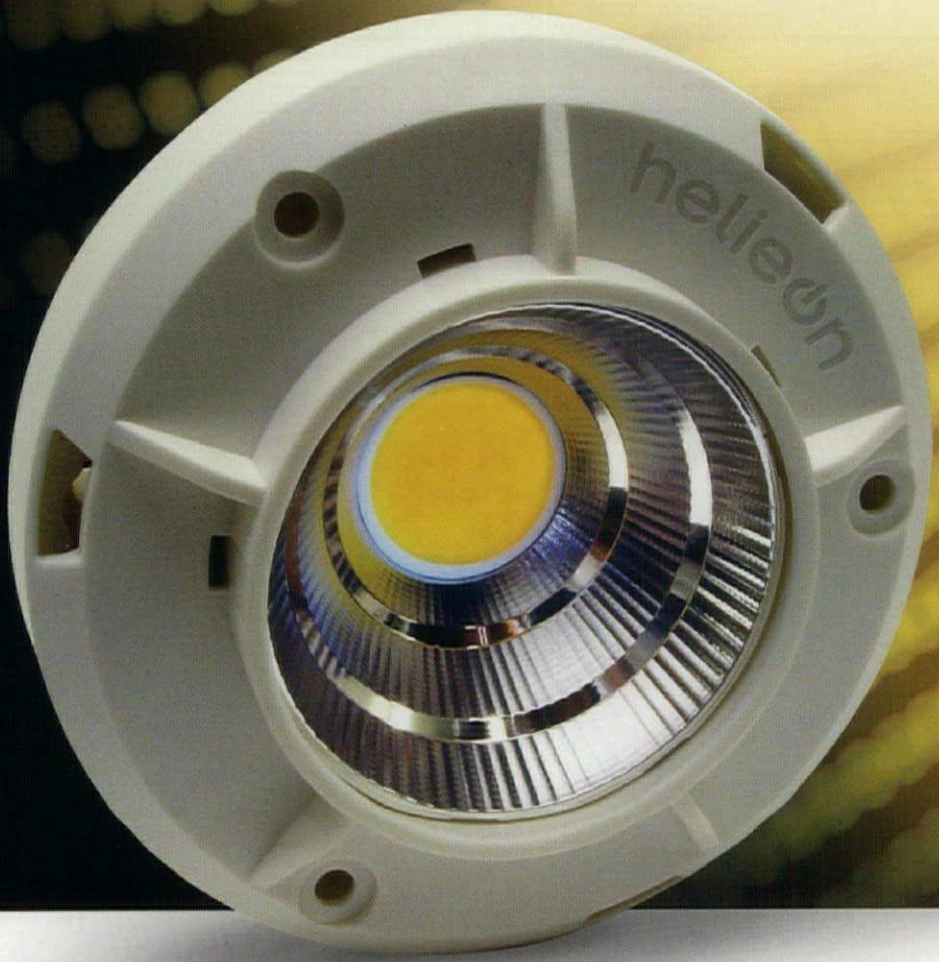

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SCOTT ROBERTS

Light and Productivity

EXAMINING HOW LIGHT IMPACTS TEENAGERS' SLEEPING HABITS

The contemporary world, with its deep-core buildings and around-the-clock work schedules, may be impacting our circadian system—the biological functions that run on about a 24-hour sequence, such as the sleep-wake cycle. Sleep typically occurs about two hours after the onset of melatonin, a hormone produced in the evening and under conditions of darkness, which acts as a timing messenger signaling to the body when it is nighttime.

Like a clock that needs to be set daily for accurate time-telling, the brain's circadian clock requires a rhythmic pattern of light-dark exposure to orchestrate all of the body's complex biological functions, one of which is melatonin production. The human biological clock runs with a period slightly longer than 24 hours; therefore, each morning when you receive sufficient light, your biological clock is "reset" to match the 24-hour solar day. A natural cycle of bright days and dark nights is the ideal regulating rhythm for the circadian system.

However, patterns of light and dark in today's built environment are often inconsistent with the natural rhythm of bright days and dark nights. Surprisingly, electric light in buildings pales in comparison to outdoor light levels during the day—even under cloud cover or during the winter. This absence of suitable light exposures during the day may induce "circadian darkness" because the indoor electric lighting can be insufficient to strongly stimulate the circadian clock. Likewise, too much light in the evening, either through electric lighting or extended daylight hours in the spring and the summer, may be too bright to signal darkness to the brain's clock. Lack of exposure to morning light, or exposure to too much light in the evening, can delay melatonin production onset, and therefore delay sleep, resulting in circadian disruption.

Long-term effects of circadian disruption may be impacting our health, well-being, and performance. In fact, recent studies using animals (e.g., mice and rats) showed that circadian disruption by irregular light-dark patterns are associated with increased mortality, higher risks for developing diabetes, obe-

sity, cardiovascular disease, and even cancer. Epidemiological studies in humans show that those who work swing shifts for an extended number of years—20 to 30—are more likely to experience circadian disruption, are at higher risks of diseases such as breast and colorectal cancer.

CIRCADIAN LIGHT

This irregular light-dark pattern exposure may have an acute effect on teenagers. Sleep restriction is common in adolescents and has received growing attention in the past few years. Pubertal changes in sleep regulation mechanisms are believed to underlie the tendency toward later bed and rise times experienced by adolescents. Rigid school schedules require teens to be in class very early in the morning, yet schools are not likely to provide adequate electric light or daylight to stimulate a student's circadian system, which regulates body temperature, alertness, appetite, hormones, and sleep patterns. The circadian system responds to light much differently than the visual system and is much more sensitive to short-wavelength ("blue") light. Therefore, having enough light in the classroom for teenagers to read and study does not guarantee that there is sufficient light to stimulate their biological systems. Because daylight can provide a robust circadian stimulus of the correct spectrum (rich in short-wavelength radiation), quantity, timing, and duration, it is reasonable to suppose that daylight can affect circadian timing and thus sleep onset at night and rise time in the morning.

Although daylight is an ideal source to synchronize the circadian system, its impact on scholastic performance is still unresolved. To begin to establish a scientific foundation in the context of linking daylight to scholastic performance, three important issues must be addressed. First, it is necessary to identify an underlying mechanism that could plausibly support such a link. Second, it is necessary to measure the stimulus needed to trigger that mechanism. And finally, a formal hypothesis of the presumed biophysical relationship between the measured stimulus and a measured response from the mechanism must be tested. For validation, it is also important to demonstrate that the application of the stimulus consistently produces a predictable response.

The scientific journals *Neuroendocrinology Letters*, *Chronobiology International*, and *Lighting Research & Technology* recently published results[1,2,3] from field studies done by Rensselaer Polytechnic Institute's Lighting Research Center (LRC) at Smith Middle School in Chapel Hill, N.C. These studies examined how morning light exposure may impact the sleep patterns and self-reports of well-being of teenagers. These studies were also a first attempt to systematically explore the possibility that the human circadian system might be the underlying mechanism in the proposed link between daylight and scholastic performance. Smith Middle School is housed in a building that uses south-facing roof monitors. This is done to deliver daylight to the interior spaces, thereby exposing students to some of the highest light levels of daylight found in an indoor classroom environment.[4] In one of the Smith Middle School studies conducted in 2009, the LRC showed that when the same group of 11 teenage subjects wore special orange glasses in the morning to remove short-wavelength ("blue") light from reaching their eyes, their melatonin onset was delayed by about 30 minutes compared to the previous week, when they did not wear the glasses.

In a larger study at Smith Middle School, 22 students participated before and during school hours for a week. Half the students wore the orange glasses that minimized short-wavelength light exposure needed for circadian-system stimulation, while a control group did not wear the orange glasses. Melatonin onset was delayed (approximately 30 minutes) for those students who wore the orange glasses compared to the control group. Sleep durations were slightly, but not significantly, curtailed in the orange-glasses group. Performance scores on a brief, standardized psychomotor vigilance test (the test lasted about 5 to 7 minutes and subjects had three types of performance tests: reaction times, forced-choice reaction time, and short-term memory task) and self-reports of well-being were not significantly different between the two groups.

In both instances, each student wore a Daysimeter, a small, head-mounted device developed by the LRC to measure an individual's exposure to daily "circadian light," as well as rest and activity patterns. The definition of circadian light is based upon the potential for light to suppress melatonin synthesis at night, as opposed to measuring light in terms of how it stimulates the visual system.

TEENS' CONFLICTING CLOCKS

Teenagers must rise at a set time to get to school on time, regardless of when they may fall asleep. As a result, it is quite possible that students are missing the morning light necessary to synchronize their biological clocks with the 24-hour solar day, because they are often traveling to and arriving at school before the sun is up or just as it's rising. Most of our electric lighting is designed to meet the needs of the visual system, not to stimulate our biological clock. As teenagers spend more time indoors, they miss out on essential morning light needed to stimulate their circadian system.

Another study in 2009, conducted by the LRC at Algonquin Middle School in Averill Park, N.Y., examined how extended daylight hours influence the sleeping patterns of teenage students. The study found that the 16 subjects from this upstate New York school experienced a delay in melatonin onset by an average of 20 minutes measured in one day in spring relative to one day in winter. The Daysimeter was used again and the students also kept sleep logs as part of the seven-day study, which collectively showed a 16-minute average delay in reported sleep onset and a 15-minute average reduction in reported sleep duration measured in one day in spring relative to one day in winter. The results demonstrated that it was the extended daylight hours due to the seasonal change, not evening electric lighting after dark in the home, that likely had the greatest impact on delayed sleeping patterns.

The results of the Algonquin Middle School study supplement the Smith Middle School studies and emphasize the general hypothesis that the entire 24-hour pattern of light-dark exposure influences synchronization of the body's biological clock to the solar day. In addition to teenagers increasing morning daylight exposure year round, they should decrease evening daylight exposure in the spring and early fall to help ensure they will get sufficient sleep during the school year.

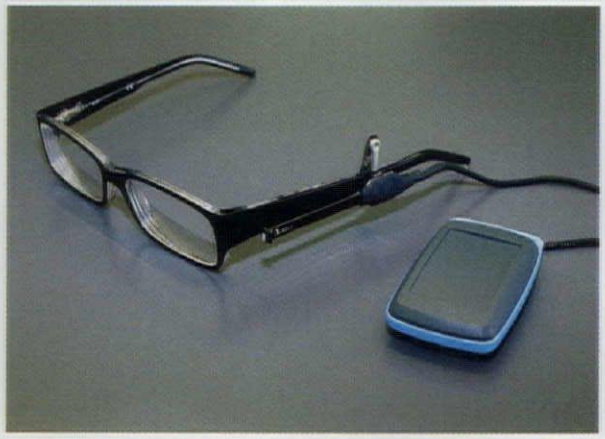
If the lighted environment in schools promotes circadian synchronization, it will help students fall asleep earlier, and therefore reduce their sleep deprivation. Studies have shown that teen sleep deprivation may lead to mood changes, increase risk of obesity, and perhaps contribute to underperformance in school. The studies detailed in this article, funded by the U.S. Green Buildings Council and the Trans-National Institutes of Health's Genes, Environment and Health Initiative, will result in a set of guidelines for architects, designers, and school administrators to enable the development of school building designs that promote circadian synchronization and maximize students' health, well-being, and performance. **MARIANA FIGUEIRO AND BARBARA PLITNICK**

Mariana Figueiro, Ph.D., is Light and Health program director at the Lighting Research Center and associate professor at Rensselaer Polytechnic Institute. Her research is focused on the area of human circadian response to light. She is former chair and current member of the Illuminating Engineering Society's Light and Human Health Committee.

Barbara Plitnick, RN, is a research nurse at Rensselaer Polytechnic Institute's Lighting Research Center where she plays a critical role in managing and conducting studies pertaining to the effects of light on human health and well-being.

The Daysimeter

In order to link the impact of daylight and electric lighting on students' performance and well-being, it is necessary to quantify the actual amount of daylight or electric light that students are being exposed to—specifically, the kind of light that stimulates the circadian system. The Daysimeter[5] is a research device first developed by the Lighting Research Center (LRC) in 2004 that monitors and logs an individual's light exposure and rest-activity patterns over an extended period of time. It is the first device to accurately measure and characterize circadian light—the light entering the eye that affects the biological clock.[6] The Daysimeter also measures conventional light levels and records head movements to differentiate between rest and active periods.



The current generation Daysimeter has been used extensively in LRC and non-LRC research efforts. Its look has transformed since its initial development, continuing to shrink in size and become more user-friendly. As demonstrated above, it can easily be worn using a small, lightweight head-mounted device. Under a grant from the Trans-National Institutes of Health's Genes, Environment and Health Initiative, the LRC is currently developing an even smaller next-generation Daysimeter with wireless communication and enhanced biofeedback capabilities.

Use of the Daysimeter is allowing for more in-depth studies concerning the impact of light on human health and well-being. It will enable better design of light sources, luminaires, lighting techniques, and lighting applications that will help maintain regular circadian functions.

COURTESY LIGHTING RESEARCH CENTER

[1] Figueiro M.G., Rea, M.S. 2010. "Lack of Short-wavelength Light During the School Day Delays Dim Light Melatonin Onset (DLMO) in Middle School Students." *Neuroendocrinology Letters* 31(1): 92-6.

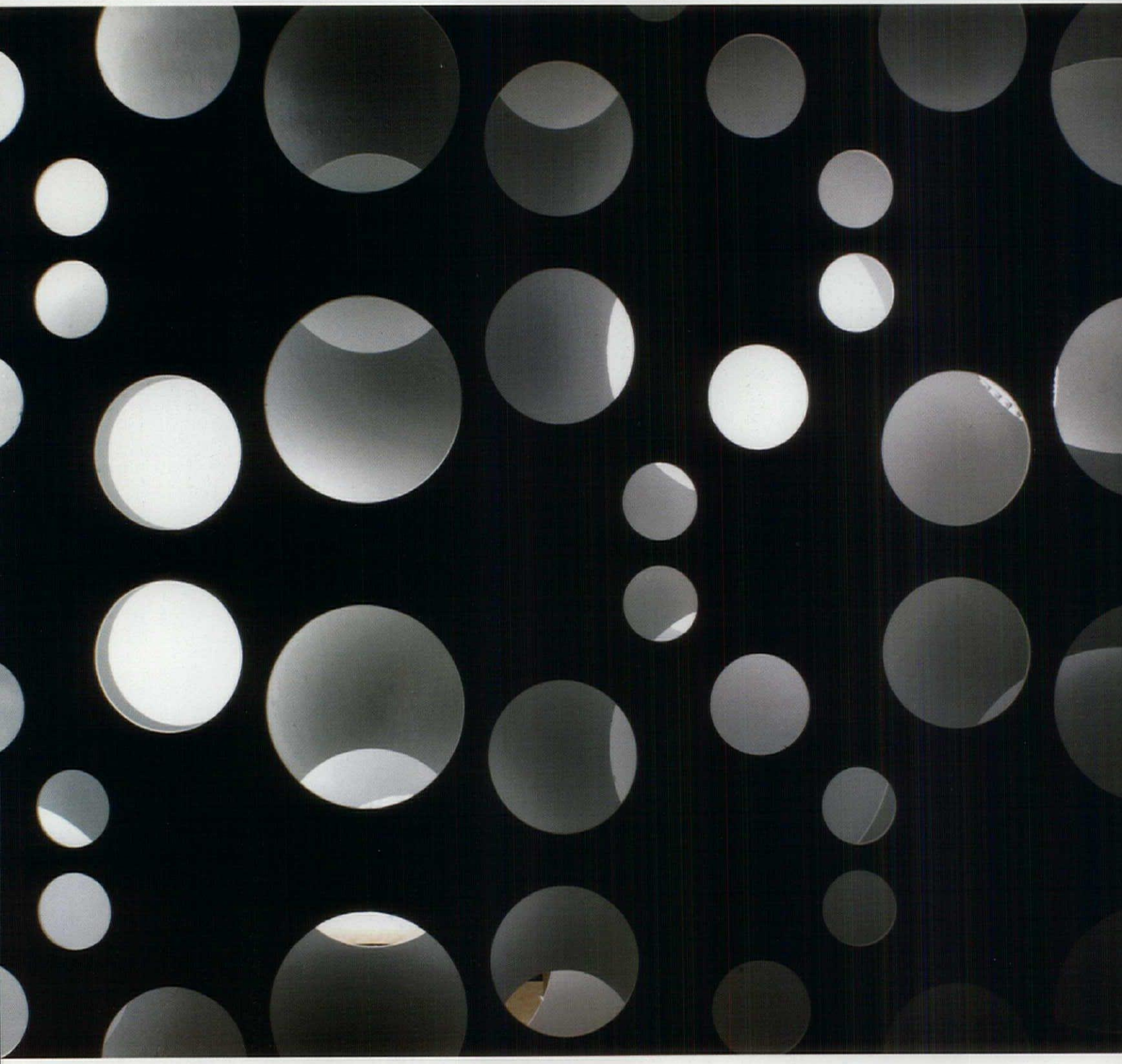
[2] Figueiro M.G., Rea M.S. 2010. "Evening Daylight May Cause Adolescents to Sleep Less in Spring than in Winter." *Chronobiology International* 27(6): 1242-1258.

[3] Figueiro M.G., Brons J.A., Plitnick B., Donlan B., Leslie R.P., Rea M.S. "Measuring Circadian Light and its Impact on Adolescents." *Lighting Research and Technology*, in press.

[4] Lighting Research Center. 2004. "Daylight Dividends Case Study: Smith Middle School, Chapel Hill, N.C." Go to lrc.rpi.edu/programs/daylighting/pdf/SmithCaseStudyFinal.pdf.

[5] Bierman A., Klein T.R., Rea M.S. 2005. "The Daysimeter: A Device for Measuring Optical Radiation as a Stimulus for the Human Circadian System." *Measurement Science and Technology* 16: 2292-2299.

[6] Rea M.S., Figueiro M.G., Bierman A., Bullough J.D. 2010. "Circadian Light." *Journal of Circadian Rhythms* 8: 2.



The Catalyst

ARCHITECTURE STUDENTS EXPERIMENT WITH LIGHT AND MATERIAL

"The history of architecture is the history of the struggle for light." Le Corbusier's oft-repeated quote captures the obsession most architects have with the role of light in buildings. And yet, the study of light is often absent from architecture curricula. Students rarely get the opportunity to experiment with light or to better understand how this transient, yet critical, property functions.

Blaine Brownell, an assistant professor at the University of Minnesota (UMN) School of Architecture, remembers this disconnect in his own architecture education. "Lighting was something that we talked about but never studied on its own," he says. He endeavored to change that for his students. UMN offers a unique one-week course to its architecture graduates called a catalyst class. The aim is to immerse participants in an intense, quick study of a topic. "The idea of [the] catalyst [course] is that within one week students can take a break from their current coursework and they can focus on one thing," he says. "And that one thing can be experimental and high risk."

Brownell has developed two catalyst courses around light—Light as Material and The Shape of Light. "Architecture is often defined as necessitating the presence of light, the embodiment of beautiful forms and light," he says. "Yet for students, it's almost always referred to in general terms and assumptions. These classes are about learning by doing. I wanted to inspire them."

The first class, Light as Material, was held in the spring of 2009. The goal: Teach students about the behavior of light and material integration. In five days, participants would create their own physical structures using light as a primary ingredient and install them on campus. To assist in this, Brownell brought in John Huizinga, at the time a scientist at St. Paul–based 3M, to mentor the students. Huizinga, who is now retired from 3M, presented the company's enhanced specular reflector (ESR) film as a tool for manipulating light. "A typical bathroom mirror is 90 percent reflective. The 3M film is 99 percent reflective. You can do a lot more [to direct the light's travel path] and not lose the light as quickly," he says.

Typically 3M uses ESR film to bring daylight into buildings—a particularly valuable system for adaptive reuse projects—but Huizinga was

Details

Class/Semester Light as Material, Catalyst: Arch 5110, Spring 2009; The Shape of Light, Catalyst: Arch 5110, Spring 2010

School University of Minnesota, School of Architecture, Minneapolis

Faculty Member Blaine Brownell

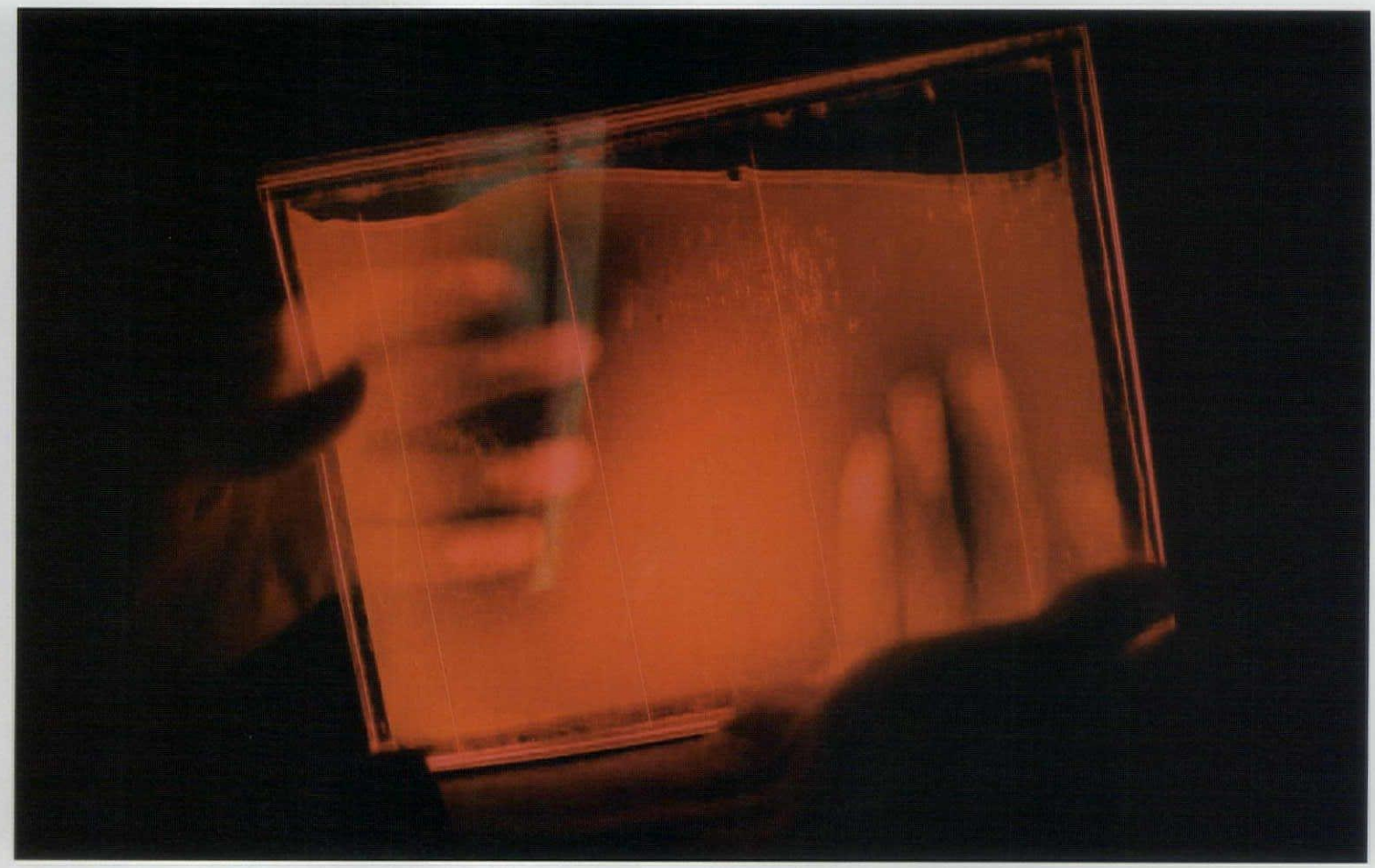
Visiting Critics, Light as Material: John Huizinga, 3M, and Abhinand Lath, Sensitile; The Shape of Light: Margaret Vogel-Martin, 3M

Students

Light as Material:
Joe Brown, Tom Christian, Ryan Diedrich, Darin Duch, Jennifer Garman, Matt Haller, Jonathan Leung, Jessica Lucas, Alison Markowitz-Chan, Jessica McClurg, Yong Moua, Caleb Nelson, Tim Ogren, Peter Portilla, Greg Schwartz, Aaron Wilson, and Brad Zielinski

The Shape of Light:
Thomas Everson, Olawale Falade, Laura Flynn, Ben Garrison, Josh Grenier, Abby Kurlinkus, Kelly Martinez, Laurie McGinley, Tam Ngo, Elizabeth Payton, The Phan, Sopheak Pho, Denisse Velez Rivera, Andrew Schoenherr, Kyle Snyder, and Piseth Tep

Images Courtesy Blaine Brownell



Students at the University of Minnesota School of Architecture have been exploring light's interaction with materials in two courses developed by assistant professor Blaine Brownell. In the 2009 class, Light as Material, students designed their own physical structures using light as the primary material. For their project, "Light Bridge," students Joe Brown, Greg Schwartz, Aaron Wilson, and Brad Zielinski explored the "light-propagating properties of polymer sheets" (left). Jennifer Garman, Tom Christian, and Ryan Diedrich's project, "Liquid Bricks," developed a glowing structural brick system (above). In the 2010 class, The Shape of Light, Ben Garrison and his teammates The Phan and Sopheak Pho developed an adaptable multilayered surface with different-sized apertures in their project, "Light Screen" (previous page).

curious to see how architects-in-training might apply the technology. "My role [in the class] was to tell them what was different about those films in dealing with light and to get them to design something that would look architecturally different," he says. Huizinga was particularly excited to see the film used in new ways that differed from the typical daylighting systems that 3M creates.

Brownell and Huizinga inspired students with a lecture and a series of readings on the nature of light, then Brownell set the class loose to design and fabricate a light-propagating installation—a surface, system, or device—that used materials to manipulate light. Twelve projects emerged by the end of the week, all with vastly different approaches. Some students worked as teams; others worked solo. One student team used the ESR film to great effect with wood veneer with a project called Illuminated Wood. By backlighting the wood, the film transformed the material, which then emitted a warm, rosy glow. Another student created a self-supporting sculptural tapestry out of wood and plastic that could transmit electric light and reflect daylight. "It's a hybrid between structure and form and lighting," Brownell says.

For her team project, "Liquid Bricks," student Jennifer Garman, then in her second year, and her partners—Tom Christian and Ryan Diedrich—played with light, liquid, and translucency. "We were excited to see how you could take an intangible source like light and make it work as a material," Garman says. They explored several different materials to see what could be sandwiched between plastic to create a kind of liquid diffusion system. The final design used corn syrup and India ink. "We also played around with glow sticks, which was really fun," Garman says. From this initial exploration, the team developed a glowing structural brick system composed of lasercut 2-inch-square cubes of acrylic strung with a network of LEDs. They also developed bricks filled with a light-emitting polymer liquid.

Another project from the Light as Material class, "Structural Tapestry," was designed by Alison Markowitz-Chan, who developed "an idea for an emergent structural curtain comprised of semi-conical cells." Markowitz-Chan designed modules made from wood and PETG to house embedded LEDs and lined the interior module surfaces with an enhanced specular reflector (ESR) film produced by 3M. The film reflects light at certain angles and transmits it via others. The final project becomes "a large, undulating surface that emits light in unpredictable ways" (left). In The Shape of Light class, Denisse Velez Rivera, Laura Flynn, and Abby Kurlinkus explored light's horizontality in their project "Light Canopy" (above). The students developed a series of six scrims that emulates the effect of a tree canopy and creates the sensation of dappling light.

Brownell's second catalyst course, The Shape of Light, was held this past spring and it had a similar experimental vibe. This time, participants explored the ways in which fiber optics allow for the bending and extension of light through structural devices such as light pipes, acrylic tubes, and mirror ducts. This time, Brownell partnered with 3M's Margaret Vogel-Martin. Students were asked to utilize a scale model of 3M's Light Guide system—a duct system that brings daylight into the deep recesses of buildings—and develop new lenses, filters, fixtures, and delivery mechanisms for the sunlight dispatched through the Light Guide. They then created scaled-down mock-ups of their systems to test the ideas.

Students Ben Garrison, The Phan, and Sopheak Pho came up with the idea for a Light Screen, an adaptable multilayered surface with different-sized apertures. The mock-up they designed has a system of Swiss-cheese-like metal screens on tracks that can be moved by the user to change the openings of the apertures. The result is a dappled light effect reminiscent of a room-dividing screen used in Middle Eastern architecture.

In contrast, Denisse Velez Rivera and her teammates Laura Flynn and Abby Kurlinkus looked to the ceiling. For their project, titled "Light Canopy," they developed a series of six scrims that mimicked the effect of a tree canopy. The system is meant to create an expansive, open sky sensation in a room. "Rather than a plenum space that is dropped over your head, there would be a sense that there was an expanse and the whole ceiling is light," Brownell says.

While the class is short and sweet—five intense days of long hours, research, and experimentation—the lasting impact on the students is significant. "I've always been interested in the phenomenology of light and how it can transform space. With the catalyst you get to innovate and explore that one dimension of a building," Garman says. "And to be able to go hands-on and have a project that you can hold at the end of the week is pretty unique."

ELIZABETH EVITTS DICKINSON

Gleaning the Sun

MARILYNE ANDERSEN'S **MIT DAYLIGHTING CLASS** TAKES A HANDS-ON APPROACH

As one might expect from the founder of the Daylighting Lab at the Massachusetts Institute of Technology (MIT), Marilyne Andersen (now the founder and head of the Interdisciplinary Laboratory of Performance-Integrated Design at the Swiss Federal Institute of Technology [EPFL] in Lausanne, Switzerland), comes from a background not in design, but science. After earning a master's degree in physics and a Ph.D. in building physics from EPFL in her native Lausanne, her interests gravitated toward architecture. When she came to MIT in 2004, Andersen sought to find an area of focus that would encompass both the analytical and experiential aspects of creating structures for human habitation. "I was looking for a bridge between architecture and engineering," she explains, "and daylight seemed to be the most central link between the two. It relates to heating and cooling—the major energy issues—but it's also very strongly connected to the aesthetics and ambience of a space. It even relates to health."

Having found the intersection of her interests, Andersen established the Daylighting Lab, a research group that sits somewhere between engineering, science, and architecture. The lab combines theory with hands-on experience, and has drawn students from disciplines as varied as her own. In 2009, about a third were in the M.Arch. program, another third were pursuing professional postgraduate degrees in science and engineering with a focus on building technology, and the final third were undergraduates. She strongly believes in the importance of having an open exchange between professor and pupil. "One of the things that I really enjoy and think is essential, is to interact with the students," she says. "This means having a small class, ideally 15 or 20 students, who feel free to interrupt the teacher."

An extension of the lab is the daylighting class, the only such one at the institute. Andersen developed the class to introduce students to daylighting strategies, using an existing building as a case study. Andersen always tried to make sure that there was a mix of students on each team to create a diverse range of knowledge, as well as give the professional students in architecture and engineering a prep-course in how to communicate with others—a valuable skill for their futures.

Rather than mandate specific approaches, Andersen encouraged the class to develop its own ideas, and equipped all of the students with the strategies and processes available to architects, lighting designers, and daylighting consultants. The students learned fundamental and advanced strategies with the goal of developing a vocabulary and intuition with daylight to the point that they would be able to predict how a given design would affect a space and be able to express those views. Calculation methods and simulation tools were taught. The students also worked with

Details
Class/Semester Daylighting, Delight in Greener Daylight, Fall 2009
School Massachusetts Institute of Technology, School of Architecture + Planning, Cambridge, Mass.
Faculty Member Marilyne Andersen
Teaching Assistant Jaime Lee Gagne
Students Bruno Bueno, Sam Cheng, Cristen Chinea, Shreya Dave, Justin Hipp, Kian Yam Hiu Lan, Juliet Hsu, Christelle Huberty, August Liau, Andrea Love, Alejandra Menchaca, Jie Qian, Siobhan Rockcastle, Jason Tapia, Mallory Taub, Kevin Thuot, Yang Yang, and Tea Zakula
Images Courtesy Marilyne Andersen

software, including Ecotect in combination with Radiance and Daysim (lighting calculation and rendering programs), which predict when a certain illuminance threshold is available at a given point on the globe. They also worked with Lightsolve, a program that Andersen designed with her research students and Rennselaer Polytechnic Institute. Lightsolve uses yearly meteorological data and then calculates and displays goal-based performance metrics for illuminance, glare, and solar gains. It then produces renderings.

For the Fall 2009 class, Andersen asked her students to develop daylighting solutions for the Consulate of Switzerland's office, also known as Swissnex Boston, located at 420 Broadway in Cambridge, Mass. They focused on the second floor, which is a recent extension to the original building designed by Convergeo, a firm based in Concord, Mass., and Lausanne, Switzerland, and founded by Muriel Waldvogel and Jeffrey Huang. Constructed in 2008, the extension rises out of the existing brick building's gravel roof, its walls made up of concave and convex curves. Basically, it is a glass box with glazing on three of the four façades. The fourth façade, which faces south-southwest, features a solid wall punctured by a few windows.

Andersen divided the students into five groups, assigning each team two individual spaces with differing orientations. Four of the five groups received fully glazed office spaces. The fifth group was assigned a large meeting space, which features the mostly opaque façade. The selection of two different orientations for each team was essential to the project: It created the challenge of coming up with an architectural language that would handle contrasting daylight conditions.

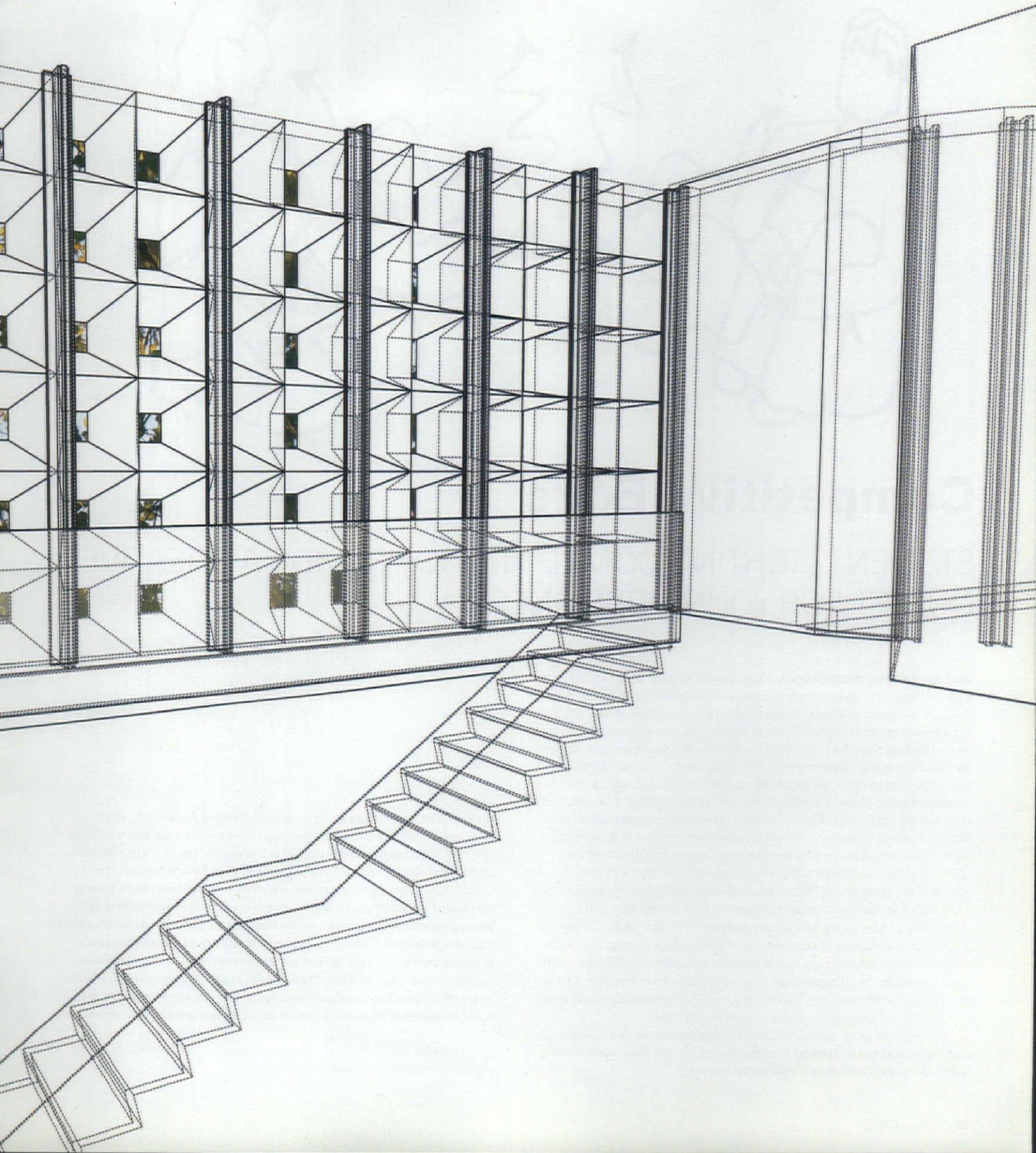
The students had to follow a specific sequence of phases. The first was an on-site diagnostic, for which they visited Swissnex, took pictures and measurements of their spaces, and got a sense of the surroundings. Using what they had gathered from this, each team proposed an initial daylighting renovation. The ideas were then discussed with the entire class. Next, the students built physical models based on the feedback from the discussion. In the fourth phase, they used simulation tools to validate their approach, subjecting their models to overcast and full-sun conditions. Finally, after tweaking the designs based on what they learned from the physical models, the students ran their proposals through the battery of software programs mentioned above.

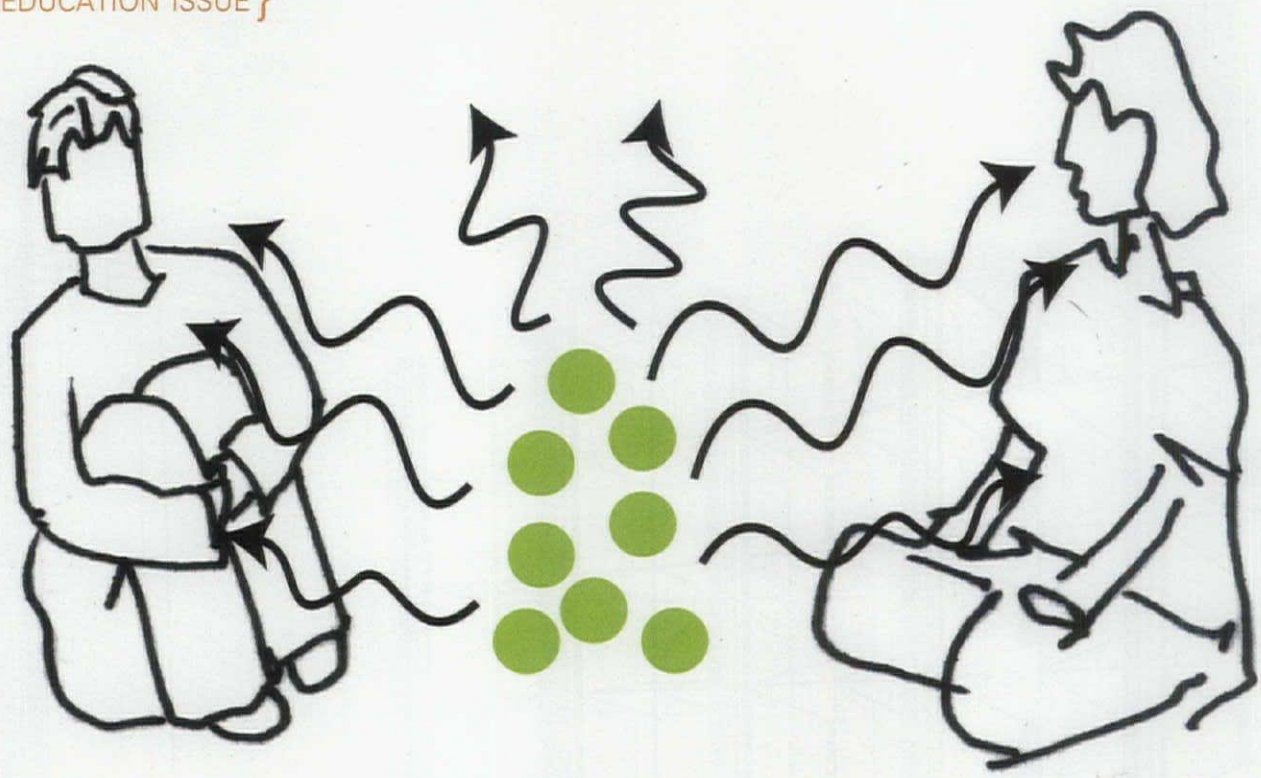
While most of the teams had to deal with mitigating exposure to too much light, perhaps the most interesting challenge was in the meeting area, the darkest space in the building, which featured a south-facing wall with multiple windows. Here the students had to figure out a way to bring in more daylight without opening the space to the full aggressive glare of southern sunlight. The group decided to replace the wall with a grid screen of self-shading cells. (They titled their project "Screening Light.") The screen's cells are oriented to block incoming sunlight during the summer and allow it inside during the winter. The cells come in a variety of sizes and geometries, favoring the most interesting views and adding visual interest to the space. They also added north-facing skylights to provide additional illumination.

The other groups developed proposals that fit their own projects' orientations. Those who had northeast and northwest façades employed vertical fins or panels to try to let in light but only at certain angles or after being diffused by reflection on the fins. Those with the southeast or southwest exposures were mostly concerned with glare and potential overheating. They turned to slat- or louver-based systems: a retractable horizontal louver in one, a vertically rotatable and retractable louver that follow the curves of building in the other.

At the conclusion of the class, the students exhibited their work, displaying presentation boards, models, and audio recordings that documented their proposals. (This exhibition was a first for the Daylighting Lab.) The tenants of Swissnex, including the Swiss consul, came to see how the wiz kids of MIT would improve on their digs and were reportedly impressed, though they have no plans to implement any of the solutions. Besides, Andersen never intended her students' work to be built. "I didn't want them to be restricted by feasibility, cost-effectiveness, or winning acceptance from the town," she says. "I wanted radical proposals." **AARON SEWARD**

Students enrolled in MIT's Daylighting class displayed their work in an end-of-semester exhibit at the School of Architecture + Planning's Wolk Gallery. Each of the five student teams documented its daylighting proposals for the Consulate of Switzerland's office in Cambridge, Mass., using presentation boards, models, and audio recordings (previous page). For their project, "Screening Light," students Shreya Dave, Juliet Hsu, Jie Qian, and Siobhan Rockcastle were asked to focus on the Consulate's south-facing lounge, which is used as an informal meeting area (this page). To provide the space with a more dynamic quality, the students proposed a screen of self-shading cells to control sunlight penetration that also increased the amount of indirect daylight access into the lounge. The cells vary in size and depth to maximize preferred views and critical sun angles. A series of north-facing skylights brings more light into the center of the lounge.





Competitive Edge

STUDENT LIGHTING COMPETITIONS PROVIDE A CREATIVE OUTLET FOR YOUNG DESIGNERS

Student lighting competitions, regardless of whether their focus is on a project or luminaire, play an important role in the educational opportunities available to students. While limited in number, as are grants and scholarships associated with a specific design problem, these competitions provide needed monetary prizes that aid in covering tuition and expenses associated with attending industry conferences and events such as Lightfair.

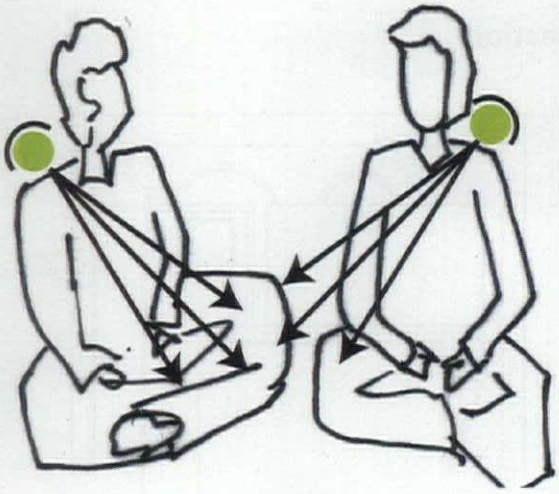
Equally important, these competitions provide students with a creative outlet to explore ideas related to light. For some students it is their first foray into lighting, and the competition format serves as an excellent complement to their existing coursework, regardless of whether their primary course of study is architecture, engineering, interior design, or lighting.

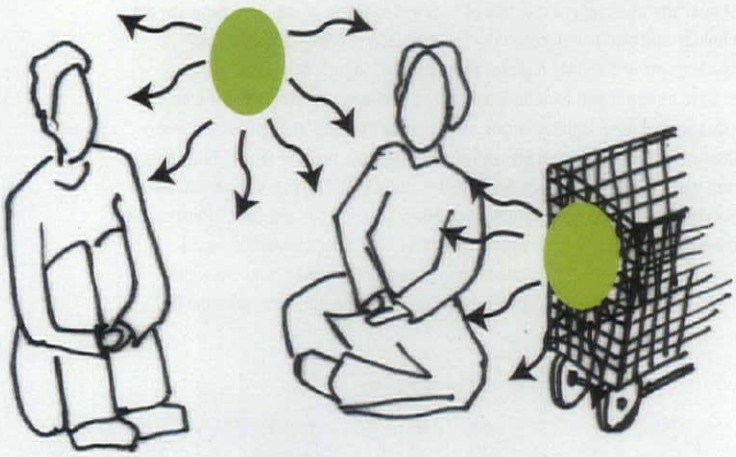
The programs vary depending on how they are administered and who is eligible. The Robert Bruce Thompson Annual Student Light Fixture Design Competition (rbtcompetition.org) is overseen by a private trust and is open to students enrolled in an accredited program. The Saul Goldin Memorial Lighting Design Competition (iesla.org) is reserved for southern California residents and is overseen by the Illuminating Engineering Society's (IES) Los Angeles Section. On the east coast, the IES's New York City Section administers the Richard Kelly Grant (iesny.org/RichardKelly.aspx), directed at students and young professionals under the age of 35.

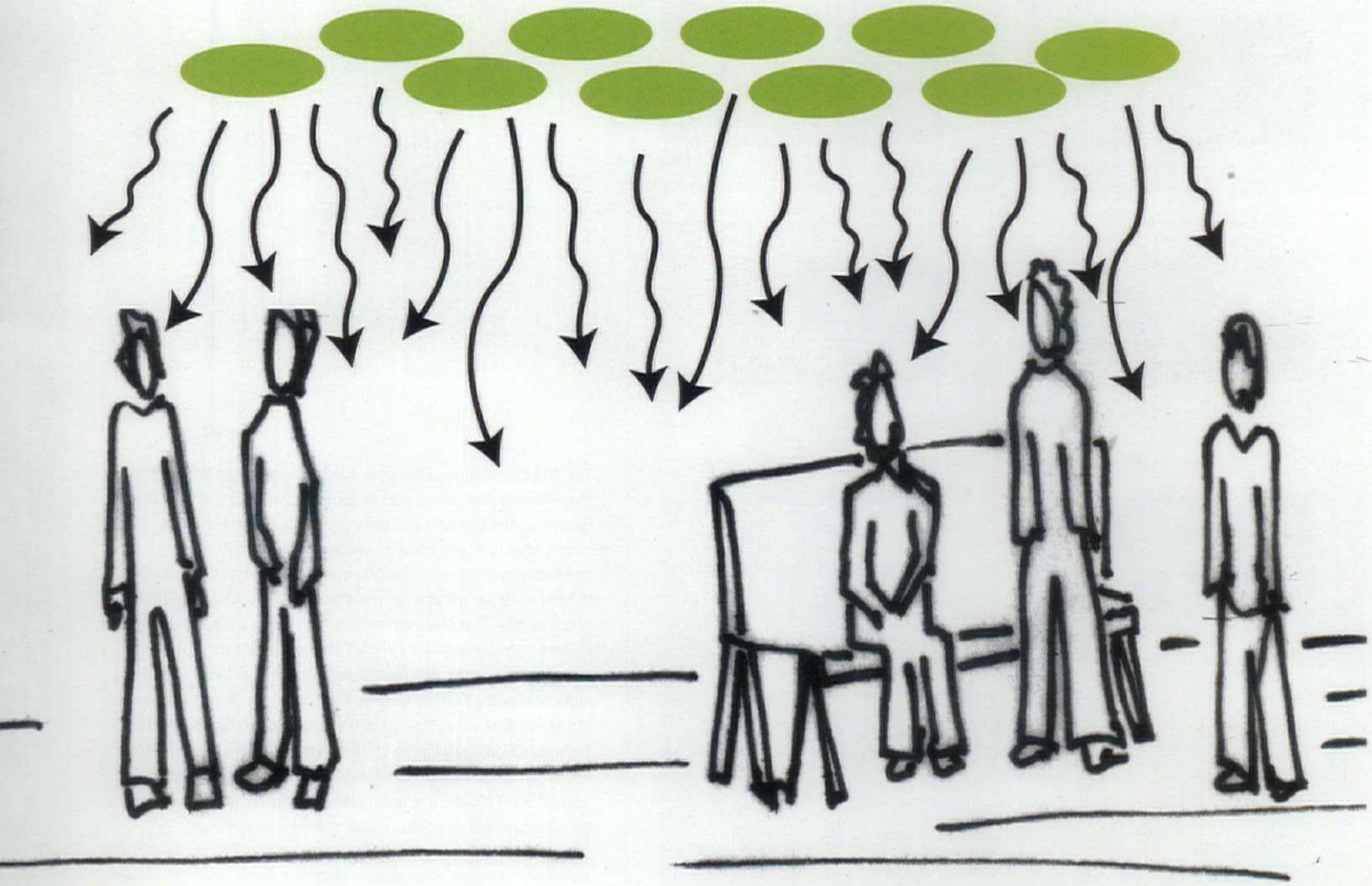
The range of work on the following pages speaks to the diversity of students interested in lighting, and the incredible wealth of ideas waiting to find an outlet of expression. **ELIZABETH DONOFF**

The Kelly Grant, which honors the legacy of lighting designer Richard Kelly, was established in 1980 "to recognize and encourage creative thought and activity in the use of light." The first of two Kelly Grants awarded in 2010 went to Francesca Bastianini, a 2010 graduate from the architectural lighting design program at Parsons the New School for Design, who was recognized for her work analyzing the role light plays for the homeless. Her research project "Sheltering Light" examines one of the most significant losses that those who are homeless experience: the inability to control their surroundings. By creating a portable, rechargeable light fixture that can be operated by an individual in a variety of settings, including shelters, the luminaire can become part of the individual's pillow, blanket, sleeping bag, or backpack. The fixture can also block surrounding light or serve as a tasklight. Most importantly, it would provide an individual with a sense of control in a setting where they might not feel they are in charge of their situation or environment.

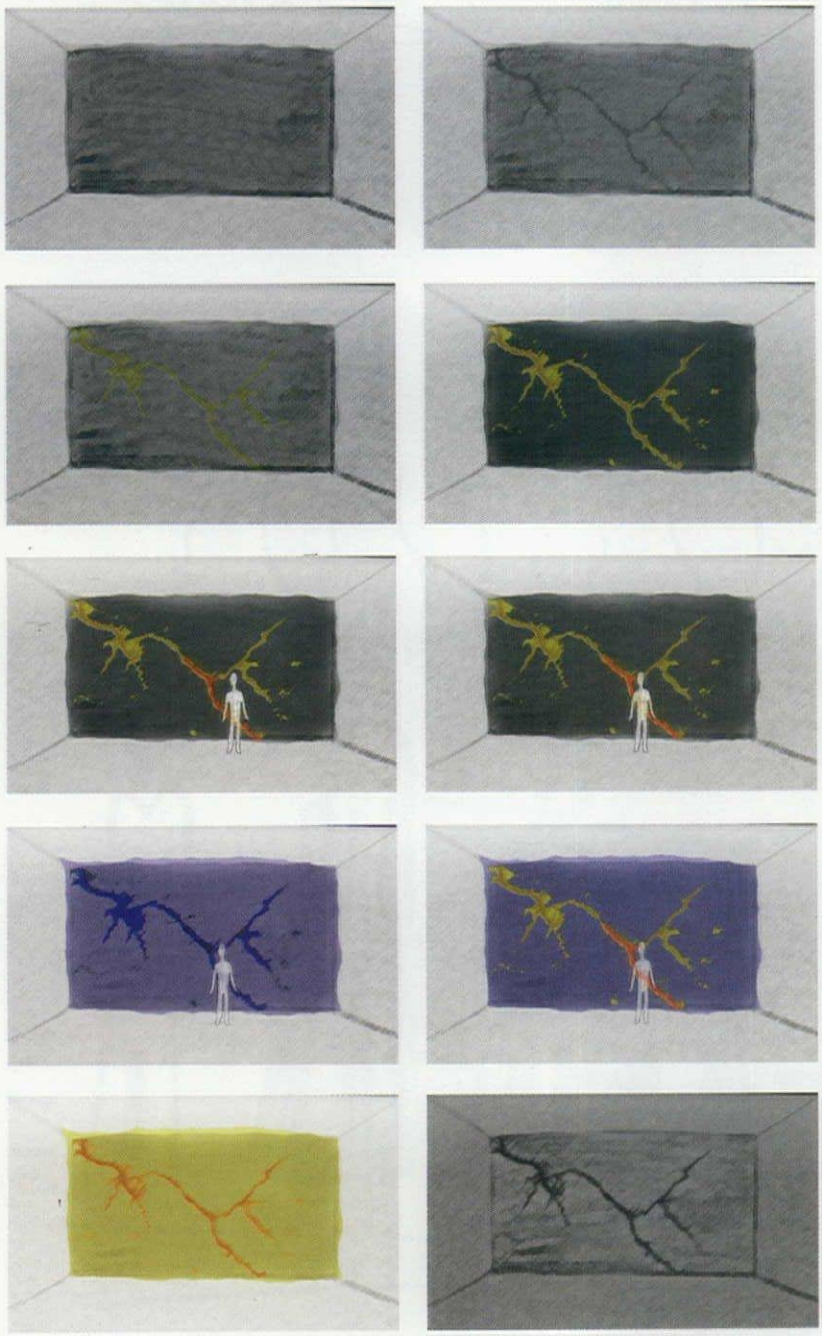
RENDERINGS COURTESY FRANCESCA BASTIANINI







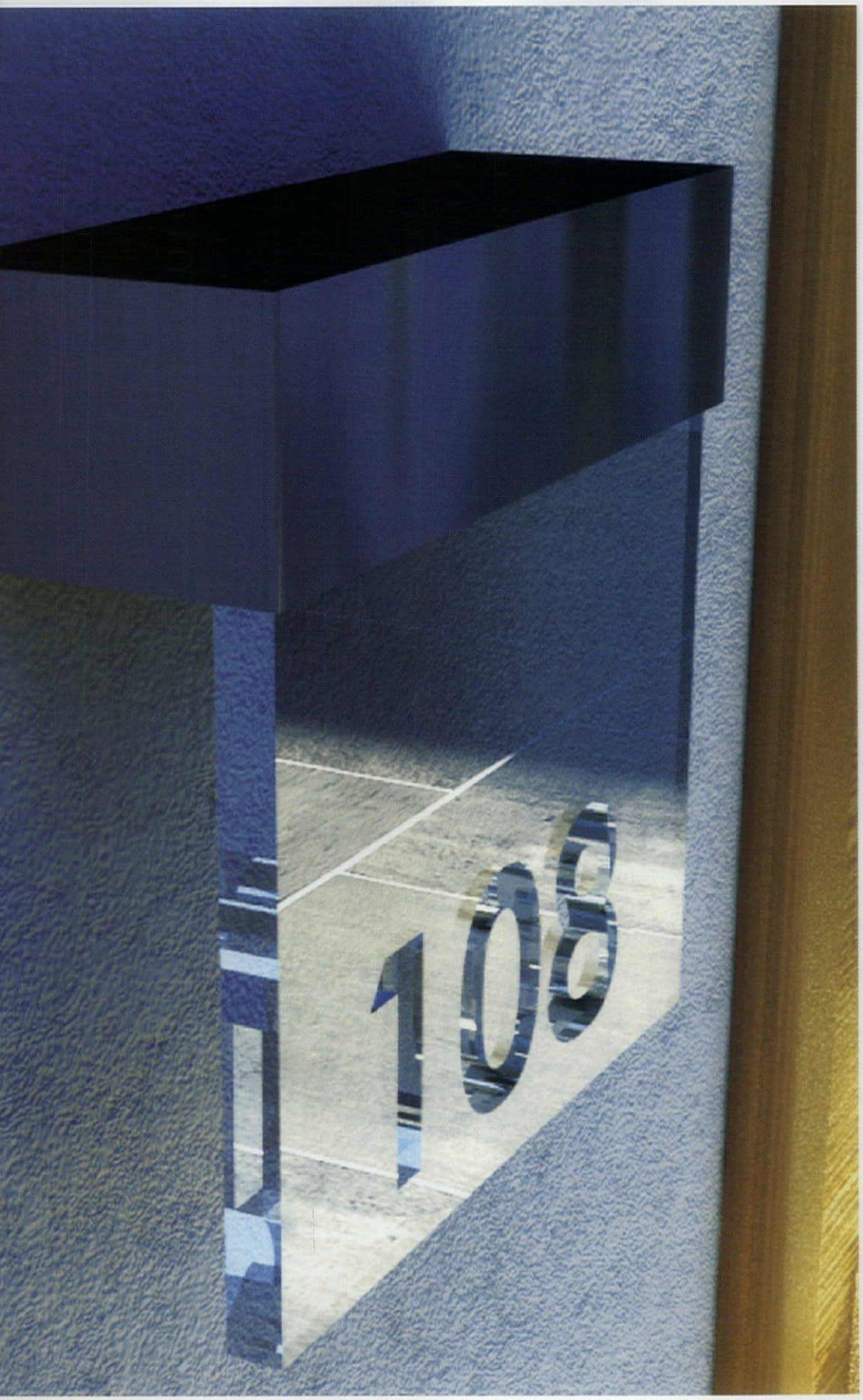
The second Kelly Grant awarded in 2010 went to Maja Petric, a Ph.D. student at the Center for Digital Arts and Experimental Media at the University of Washington in Seattle, who received recognition for her light art installation titled "The Crack" (below). The work explores "the changing perception of space in function of art," and experiments with technology and traditional materials. The art piece is composed of a wall "fabricated to cover and imitate a real wall in a room." In turn, the "fake" wall is programmed to contract and expand in motorized sections, and the result is a crack that develops in real time. Light emerges as the crack appears and grows and, with that, a different sense of time and place. Several iterations of "The Crack" have been constructed using different halogen, fluorescent, and LEDs. The installation has also been used as the backdrop for a dance piece titled "The Eyes of the Skin." Petric worked with Jennifer Salk, associate professor at the University of Washington's dance department. The wall cracked over the course of the performance, and the wall's movement and changing colored lights corresponded to the dancer's movements.

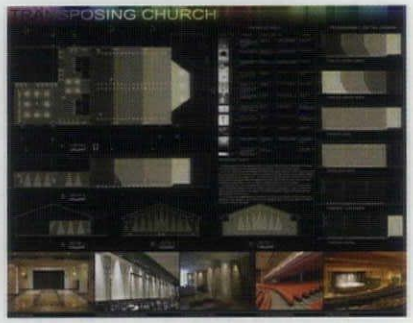


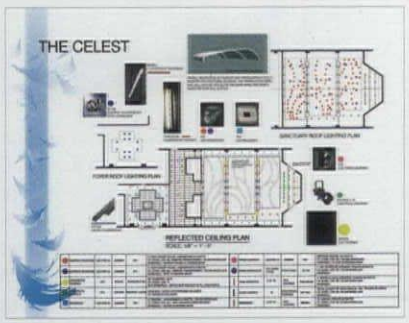
Section

The 2010 Robert Bruce Thompson Annual Student Light Fixture Design Competition asked participants to design a front door porch light for a residence. The luminaire had to be appropriate for either a new construction or a renovation, as well as a single-family unit or a multifamily condominium. The fixture also had to allow the visitor's face to be seen by the homeowner, and illuminate the entryway and the house number. First place winner Guanqun Wang, an interior design student at the University of Central Oklahoma in Edmond, Okla., impressed the judges with her luminaire "Luminous Glass" (above and right). Measuring 8 inches wide by 9 inches tall, the fixture is made up of a stainless steel housing, which conceals an LED light bar, and it supports a high-quality piece of 1/2-inch-thick float glass in which the house number is etched. Homeowners can control the brightness and color of the LEDs with a remote control. The fixture is powered via stored energy collected with a solar battery plate at the top.

IMAGES COURTESY RICHARD KELLY GRANT (LEFT); ROBERT BRUCE THOMPSON ANNUAL STUDENT LIGHT FIXTURE DESIGN COMPETITION (ABOVE AND RIGHT); SAUL GOLDIN MEMORIAL LIGHTING DESIGN COMPETITION (FAR RIGHT)







The Saul Goldin Memorial Lighting Design Competition was established in the name of Saul Goldin, an electrical engineer and lighting designer who taught at the University of Southern California (USC) and at SCI-Arc. For 2010, participants were asked to design a contemporary lighting scheme for a nondenominational Christian house of worship. The lighting had to provide a flexible layout so that the sanctuary space could be used for activities other than Sunday morning services. The jury of Los Angeles–based design professionals selected the award winners using a two-stage process. Once this jury narrowed their selection down to three projects—evaluating the students' work using a number of criteria, including compliance with Title 24 requirements, each student was asked to give a verbal presentation followed by a question-and-answer session. Based on the final reviews, the jury selected the order of prizes. This year, USC student Nima Payen received first place for his project "Transposing Church" (above top). Second place went to Praluck Praditsaph, a student at UCLA's Extension school, for his project "The Celest," (above center). Third place went to Mohamed Mansour Abdel Khalik El Sheikh from USC for his design "Pixels Church" (above).

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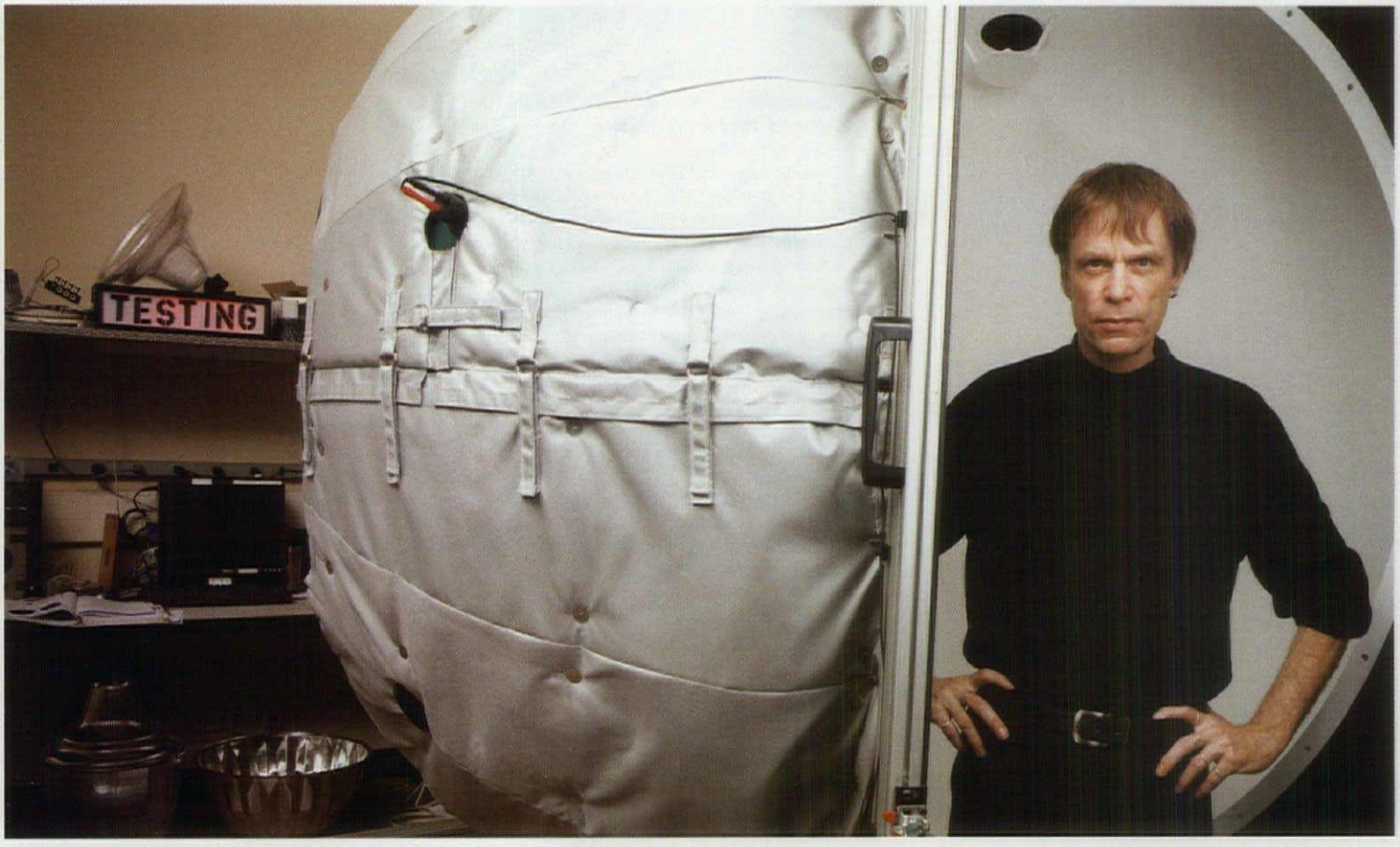

Michael Siminovitch

AN INTERDISCIPLINARY APPROACH TO LIGHTING EDUCATION

Michael Siminovitch describes his education and career as an "evolutionary process." With degrees in industrial design, architecture, and human factors engineering, most of his focus for the better part of the past two decades has been on lighting and energy efficiency. As director of the California Lighting Technology Center (CLTC) and a professor of design at the University of California at Davis, Siminovitch is forging new industry partnerships between manufacturers, utilities, researchers, and even other lighting programs in Thailand and China. For students, it is a rich introduction to real-world lighting issues, one that encourages a creative approach to problem solving. ELIZABETH DONOFF

What is your teaching philosophy?
To expose students to multiple perspectives in which they're constantly challenging themselves with new ideas and new technologies.

What is the CLTC's approach to lighting education?
Students are "hands-on" with ongoing laboratory to marketplace efforts. They see real technology and design working together.

How are universities evolving?
Universities have tremendous stresses today financially. They're trying to maintain relevance and vitality. They look at the CLTC as a research experiment. We operate off of many smaller industrial agreements; it's a different paradigm than the individual with a single research grant.

How do you present new lighting technologies to students?
I try to pull in these new innovations (i.e., LEDs) and get them into the classroom as soon as possible. Once students understand the basics of lighting, and can ask the right questions, they can deal with change.

Is there enough communication between educators?
My rule of thumb is there's never enough communication. We should always be challenging our thinking in terms of how we teach. Tomorrow's lecture should not be the same as the one that we gave today.

What are your thoughts on the idea of a common curriculum?
I'm very supportive of sharing information, but I'm not supportive of common learning packages. This kind of uniformity is counterproductive to allowing a diversity of teaching—and learning.

What advice would you give students and recent graduates?
Try to get as many varied experiences as possible so you'll really understand the whole process—concept, design, and manufacturing.

ANNE HAMERSKY

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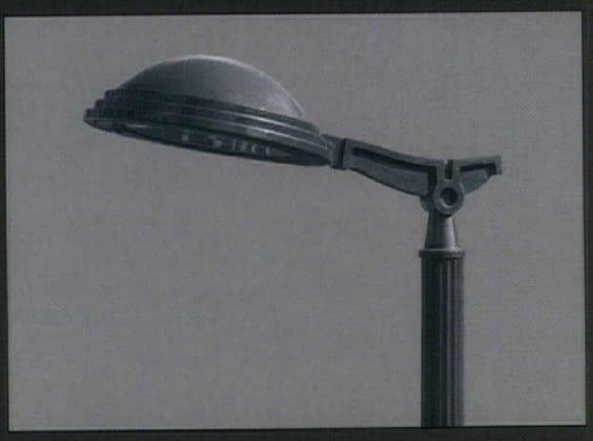

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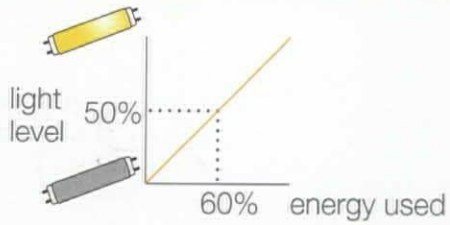

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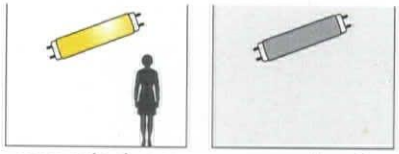
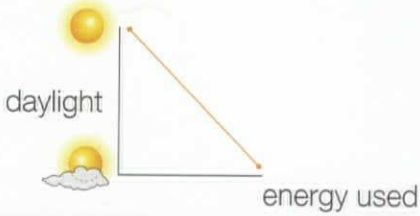
- **NEW** Radio Powr Savr™ occupancy/vacancy sensors are easy to retrofit with wireless communication and 10-year battery life
- Can provide up to 20% lighting energy savings



Daylight Sensors

- Automatically dim or turn off overhead lights when daylight is available
- **NEW** Radio Powr Savr wireless daylight sensor is simple to retrofit with no new wiring
- Can provide up to 20% lighting energy savings



For more information about Lutron Ecosystem solutions—or to schedule an on-site lighting energy assessment—call **1.888.LUTRON1** or visit **www.lutron.com**

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