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The magazine of the Illuminating Engineering Society of North America

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Joslyn Art Museum

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LD+A
LIGHTING DESIGN & APPLICATION

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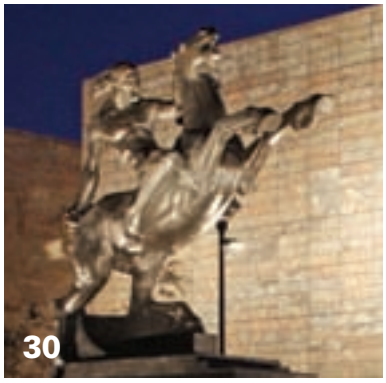

UP FRONT

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ON THE COVER: Carefully curated lighting enhances the exterior aesthetic of the Joslyn Art Museum in Omaha, NE (p.30).
Photo: Tom Kessler Photography, courtesy of HDR Architecture.

EDITORIAL

Last fall, a designer being interviewed for a project story in *LD+A* observed that a few areas of the building were "creatures of their time," in that different lamps might be used if those spaces were being designed today.

The same holds true for magazines: Graphic treatments, fonts and layout styles that were current in 2006 (when *LD+A* was last redesigned) eventually become outdated, just like fashions and lamp sources. Thus, we began work last summer to refresh the magazine's design and editorial content. The result is this issue of *LD+A*.

Content providers—whether they're producing print periodicals, electronic newsletters, blogs or tweets—are essentially in a competition for "eyeballs on the page." More important is how *long* those eyeballs stay on those pages. We track those numbers each year through a third-party research firm. In 2010, we found that 44 percent of readers spend between a half-hour and an hour with the magazine. (Not bad, given all the other media available.) Thirteen percent spend between one and two hours perusing our pages. (Impressive; that amount of time should get a reader through most, if not all, of the magazine.) Finally, 3 percent said they spend more than two hours reading *LD+A*. (Contact us, so we can send you flowers and a thank-you note!)

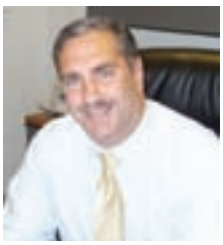
We're pleased that so many readers are dedicating so much time to *LD+A*, especially considering what else you can do with 30 minutes or more (another trip to the gym? an episode of *Glee*?). So then, guided by the premise that a reader's time is extremely valuable, we've re-imagined certain sections of the magazine. A few highlights:

To create more visual interest in the news section, we've refashioned some of the longer, traditional text items as shorter copy chunks—quick-hitting, easily digested morsels of information that will complement the long-form essays, technology pieces and project stories that comprise our feature well.

We also want to celebrate the history of the IES and *LD+A* in every issue. The Society turned 105 in January and the magazine is now in its 41st volume. While we don't want to look at the future through the rearview mirror, we do want to use the magazine to recall the projects, controversies and trends that were top-of-mind in years past. With that, we've added a new department called "Out of the Archive." (See page 72 for a trip back to the February 1982 issue of *LD+A*.)

Finally, since visual quality is a critical aspect of lighting, we have switched from a gloss to a matte paper stock for both the cover and inside pages to minimize glare on the printed page.

We hope you enjoy Volume 41, No. 2 and look forward to your thoughts on our redesign.



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LD+A is a magazine for professionals involved in the art, science, study, manufacture, teaching, and implementation of lighting. LD+A is designed to enhance and improve the practice of lighting. Every issue of LD+A includes feature articles on design projects, technical articles on the science of illumination, new product developments, industry trends, news of the Illuminating Engineering Society of North America, and vital information about the illuminating profession. Statements and opinions expressed in articles and editorials in LD+A are the expressions of contributors and do not necessarily represent the policies or opinions of the Illuminating Engineering Society of North America. Advertisements appearing in this publication are the sole responsibility of the advertiser.

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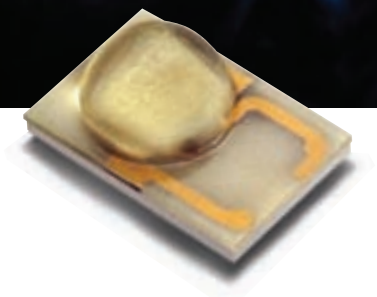

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LETTERS

Youth Shall Be Served

The December issue of *LD+A* was pleasantly adorned with 25 beautiful, bright, young "Faces of the Future" in lighting, and 14 of them were women! When I scanned the room from the podium at the IES Annual Conference Gala Dinner in Toronto, I couldn't believe how many in the audience were also young women. My first Annual Conference was in 1951 in New York City, and I can remember there being only one woman in attendance, Dr. Domina Eberle Spencer, whose textbook I had used. My congratulations to *LD+A* and to the Society for recognizing that the key to the future is attracting bright young men and women to join our profession and Society.

Bill Warren PE, LC, Fellow IES
Willard L. Warren Associates
New York City

Just received the December issue of *LD+A* and the article on the "Faces of the Future" was brilliant. The energy and the enthusiasm for lighting contained in these stories is and should be infectious for all of us who have spent time in the trenches. Our future is indeed bright. I could certainly use one article like this a year. How about it?

Fred Oberkircher, LC, Ed. IALD,
Fellow IES, IES past-president
Dunlap, TN

60 Is the New 40: Let There Be Less Light

Greg Pride and Bruce Dunlop opine in the "Letters" section of December *LD+A* that energy codes reduce lighting wattage to unacceptably low levels. In fact, the reduction in lighting power densities (LPD) between IECC 2006 and IECC 2009 is zero. The IECC 2012 reduces the 2009 LPD by only 10-20 percent while IECC 2012 as a whole achieved the "30 percent solution," improving efficiency by 30 percent compared to IECC 2006.

Mr. Dunlop claims that everyone over age 50 is visually handicapped, unaware that the new 60 is the old 40. Our understanding of physiology has exploded in the last 30 years and we can use that knowledge to tremendous advantage. Thanks to Aldous Huxley's *The Art of Seeing*, for instance, my visual strength doubled while my age doubled, and I've got plenty of company. For those needing extra lighting, the code is silent on providing individual task lights.

Rather than focusing on LPD, the IECC 2012 committee strengthened the lighting controls section to ensure that lights are off when not needed. Hawaii will consider taking controls to the next level, for instance, by requiring hotel keys that

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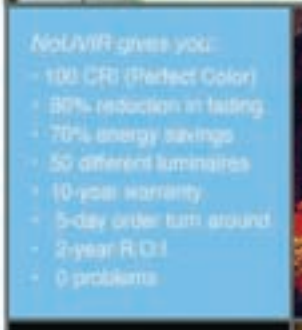

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turn on all room equipment upon entrance and shut it down upon exit.

The next improvement in lighting codes, in my opinion, is not lowering LPD levels, but improving outdoor lighting. Hawaii may shift from HPS to LED outdoor fixtures, which a) virtually eliminate uplight and light trespass, b) direct light precisely onto driving and pedestrian tasks, c) substantially improve CCT and visual performance while staying below 3,500K to accommodate astronomers, and d) reduce energy consumption by 50 percent or more.

In summary, I suggest that Mssrs. Pride and Dunlop realize that lowering LPD was not emphasized, we're just getting warmed up at age 50 and we all need to promote lighting improvements in energy codes, knowing that America must innovate or fade away.

Howard C. Wiig, president IES Hawaii Section
Dept. of Business, Economic Development and Tourism
State of Hawaii
Honolulu, HI

Taking Stock of the *Handbook*

The coming release of the Tenth Edition of the IES *Lighting Handbook* (*LD+A*, January, p. 87) no doubt has many of us anxiously waiting for the final editorial revisions to be completed. Having had a chance to thumb through Gary Steffy's own proof copy at the Annual Conference, it appears he is responsible for the layout overhaul—lots of graphics, lots of color. This is good for everyone, because Gary's books are very accessible.

I would, however, like to point out a bit of wisdom from our lighting forefathers from the Preface in my 1947, First Edition of the *IES Lighting Handbook*:

In many ways the IES Lighting Handbook is particularly well-adapted to reader convenience. For example, the type face is larger than that often encountered in engineering books and, in combination with the matte finish paper, is more legible. To make clear and easily understood all points of particular importance, an unusually large number of carefully selected photographs and specially prepared line drawings are included.

As textbooks more frequently turn to graphics in order to catch the eye rather than composing text, we must not forget our own metrics. If we had the foresight to mitigate reflected glare through proper paper stock selection for the First Edition, will we be accommodating similar stock selection for the Tenth Edition?

Noll W. Kretschmann, P.E., LC, LEED AP
Clark Nexsen
Architecture & Engineering
Charlotte, NC

Editor's Note: The paper to be used in the Tenth edition of the *Handbook* will be identical to that used in the Ninth edition.

Project Credit

The article on the Vancouver International Airport (*LD+A*, November) did not credit a design firm that contributed to the project. Auerbach Glasow French provided conceptual design, calculations, preliminary layout and mock up design and review for the "tree" lights in the Oval Link portion of the project.

Photo Credit

The photographers for the "Anatomy of an Award" section in the January issue should be credited as follows: Dimension Images for the AIA Iowa Office; Jim DeLutes for the DTC Monument. *LD+A* regrets the omission.

BOOK REVIEW

by Fred Oberkircher

Brilliant: The Evolution of Artificial Light
By Jane Brox
ISBN# 978-0-547-05527-5
www.HMHbooks.com

One of the marks of our modern culture is that you have arrived when people start writing about you. If that is the case, then light has arrived! This is not a technical book written by a technical author discussing some highly detailed issue about light. This is a book written for the masses by an author completely outside the lighting industry. The book has even picked up a negative endorsement from our own David DiLaura, who, in a recent *LEUKOS* editorial, lamented the fact that the IES is never mentioned in the entire book. A new day has dawned indeed!

As the title implies, *Brilliant* traces the historic endeavors of humanity to separate the darkness from artificial light. The first five chapters are dedicated to a fascinating discussion of the evolution of flame—from the earliest forms of torches through candles and matches to gaslight. Along the way, *Brilliant* even delves into the development of a candle derived from the head of the sperm whale called "Spermaceti" that was used in the first scientific light experiments and would become the standard for measuring luminous intensity—one candlepower.

Beyond just the specific developments in lighting, *Brilliant* expands our knowledge of the social and economic implications of humankind's search for increased brilliance. Hence, there is information regarding the economic costs of lighting by candle light, the cost ratio of lighting by whale oil as the supply of whales was reduced almost to the point of extinction and the social implications involved as the apprehensive term "night" was replaced by a new word, "nightlife."

The next several chapters deal with the intertwined relationship between discoveries concerning electricity and electric light, culminating in the invention of incandescent lighting. Again, the investigation into the inventive side is enhanced with explorations into the impact and implications of these new inventions. Brox points out that since machines are most economical running all the time, the invention of incandescent lighting was the harbinger of the three-shift society and the final erasure of natural time in the factory. The magnitude of this societal shift is best documented in the discussion of the Columbian Exposition of 1893, where the White City had more lighting than the host city of Chicago and consumed three times as much electricity.

The final half of the book deals with the ramifications of a globally expanding use of light. From the advent of fluorescent light through the U.S. blackout in 1965, to the current dark-sky movement and energy concerns, Brox raises questions that, while not new within the lighting industry, are new to the general public. And in the end, it is the public that is best served by this book, for it finally introduces them to both the miracle and the responsibility of brilliance. In that vein, it is also a book that we should read for precisely the same reason.

BUY IT. . .if you want a fascinating look at the history of light.

DON'T BUY IT. . .if you want to read how the lighting industry has made life better.

Stage Lighting-Fundamentals and Applications
By Richard Dunham
ISBN# 978-0-205-46100-4
www.pearsonhighered.com

At first blush, the architectural lighting practitioner might wonder why this book should be considered as an addition to his/her reference library. Notwithstanding that many of the giants of lighting design began their careers in theatrical lighting, there is much to be learned from the profession of stage lighting, and this new book certainly adds to that legacy by combining salient print information with the opportunity to access online application chapters.

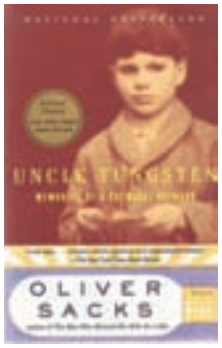
This no-frills, black-and-white publication provides an impressively wide variety of valuable information ranging from the obviously theatrical to the not-so-obvious discussion of retail and museum lighting, architectural lighting and even landscape lighting in Chapter 17. A bonus found in this and several other chapters is a profile on a designer relevant to the chapter's discussion, in this case Robert Shook. In between are chapters on the nature of light, light and perception, color and its effects, essentials of lighting design, and basics of general illumination. While all of these chapters contain information familiar to the architectural lighting practitioner, they are always presented from the unique perspective of the theater. Hence, the unit on the Functions of Light, while starting with "visibility," quickly moves on to topics such as, "establishing the scene," "modeling," "mood," "focus," "composition," "style," "staging the story" and "rhythm." This change in perspective is the major reason why this book should merit serious consideration as required reading for the architectural lighting practitioner.

One glowing weakness of this book is the discussion of lamp types. While it is well understood that theatrical lighting has historically utilized a limited lamp palette, the book dates itself in the manner in which it includes LEDs. Aside from the obvious opportunity that LEDs bring to the theatrical use of color, their use is discredited due to their lack of brightness. Considering the rate of advancement for LED technology, it would have been more valuable for the intended readership to include significant discussion of the emerging opportunities for LEDs and let technology catch up with the book.

This single criticism aside, *Stage Lighting* provides great reading and a real opportunity to do what architectural lighting practitioners like to do—to think outside the box. In this case by changing boxes to a theatrical one.

BUY IT. . .if you want to add to your tool chest of lighting design techniques.

DON'T BUY IT. . .if you are looking for a coffee table book on theatrical lighting.



Uncle Tungsten: Memories of a Chemical Boyhood
By Oliver Sacks
ISBN# 0-375-40448-1
www.vintagebooks.com

Oliver Sacks is, of course, the brilliant author of many books related to neurological issues such as *The Man Who Mistook His Wife for a Hat* and *Seeing Voices*. In this remarkable book, Sacks recounts memories of his early teens in England just before and during World War II. A precocious child born into a brilliant extended family, Sacks was indulged by his parents as he began his systematic investigation of the entire periodic table initially enthralled by the amazing properties of metals. During his early investigations, Sacks was told to seek the aid of his close Uncle Dave, who was also known as Uncle Tungsten because he manufactured filaments for incandescent lamps.

BOOK REVIEW

What sets this book apart is the passion Sacks discovers as he devours treatise after treatise from a veritable who's who of famous chemists and then, one by one, replicates their early investigations and experiments in a laboratory that he is allowed to set up—unassisted—in the family basement. As Sacks details the wonder of each experiment, we get to open a window into the exhilaration that the original scientists felt as they discovered a world not known before—the world of chemistry.

Chapter Four, "The Ideal Metal," chronicles the teacher/student relationship that allows us, through Sacks, a closer insight into the metal that lies at the heart of the incandescent lamp. Tungsten's properties of ductility, high meting point and resistance to electrical current provided an ideal solution to the main problem standing in the way of making the incandescent lamp the universal standard. Who knew that this process would include failed industrial attempts with two other metals, osmium and tantalum?

Chapter Five, "Light for the Masses," investigates the parallelism between the history of chemical discovery and the quest for light. It is this chapter that provides the insight and the explanation of light as a chemical process and explores the many steps necessary to standardize what we take for granted today.

In fact, it is this expanded wonder into the process of scientific exploration that may be the most lasting impression carried from this book. Uncle Tungsten has devoted both his business and creative life to the use of the metal tungsten as a filament. His rewards are both social and physical. Social in the joy of seeing his product produce light for the world. Physical in that the years spent working with the metal have turned his hands permanently black. And his is only one of many stories of invention and sacrifice that run like a sub-current through the book.

Sacks ends at the beginning. His early obsession with chemistry is transformed, not into the profession of a physician as his parents had hoped, but into neurology, where he would become famous.

BUY IT. . . If you love to be both sidetracked and immersed in something new.

DON'T BUY IT. . . If you prefer the *Reader's Digest* version of any discussion.

Fred Oberkircher, Fellow IES, Ed. IALD, LC, past-president IES, is Book Review Editor for LD+A.

ANNOUNCING...

10TH EDITION OF THE IES LIGHTING HANDBOOK

Editors: David DiLaura, Kevin Houser, Richard Mistrick, Gary Steffy

Pre-publication offer extended to Feb. 28!

Changes to the new edition:

- New illuminance determination procedure consisting of visual age-based illuminance ranges and mesopic adaptation
- Extensive updates on light sources, including solid state lighting
- Holistic and complementary daylighting and electric lighting strategies
- More extensive and specific qualitative lighting design criteria such as subjective impressions (psychological factors) and architectural spatial factors
- Broader quantitative criteria such as illuminance uniformities, power and energy aspects, light trespass, and light pollution
- In-depth coverage of sustainability practices: new chapters on daylighting, controls, sustainability, commissioning and energy management

Features:

- Provides a compendium of what is known that directly relates to lighting and lighting design
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- Conveniently-referenced tabular information is exemplified with numerous photographs and illustrations
- Sustainable practice embedded throughout: refinement of light level criteria, definitive criteria related to brightness and user impressions, factors influencing power and energy use for lighting, and methods to minimize light trespass and light pollution

"The Handbook is the most thorough and comprehensive revision in the past forty years. Not only is the format completely new, but the scope and depth of the subjects are unprecedented. This new edition is both an authoritative source of data and an eloquent explanation of the 'how' and 'why' of the IES recommendations. It is quite simply the best Handbook ever."

Alan Laird Lewis, OD, PhD, FIES

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NEWS+NOTES

Savings Trumps Spending, Survey Finds

When it comes to commercial lighting, energy efficiency and lifetime may be the top criteria for commercial decision-makers—even if it means a higher first cost for fixtures. According to a recent survey from OSRAM SYLVANIA, commercial facility decision-makers, as well as lighting designers and specifiers, are more likely to consider the energy efficiency and lifetime of lighting systems over the systems' initial cost.

Of the more than 350 participants polled, 76 percent claimed that it was more important to have "lighting that saves money over its lifetime than lighting that is inexpensive to install." Eighty-four percent consider energy efficiency and lifetime to be either important or very important considerations in their lighting decision-making, while 77 percent claimed that initial cost was important.

The survey also found that facility management professionals and corporate executives have lighting on the brain. Fifty-three percent reported that they or their clients have evaluated new lighting options in the last six months, and 61 percent claimed that they pay more attention to lighting now than they did just a few years ago. Of the lighting professionals polled—32 percent of whom identified as IES members—80 percent said that they were more focused on energy-efficient lighting than they had been in previous years.

Among all respondents, LED familiarity and usage was high. Eighty-five percent of participants are familiar with LEDs, while 73 percent currently use them. In addition, 90 percent of the respondents who currently use LEDs have had positive experiences with the technology. Long lifetime and reduced energy costs were the top two reasons for considering LEDs, while size of initial investment and lack of standardization were cited as potential barriers to LED adoption.

Garden-Variety Electricity

A discovery by North Carolina State University scientists may change the meaning of the phrase "power plant." Hyung-Jun Koo, Orlin Velev and other scientists have developed a new type of solar cell inspired by the process of photosynthesis in plants.

The cell is made of a water-based gel with photosensitive molecules that produce electricity when exposed to sunlight. The gel is enclosed within two electrodes and embedded with two photosensitive ionic dyes along with two common plant compounds (including chlorophyll). The combination can generate as much or more electricity as existing photovoltaic technologies that seek to mimic photosynthesis, and it could become a cheaper, less environmentally harmful alternative to silicon solar cells.

A Greener Government

The U.S. General Services Administration is changing its colors—as least as far as LEED is concerned. Having previously set LEED Silver certification as its standard, the GSA now requires LEED Gold certification for all new construction and major renovations of federal facilities. The requirement will affect all projects currently in design, as well as future projects.

IALD Seeks Students

The IALD Education Trust is accepting applications for several scholarships and stipends open to students who are pursuing architectural lighting design as a course of study or to those who are interested in learning more about the lighting profession. These include the 2011 IALD Education Trust Scholarship Program; the Thomas M. Lemons Scholarship; and the IALD Education Trust Stipend to LIGHTFAIR International 2011. The deadline for the scholarships and stipends is March 1. To apply, visit *www.iald.org*.

Numbers Game

17.2
Percent incandescent lamp shipments declined in Q3 2010, registering a record low of 46.5 on NEMA's index

48.7
Percent T5 lamp shipments grew from Q3 2009 to Q3 2010, according to NEMA's T5 index, which reached an all-time high

1,500
Number of lumens produced by GE's new LED prototype bulb, which uses jet-engine cooling technology

117,000
Number of halogen accent lights that Macy's will replace with PAR38 LED lamps in 86 U.S. stores

1 billion
Square footage of all commercial space that has been LEED certified as of November 2010

Photo: Robin Hill

Underwater in the Air

Art meshed with architecture at the 25,000-sq ft Exhale Pavilion at Art Basel 2011 in Miami Beach, FL. The exhibit immersed visitors in an underwater ambiance inspired by the bioluminescent glow of algae. Created by architects Phu Hoang and Rachely Rotem, the moving pavilion consists of 7 miles of hanging phosphorescent and reflective ropes activated by wind-speed sensors and illuminated by ultraviolet lights.

Light pollution can contribute to air pollution, according to a recent study by the National Oceanic and Atmospheric Administration (NOAA) and the Cooperative Institute for Research in Environmental Sciences (CIRES) at the University of Colorado. Aerial measurements taken over Los Angeles show that light pollution is suppressing the nitrate radical, which helps clean up air pollution. Study results suggest that city lights can slow down the nighttime cleansing by up to 7 percent and increase chemical pollutants by up to 5 percent the next day.

Reports and Standards

Recently Released

- The CIE has published three new reports: *Emergency Lighting in Road Tunnels; Practical Daylight Sources for Colorimetry*; and *Proceedings of CIE Expert Symposium on Spectral and Imaging Methods for Photometry and Radiometry*. **www.cie.co.at**
- The CLTC has released the *Title 24 Residential Lighting Design Guide*, a supplemental publication for the *2008 Residential Compliance Manual*. The guide is a resource of best practices and lighting designs to help builders, energy auditors and lighting designers comply with California's *2008 Title 24 Building Energy Efficiency Standards*. **http://cltc.ucdavis.edu**
- NEMA has published ANSI C136.26-2010 *American National Standard for Roadway and Area Lighting Equipment—Troubleshooting Guide for High-Intensity Discharge (HID) Luminaires*, which offers step-by-step guidance for troubleshooting HID lighting fixtures in the field. **www.nema.org**

by Willard L. Warren

Time is running out to take advantage of rebates that are still available to upgrade lighting installations with more efficacious sources and more efficient luminaires. But that's not the only way to maximize lighting energy savings

Most people in the country are unaware that beginning in 2012 many popular incandescent and T12 fluorescent lamps will be phased out. Presently more than 75 percent of the country is served by utilities and governmental agencies that offer rebates to replace those soon-to-be obsolete sources. Some states, like Colorado, are using some of their American Recovery and Reinvestment Act (ARRA) stimulus funds to finance energy upgrades with low-interest loans. But this honeymoon will soon be over as we will have no choice but to use CFLs and LEDs to replace incandescent lamps, and to use high-performance electronic T8 and T5 fluorescent lamps to replace magnetic T12s. There will be no need for incentives when users have no choice but to upgrade their lighting systems with more energy-saving sources.

We waste at least 1 watt per sq ft in lighting and $1 to $2 per sq ft in costs that could be eliminated by shedding load and shaving peak demand. Until 2012 we can upgrade incumbent lighting systems and be rewarded with rebates. Many major property managers are applying for rebates now to reduce the cost of lighting in their building's common areas. Lobbies, corridors, stairways and service areas constitute 20 percent of the gross area of a building and reducing overhead expenses increases property managers' income and the market value of the property.

With respect to LEDs, there's still a lot of hype in ads with claims for energy savings and "equivalency," and while many users have successfully employed LEDs, there are still some unknowns in the marketplace. In an engineering report accompanying one of the DOE's Gateway projects, the lighting designers indicated that they tried a dozen different LED products before finding the one that was appropriate for their specific needs. When it comes to LEDs, "one size does not fit all," and the DOE warns that caution is advised.

Time is running out to take advantage of rebates that are still available to upgrade lighting installations with more efficacious sources and more efficient luminaires. But that's not the only way to maximize lighting energy savings. We can also save energy by increasing the efficiency of the visual environment.

THE BIG FOUR

Visual performance is affected by four variables: the viewer, the task, the visual surround and the light source. We should be investing in research in all four of these areas to maximize visual task performance. And while we don't want government to intrude too much in our lives, bear in mind that research by the U.S. Defense Department, the DOE, NASA and other government agencies, has been responsible for great advances in communication, computing, transportation and construction. And all the new technology developed for the space program was mandated by Congress to be made available to the private sector at no cost. If the DOE can justify its heavy investment in solid-state lighting to save energy, aren't the three other components involved in the process of seeing equally worthy of its attention?

As for visual acuity, all children should receive eye exams and be provided with

free corrective lenses when needed, and all employee insurance plans should include those same benefits. There are some ongoing university-based studies on the effect of the color temperature of light sources on visual perception, and on the impact of circadian rhythms on visual comfort and performance rate. It's hoped that this research will lead to energy savings.

When it comes to tasks, some publications use the smallest possible size print in their texts to save cost, when larger type is more readable. The contrast of a printed task with its background is the most important factor in extracting information from the field of view, but we see lots of fancy typography with gray letters on half-tone backgrounds that obscure the message. There was a PowerPoint presentation at LIGHTFAIR where the black bullet points were shown inside dark green balloons, making them unreadable.

Room surfaces should be required to have light finishes to conserve energy. All light rays are ultimately absorbed as heat on interior surfaces, but by using light colored interiors we get them to bounce around the room a little more. In every coefficient of utilization (CU) table, the first column of figures, for rooms with the highest reflection factors (RFs), have much higher values than the CUs in the last column for the darkest rooms. That's because the inter-reflected component of light comes from rays that bounce around before being absorbed, and these rays provide as much as half the light in a room.

We always come back to the same conundrum. Lighting professionals "know" that task performance, worker comfort, students' learning and the quality of the end product of our work is enhanced by "good lighting." But we haven't been able to document it. Using conventional random testing with "placebos" or measuring performance under sub-standard lighting conditions that cause visual mistakes and headaches and eye strain is not possible. Some government-funded, university-based, impartial research must be undertaken to prove what we lighting designers empirically know.

The 'honeymoon' will soon be over as we will have no choice but to use CFLs and LEDs to replace incandescent lamps, and to use high-performance electronic T8 and T5 fluorescent lamps to replace magnetic T12s

The eye/brain sight mechanism is not a meter; it's part of a visual system. Government rebates for more efficacious sources address only one of four components in the visual system. In our effort to conserve energy, let's not neglect the other three.

Willard L. Warren, PE, Fellow IES, LC, DSA, is principal of Willard L. Warren Associates.

The SSL Market: A Snapshot in Time

by James Brodrick

CALiPER progess is encouraging, but it's tempered by the wide performance range found among the LED products tested in each round

With new LED lighting products entering the marketplace on almost a daily basis—many of them accompanied by claims that could be politely described as overly enthusiastic—there's bound to be confusion as manufacturers, specifiers and consumers struggle to come to grips with this rapidly evolving technology. To help clear up that confusion and provide an objective indication of where the solid-state lighting (SSL) market stands at a given point in time, the U.S. Department of Energy created the CALiPER program, which can serve as a useful tool for lighting designers and specifiers.

CALiPER tests a wide range of commercially available SSL products, and publishes the results online at *www.ssl.energy.gov/caliper.html*. Since its launch in 2006, CALiPER has tested more than 300 SSL products in 19 categories, ranging from undercabinet fixtures to downlights, tracklights, cove lights, replacement lamps and outdoor fixtures. The cumulative results present a highly informative series of snapshots of the LED market.

STEADY PROGRESS

What have we learned so far from CALiPER, after 11 rounds of testing? First and foremost, that LED technology is evolving rapidly. There's been a steady increase in the average efficacy of LED products tested—from 21 lumens per watt back in 2007, to 57 lumens per watt for Round 11. In fact, the minimum efficacy found in Round 11—26 lumens per watt—is actually higher than the overall average efficacy for 2007.

That kind of progress is encouraging, but it's tempered by the wide performance range found among the LED products tested in each round. For example, those tested in Round 11 ranged in efficacy from 26 lumens per watt to 93 lumens per watt; in Round 10, from 12 lumens per watt to 72 lumens per watt; and in Round 9 from 17 lumens per watt to 79 lumens per watt. That indicates not only that there's very little consistency between different SSL products in the marketplace, but that although the upper limit keeps pushing higher, the lower range remains relatively constant. So buyers and specifiers really have to do their homework to make sure that only higher-performing products are chosen.

This is further complicated by a persistent problem that's been found in every CALiPER round: a disparity between performance and manufacturer claims. Although there's been a steady overall improvement in the accuracy of these claims since CALiPER testing began, many of the LED products tested still carry claims that are inaccurate. The Lighting Facts program (*www.lightingfacts.com*) appears to be helping in that regard, as Round 11 found manufacturer claims to be more accurate for products bearing the Lighting Facts label.

GETTING COMPETITIVE

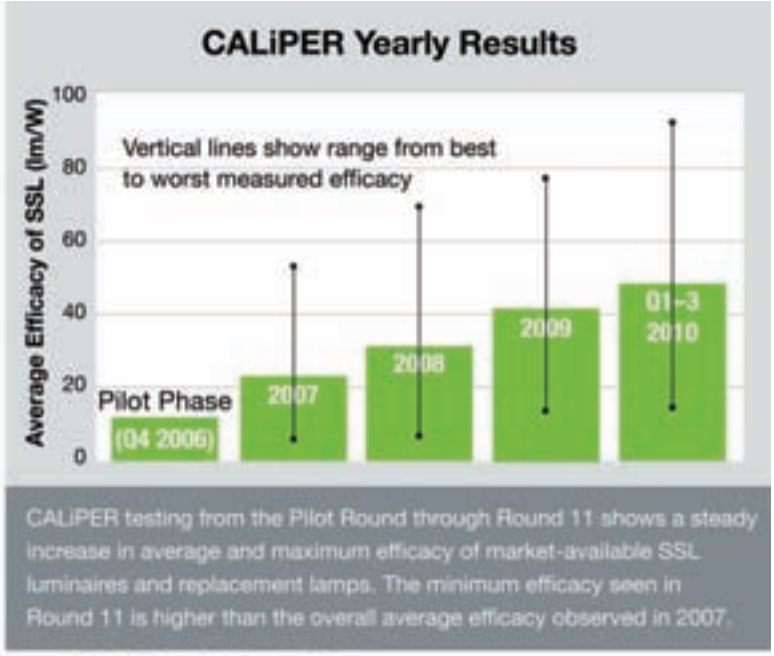
Hand-in-hand with the steady increase in SSL efficacy is a corresponding increase in the number of LED products that are approaching, matching and even exceeding the light output levels, distribution and color quality of their conventional counterparts. This has been especially true for certain applications, and the progress has often been quite rapid. For instance, a CALiPER benchmark report published in November 2008 noted wide

variations in the performance of SSL MR16 lamps and concluded that they didn't measure up to 20-W halogen products. But just eight months later, Round 8 testing found a big improvement in color quality as well as light output in SSL MR16s, with one of them exceeding what would be expected of a 20-W halogen while delivering more than three times the average efficacy.

Downlights are another application where SSL has clearly become competitive with incumbent technologies. Although the best-performing LED downlight tested in CALiPER Round 1 delivered 19 lumens per watt, that maximum had climbed to 61 lumens per watt by Round 5. And Round 9 found LED recessed downlights that performed as well as, or better than, downlights equipped with 45-W to 75-W incandescent and halogen lamps, in terms of both light output and distribution, and that met or exceeded the performance of CFL downlights for color quality, efficacy and light output.

Larger LED directional lamps—such as PAR20s, PAR30s and PAR38s—have also made notable progress. CALiPER Round 8 found that some of these products could meet light output levels and beam characteristics of 35-W to 50-W incandescent and halogen lamps, with efficacy levels similar to those of CFL R20 products—although some fell short in terms of power factor, color quality and product performance reporting.

Still another application where SSL is becoming competitive on the basis of lighting performance is 2-ft by 2-ft troffer luminaires. Those tested in CALiPER Round 9 roughly matched the light output of the fluorescent T8 troffers they were designed to replace, with one even exceeding the efficacy level of a benchmark T8 troffer. By contrast, 4-ft SSL linear replacement lamps still fall short of their fluorescent counterparts in terms of light distribution, color quality and reliability—although, as Round 11 showed, they're getting better.



Source: CALiPER Round 11 Summary Report

The performance gap between 2-ft by 2-ft LED troffer luminaires and 4-ft LED linear replacement lamps illustrates an important point about SSL. The 2-ft by 2-ft troffer luminaires are integral products designed for LED light sources, whereas the 4-ft replacement lamps are inserted into fixtures designed for conventional light sources. From the beginning, CALiPER has found the highest efficacies, the greatest light output and the most optimal light distributions in SSL products that are integral luminaires rather than replacement lamps (although there are, admittedly, some excellent small, directional LED replacement lamps on the market). That's because SSL technology, being fundamentally different from conventional lighting, works most efficiently with fixtures that are designed specifically for LED light sources.

A GROWING LIST

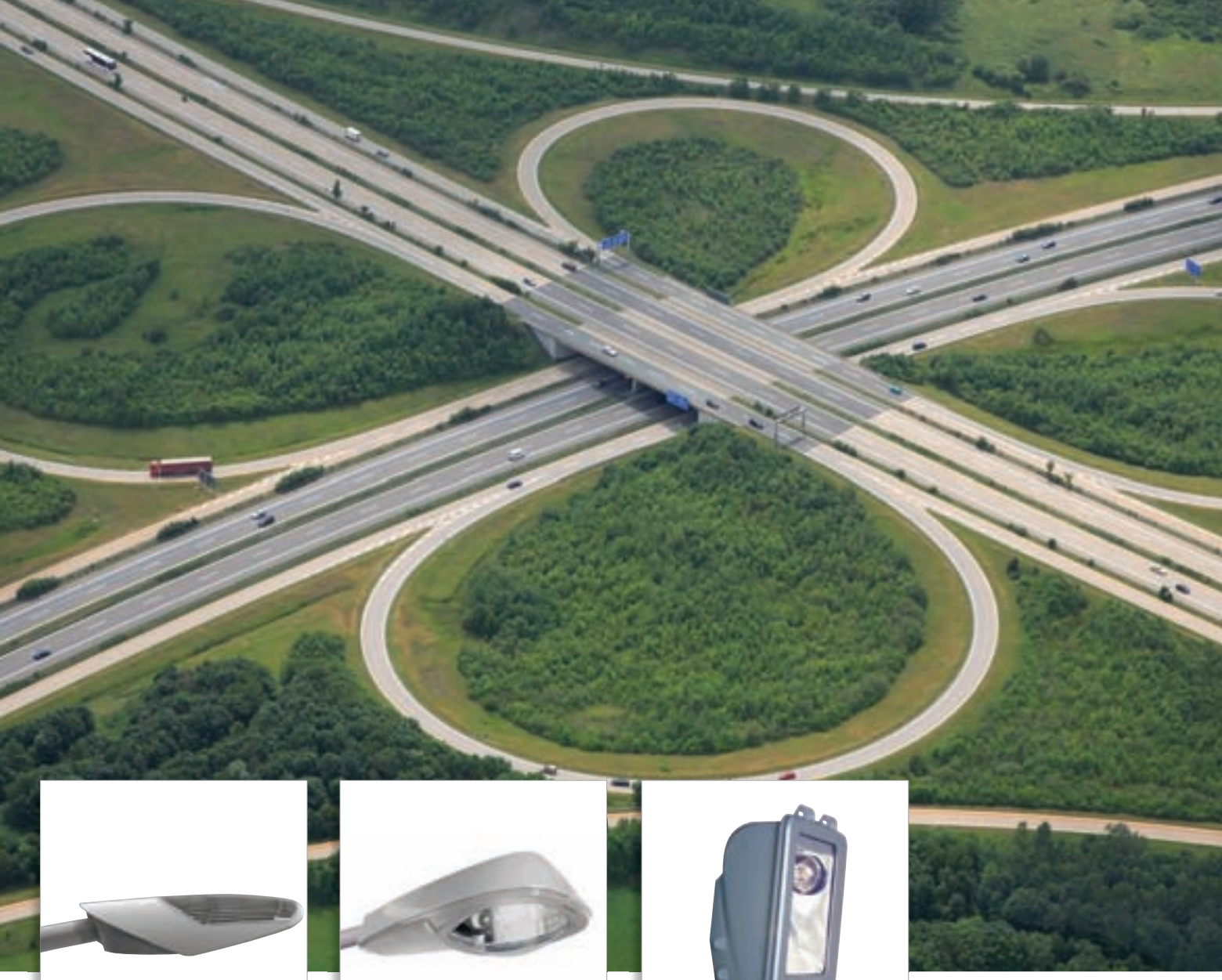
Parking-structure and wallpack fixtures can be added to the list of applications where SSL can compete. Some of the LED products tested in CALiPER Round 10 for both applications were found to meet or exceed the light output and efficacy levels of their benchmark counterparts, while also providing more uniform light distribution and less uplight. These SSL products were well-designed and often showed innovative approaches to optimizing the use of LEDs to get even better light distribution than is achieved with traditional technologies. This trend of designing luminaires to maximize light distribution

was seen with some of the smaller SSL products in earlier CALiPER rounds, but Round 10 showed it for the first time in full-blown commercial applications. Those manufacturers that don't pay sufficient attention to luminaire design are wasting a good portion of SSL's potential.

There's been a lot of interest lately in outdoor applications for SSL, where maintenance considerations can significantly shorten the payback period. In CALiPER Round 11, half of the LED outdoor luminaires tested matched or exceeded their benchmark counterparts in efficacy. But most of those products showed significant variations in color characteristics as compared to their rated CCT, and as a whole they varied widely in their distribution characteristics—making them far from a slam-dunk.

This underscores the subtleties that come into play when evaluating LED lighting products—not only for outdoor use, but for any application. And it means that specifiers and potential users should always look carefully at the specific application to find out whether a given product is suitable or not. CALiPER can help in this regard, with Summary Reports that highlight the results for all products included in a given testing round, searchable Detailed Test Reports that provide extensive data on individual products that have been tested, and Benchmark Reports that provide detailed analysis of test results for both traditional and LED lighting products for a given application. You can find these tools online at *www.ssl.energy.gov/caliper.html.*

James Brodrick is the lighting program manager for the U.S. Department of Energy, Building Technologies Program.



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Say No to the Lifetime Achievement Award

by Don Peifer

"Everything has changed, except our thinking."
-Einstein

Every time I even hear the word *lifetime*, my BS meter goes off. Especially when it comes to LEDs, lifetime discussions are an absolute red herring. Everyone sees the technology coming, sees it emerging in almost every application. You see it at every booth at LIGHTFAIR. It kind of reminds me of fiber optics years ago. . .oh, unfortunate analogy.

When it comes to LED lifetime no one knows, no one believes it and, if they are smart, they have ceased listening a long time ago

Anyways, where was I? Oh yeah, lifetime: whenever someone utters the fateful word *50,000*, the conversation shifts from what should be an advantage to a disadvantage. Why? Because when it comes to LED lifetime no one knows, no one believes it and, if they are smart, they have ceased listening a long time ago. To borrow a phrase from a famous Democratic pundit: It's about the light stupid! If LEDs are going to proliferate as a technology, then it has to be based on their merit as a light source. Let's face it, there are some tough acts to follow, and the industry isn't exactly set up for the technology shift. Therefore, hard work awaits those that choose to beat down the path to innovation, and they would do well to win on other merits besides lifetime.

WHAT'S REALISTIC?

So, what is a realistic lifetime? It kind of depends on who you are asking. A well-placed colleague of mine has cataloged the LED fixture space into four groups: the scammers, the clueless, the journeymen and the enlightened. I like that. Now if you are asking anyone in the former two categories, you will hear the 50,000-hour number (or higher) bandied about. Once those puppies are installed, however, *in situ* and the electrolytic fluid starts cooking in the power supply and what should be a heat path from the junction to the outside environment never happens, you'll be lucky to see 10,000 hours. Now journeymen firms may have all the pieces in place—thermal, electrical, mechanical and optical engineering—but they may not know how to connect the dots, or they may be doing it a little crudely. They and the customer will benefit from leaning on Tier 1 LED suppliers and caring about their own legacy. The last group is almost not even worth discussing because it represents or three or four companies in this vast space, but you can look forward to some surprisingly high and predictable (useful) lifetimes. These are the billboards for the technology—where the rubber meets the road.

TESTING FRAMEWORK

One of the problems with lifetime discussion is that there is no product-testing infrastructure in place to give a clear barometer. A 6,000-hour burn time is necessary to qualify for LM-80 and subsequent rebates, etc. Anyone familiar with astronomy knows about the concept of standard candles. It is an astronomical object (like a type 1A supernova) with a known luminosity, which can be used to gauge the size/age of the universe. To take this analogy to LEDs, there are currently no standard candles within the first 6,000 hours that would predict lifetime at 50,000 hours. Since most offerings from the scammers and clueless will have failed or seriously depreciated by then, LM-80 is useful in uncovering the chaff. As for the others, LM-80 stands as a

roadblock to innovation. The development cycle of new LEDs is far less than the 6,000 hours, and a company would need to hold their product for release awaiting a burn-in that has no basis in reality or the *in situ* application usage. Then, they would release the fixture with last year's LEDs just for the sake of LM-80? An ancillary benefit for the large, established companies—which populate the consortiums that decide things like LM-80 and giving RGB products a pass on CRI—is that 6,000 hours coincides better with their slower development schedules. It keeps things from going too fast. And who can blame them? The market—especially the consumer space—is about to be flooded with poor products from the scammers and the clueless. It's the Wild West out there.

So, the make-up of the emerging market and the product-testing infrastructure as it is today has conspired to not only turn lifetime into a non-topic but to make the promise of a long lifetime a disadvantage. The really easy solution, many would say, is to carry a warranty that better matches the 50,000-hour metric that everyone is throwing around. If lifetime and maintenance are the only things buoying up your sale, I get it. If you are really comparing a light source on its own merits outside of lifetime, given warranties for traditional technologies, it isn't exactly comparing apples to apples. This extended warranty for LEDs vs. limited warranty for traditional technology, again, translates into less support for innovation.

This brings me to price. Really the only thing that is going to make lifetime a moot point is when LED companies can wrestle cost to the ground. They don't have to get on par with the traditional technologies; they only have to get close. Then, it becomes the Apple computer story. Customers might not be willing to pay double, but if you can offer (at least) the perception of quality for 1.3 times as much, you have successfully captured the opportunity cost. A rebate would go a long way here, but that is reliant on LM-80, which begins the vicious cycle already discussed.

A well-placed colleague of mine has cataloged the LED fixture space into four groups: the scammers, the clueless, the journeymen and the enlightened

This is why replaceability is going to be critical. To avoid the Osborne Effect (why buy a 60-watt solution when next year it will be 50 watt?) and to create repeat customers (imagine that) for LED fixture suppliers, replaceable LED modules are a must. So looking ahead when the question of LEDs and lifetime comes up, a really great and refreshing response would be, "Who cares?" If you could say that with no irony, that would mean that the technology has truly arrived. A lot of ground needs to be covered between then and now though. And we all need to be wary of the scammers and the clueless in the interim.

Don Peifer is the founder and chief innovation officer for Lunera Lighting.

A Word of Advice to a Good Friend

by Mark Lien

Greenbuild has evolved into clusters of slick corporate marketing imagery focused on being greener than thou with no discernible filter for legitimacy or commitment to the movement

With this issue of *LD+A*, the focus of my column shifts from education to the changes occurring in our industry. It is a broadened perspective and especially challenging due to the accelerated pace of change in the lighting field. There is a precedent for the turbulence. While "those who cannot remember the past are condemned to repeat it," they are also destined to misquote it. For this reason I have been immersed recently in the history of the IES and lighting in general. My intent is to find ideas from the ghosts of lighting past—the brilliant leaders and pioneers of our field—and to search for relevance. Lacking that insight, comments on change will be framed within the context of our time with all of the conjecture that implies.

This first column refers to changes observed in an affiliated organization, which has unrealized potential to be very important to the lighting industry, and the mission of the IES. The *Transactions of the IES* from 1906 offers counsel on dealing with other organizations impacting the lighting field. The American Gas Light and National Electric Light Associations no longer exist (NELA is now the Edison Electric Institute), but the advice still resonates as valid.

The president of the IES in 1906 was Louis B. Marks. In his inaugural address, he stated, "The Illuminating Engineering Society is thus in no sense antagonistic to other associations that have to do with lighting. On the contrary, the Society aims to cooperate with such organizations to secure the best interests of all concerned." It is in this spirit that the following is written.

There are two purposes to this missive. First, it is important that the IES strengthen its relationship with the U.S. Green Building Council (USGBC). The LEED standards are the dominant green building metrics, and yet the organization undervalues how lighting contributes to its goal. This necessitates our aggressive involvement. Second is a caution about how we shape this relationship. This concern results from the rapid growth of the USGBC and the questionable decisions it is making.

The USGBC and two of its three founders have been named in a federal class-action lawsuit alleging that they fraudulently misled consumers and misrepresented the energy performance of LEED-certified buildings. The suit further argues that LEED is harming the environment by leading consumers away from energy-saving strategies that have proven successful. The lawsuit claims that the USGBC seeks to "monopolize the market for energy-saving strategies" and charges deceptive marketing, unfair competition, wire fraud, false advertising and other illegal activities.

LACKING IN STREET CRED

In November 2008, *Dwell* magazine observed, "The sustainability movement has gone through a series of evolutions and iterations over the past several years—from nascent niche groups to mainstream, greenwashing, and back again—bringing us to the somewhat confusing current state of affairs." It was the confusing aspect that struck me at Greenbuild last November. I have witnessed attendance triple since I began participating in this event but it was other observations that were troubling.

Greenbuild has evolved into clusters of slick corporate marketing imagery focused on being greener than thou with no discernible filter for legitimacy or commitment to the movement. The credibility derived from association with the USGBC is sold for the price of a trade-show booth or event sponsorship. The altruistic value that once resonated throughout this organization, transcending commerce, is now being suffocated beneath it. The greenwashing that the USGBC fought against is now evident at its own show. This movement was built on principles of sustainability as a priority over unrestrained consumerism and conspicuous irresponsible consumption. Attendance is up and the show floor sells out (pun intended), but that is not an effective measurement of the success of an organization with sustainability as its mission.

The momentum of this movement has sucked in even its opponents. From a $12 billion U.S. market in 2008 to a projected $140 billion in 2013, green building has forced companies to align their images with what customers want. Marketing is often the only effort invested in by firms promoting themselves as green leaders. It is no longer an advantage to be a green company; it is expected and necessary.

The USGBC benefits from large corporate marketing budgets and if its mission was unaffected by this influence it might be justified. Compromised values become visible when we see crowds gathered at booths manned by companies like Waste Management, which has been successfully prosecuted for environmental abuses in multiple states. It is intuitive from my corporate experience that image is not always consistent with the reality of intent and actions. Corporations that can buy their logo placement throughout the event meet no visible resistance. Just being a conduit that sells products does not demonstrate a commitment to sustainability.

The sustainability movement is the only way to keep this world inhabitable over the next century. Energy, water, food, biodiversity and all resources will become challenges for survival as the world population swells to over nine billion by 2050 (from 6.8 billion today), and the U.S. triples to near one billion by 2100 (from 311 million now).

One of the key reasons that I took the job I have today is because the president of our company spent much of our interview time passionately telling me about our new building being LEED Silver and what that meant to him. We are instilled with an inherent desire to be a part of causes that are bigger than ourselves. Early USGBC events had a sense of community. It wasn't so much "us against them" but rather a "we can change the world" message. It is naive to think that we have changed all of these sponsoring companies to embrace sustainability principles. Many certainly perceive green as a tool in the quest for infinite quarterly sales and profit increases.

The conspicuous corporate sponsorship at NASCAR and shows like LIGHTFAIR is as it should be. There is no pretense of an altruistic mission. It is a bunch of manufacturers shamelessly promoting their products. At LIGHTFAIR, a booth does not by association legitimize companies as a part of a movement or cause. The IES conferences also offer no advantage to vendors by association; "as seen at LIGHTFAIR or an IES trade show" is innocuous.

FINDING THE GOOD

So what is positive about Greenbuild? The bookstore at the show is terrific. It is focused on everything related to green construction including some obscure publications difficult to find or even to learn about online. This year, the more than 200 educational sessions, forums and workshops were divers, speakers were skilled, and content was new and valuable. It has, however, been frustrating in past years that so few lighting classes have been offered at Greenbuild.

My initial impression was that lighting design is a little understood, and thereby, undervalued skill that will eventually be recognized and embraced for its energy-saving opportunities. This year there were no classes focused on lighting. Daylighting was mentioned as one of three non-traditional approaches to rethinking energy modeling and this was the only mention of lighting in a search of the entire session catalog. My initial theory was wrong. The glaring omission of lighting's role in Greenbuild continues. It may be relevant that none of the executive staff or Board of Directors of the USGBC appear to be aligned with lighting manufacturers, specifiers or other lighting professsionals.

A few lighting manufacturers were present on the trade-show floor but some had scaled back their booth sizes from previous years. The IES is working to correct its disconnect with the USGBC. We have been involved recently with joint codes and standard development and at least two IES members now serve on USGBC committees. The future of this relationship is unclear despite the obvious synergetic benefits.

It is not my intent to dismiss what is good and working about the USGBC, including

their new initiative with schools, great educational outreach and the overall awareness that they have created concerning sustainable building design. My concern is about the drift away from principles and the responsibilities inherent with being the authority. There are potential negative consequences from the IES pursuing a stronger relationship with the USGBC, but the need dictates that we proceed cautiously.

Profit is sustainability for a company. There is nothing wrong with companies growing, competing and being profitable. There is, however, a need for organizations that bring together the disparate parts of the industry for the common good and that hold to high principles to provide a vision, a mission for their industry, that all can agree upon. Tesla said that science is an aberration if it does not have as its purpose the betterment of mankind. The IES promotes the advancement of the art and science of lighting. Lighting has improved lives. Sustainable design may be critical to life itself. There will always be those looking for shortcuts and easy dollars, but we should be vigilant. The appearance of impropriety is evident at Greenbuild, yet their mission is too critical for compromise.

The IES can learn from this. We should cooperate with organizations that secure the best interests of our Society. The IES was established to improve the quality of the lighted environment, not to promote companies. There are opportunities to grow the IES by selling out the principle at our core. Balancing changes in our industry with quality concerns and balancing energy concerns with the quality of the lighted environment will require vigilance and informed, committed professionals. The high road is an uphill climb but the view is worth the effort.

Mark Lien, LC, LEED AP, is director of the Lighting Solutions Center for Hubbell Lighting and a member of the IES Board of Directors.

Photos: Tom Kessler

All hospitals help heal patients, but Alegent Health in Omaha, NE, has taken care to a new place—an indoor garden sanctuary, to be exact. To provide a calming oasis for cancer patients who are unable to go outside, the hospital created a 1,010-sq ft healing garden. Along with architect Tom Zuk and interior designer Justina Georgesen (Holland Basham Architects), lighting designers Toby Samuelson and Rebecca Cherney (Farris Lighting) used varied lighting techniques to reveal nature-inspired materials. During the day, daylight from a skylight overhead provides ambient illumination. At night, an astronomical time clock prompts a slow fade to a nighttime scene where accent lighting highlights plantings, a gypsum "waterfall" and natural grass wall panels. "The lighting reinforces the concept," says Cherney. "With the stone and other materials, you really feel like you are outdoors."

Elizabeth Hall

Lakeside Hospital Healing Garden

❶ Real water wasn't allowed in the garden, so light was used to create a "waterfall." Blue-hued color-changing LEDs graze a textured gypsum panel, simulating wave-like motion.

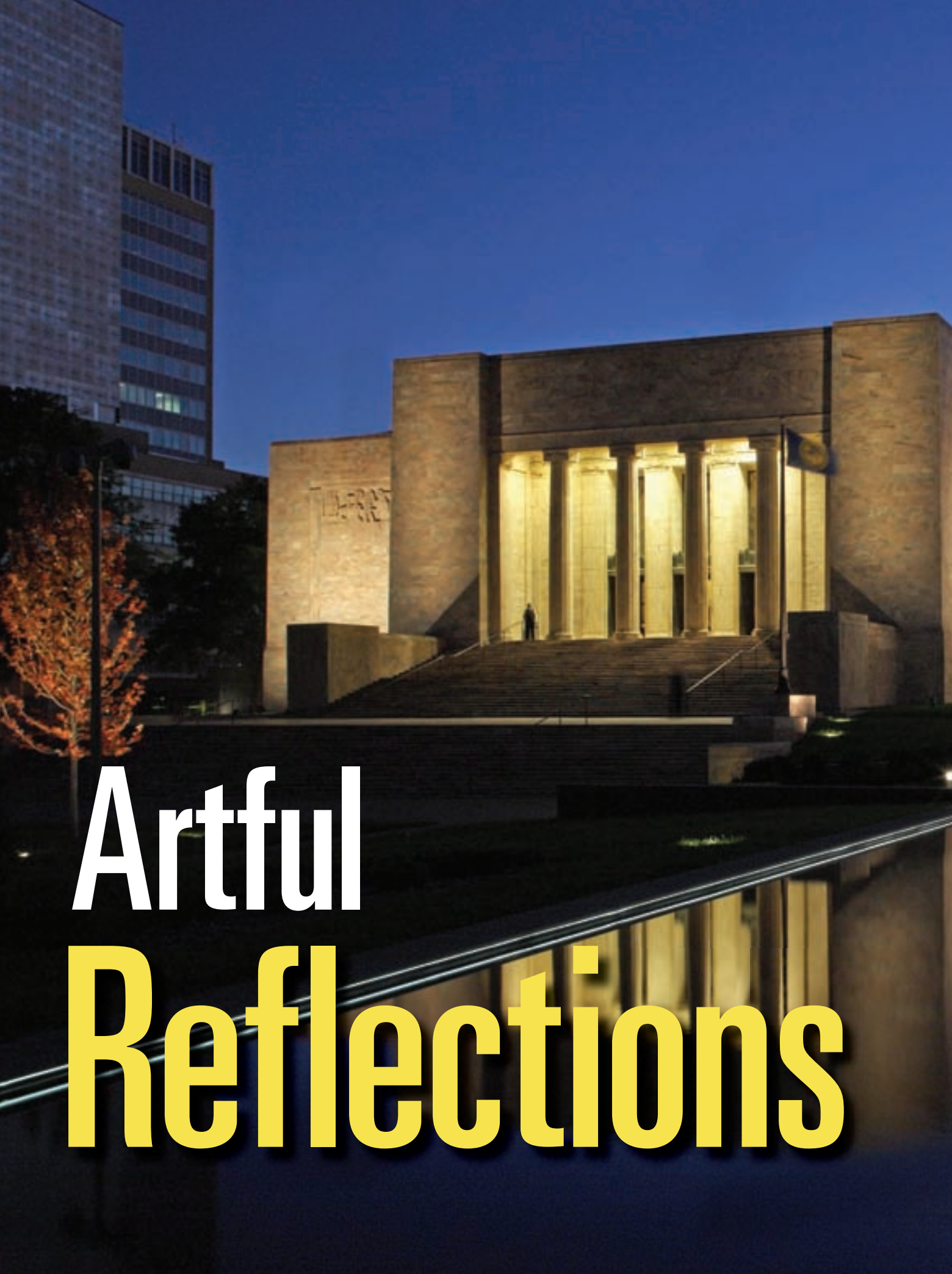
❷ Three 50-W MR16 spotlights uplight the 14-ft-tall central tree, while 7.5-W LED landscape lights illuminate plantings.

❸ Bamboo and natural grass are embedded in 7-ft-tall acrylic panels in the sitting area. "Finding a source that was intense enough to provide a uniform wash was difficult," says Samuelson, who selected high-output LED luminaires to backlight them.

❹ Pinhole MR11 downlights were arranged in a circular pattern to complement the floor. In other areas, downlights were clustered in star-like patterns.

ANATOMY OF AN AWARD

IES Illumination Award of Merit



Artful Reflections

Photos courtesy of HDR Architecture, Inc: ©Tom Kessler Photography

The lighting for Joslyn Art Museum's new sculpture garden and façade is crafted with an artisan's touch

BY ELIZABETH HALL

An historic Art Deco classic merges with a contemporary Norman Foster design. Monuments of metal and stone are surrounded by water and wildlife. The Joslyn Museum of Art in Omaha, NE, is a study in contrasts. But these opposing elements—old and new, manmade and natural—aren't contradictory. Instead, they are complementary, in part, due to a lighting scheme that unites art, architecture and nature.

Built in the 1930s, the original pink marble Art Deco building was one of the most celebrated architectural works of its time. In 1994, it was joined by a new 58,000-sq ft addition designed by Foster + Partners—Sir Norman Foster's first U.S. commission. Rather than drastically altering the aesthetic, Foster used the same monolithic style and even the same materials—pink marble mined from the same quarry as the original 1931 building.

Likewise, a sense of cohesion is present in recent upgrades and additions to the museum, including a new 1.2-acre sculpture

Ambient illumination was rejected in favor of accent lighting in the sculpture garden. In-grade CMH luminaires uplight trees and LED uplights are recessed in granite pavers; the sources are reflected off of nearby surfaces, helping to boost illuminance. In the center of the garden, fiber optics illuminate the 170-ft-long reflecting pool, while cross-aimed wet-dry niche uplights highlight opposite corners of three sculptural columns within.

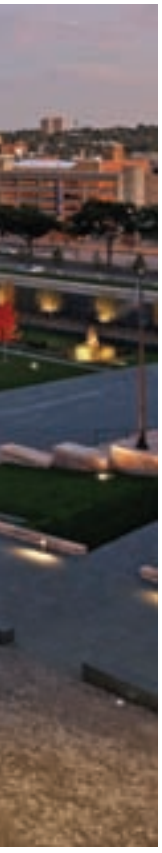
garden on the eastern side of the campus and the façade lighting of both buildings. HDR Architecture Inc., Omaha, designed the IES Illumination Award of Merit-winning lighting of the façades and the Peter Kiewit Foundation Sculpture Garden, which includes two water walls, a 170-ft-long reflecting pool and 12 sculptures (the number of sculptures varies due to visiting collections, though most are part of the museum's permanent collection). HDR also provided lighting for a new children's discovery garden and parking lot.

ART AL FRESCO

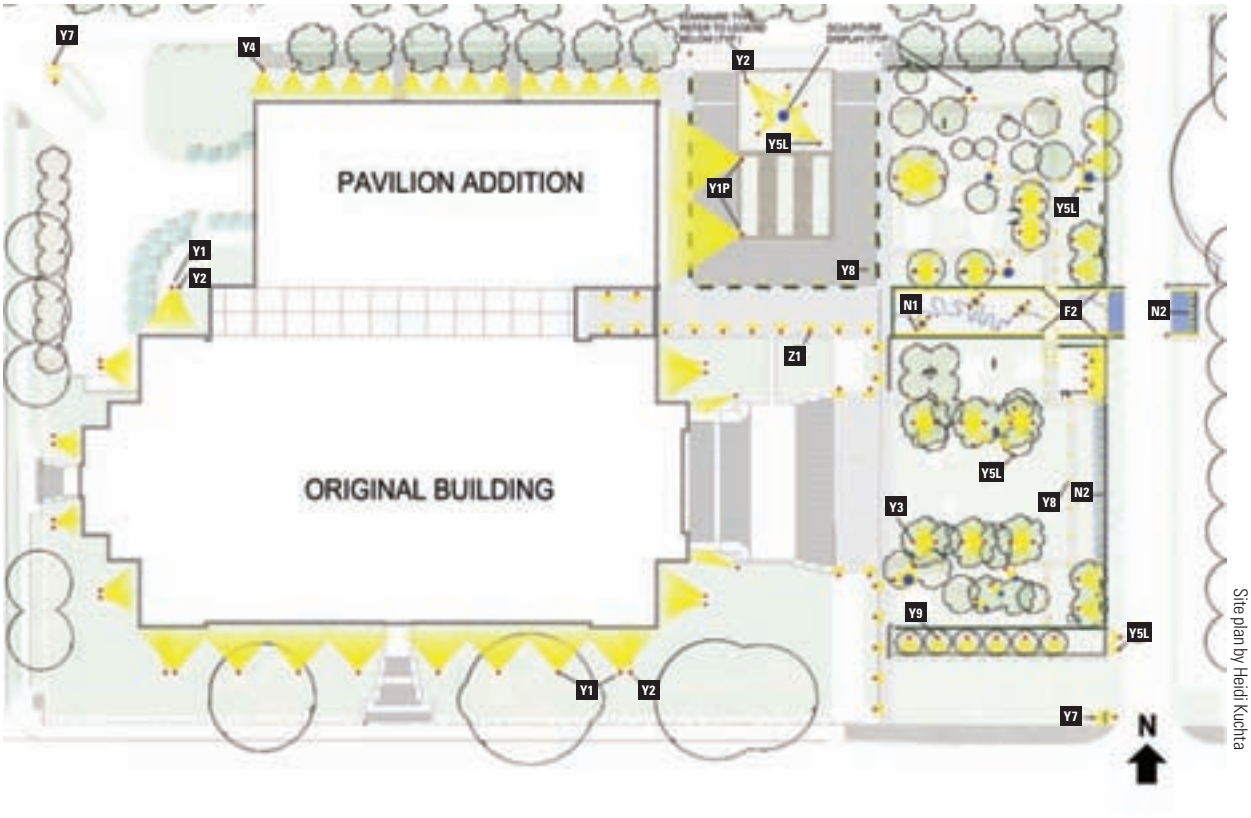
In the sculpture garden, the team wanted the light to look as organic as the landscape. HDR omitted ambient illumination and instead directed light on the art, landscaping and pathways. "We didn't want pole lights or bollards to distract from the overall experience of the garden," says HDR senior lighting designer and electrical engineer Randy Niehaus, who, along with fellow HDR lighting designer Trevor Hollins, devised a strategy that would maximize the light from accent sources.

"The theme was reflected light off surfaces, both on the perimeter granite walls of the museum and also on the trees," says Niehaus. "Usually on projects, the first thing that gets value engineered is the caliper of the trees, but these were very good sized and had some decent canopies, so we decided to uplight them. Their level of reflectance helped create an adequate illuminance throughout the garden, which really aided the overall appearance." In-grade 39-W ceramic metal halide luminaires uplight the trees, while 3-W LED uplights recessed in granite pavers delineate pathways. Additional light is reflected into the garden from a floodlighted high school building façade to the east.

Then there were the sculptures themselves, which Niehaus describes as the project's "biggest challenge" because of their indeterminate locations. What's more, the sculptures had to be in place in time for the museum's annual fundraising gala, where the new garden would be unveiled. The stringent deadline left HDR one month



SITE MAP & LIGHTING PLAN



Site plan by Heidi Kuchta

LUMINAIRE LEGEND: F2: Side Emitting Optic Cable; N1: Wet/Dry Niche Uplight; N2: Wet Niche Wall Wash; Y1: Façade Floodlight; Y1P: Façade Floodlight; Y2: Façade and Sculpture Spotlight; Y3: Ingrade Uplight; Y4: Asymmetric Façde Floodlights; Y5L: Sculpture Spotlight; Y7:Ingrade Wall Wash; Y8: LED Pathway Light; Y9: Tree Floodlight; Z1: Low-Level Bollard.

to design the lighting with the museum staff and aim the luminaires after installation.

Since the project demanded flexibility, the team kept an inventory of luminaires with different lenses and distributions on hand. Though 39-W ceramic metal halide lamps were used to light the majority of the sculptures, each work was treated individually and optical techniques varied by piece. "At times, it was a struggle to get everyone to agree," says Niehaus. "For every sculpture that arrived on site, we usually had two or three mock-ups with multiple fixtures. We'd have the museum director, curator and art director come outside after sunset and we'd play around with the positioning and aiming of the fixtures until everyone had signed off on each sculpture."

The tight deadline also forced the team to get creative when they didn't have the right tools on hand. "There were a few instances where 39-W spotlights were deemed to be too bright. With no time to order new fixtures with a more appropriate 20-W CMH lamp, the electrical contractor and I figured we had to reduce the lamp output somehow," recalls Niehaus. "Our solution was a quick trip to the hardware store to purchase some aluminum screen door mesh. We cut out multiple circles of mesh and slid them in the fixtures' accessory lens holder positions to cut the lamp intensity. It was a little embarrassing that we had to resort to such MacGyver-esque methods, but it worked great."

IMPERMEABLE ILLUMINATION

Another of the garden's main attractions is the 170-ft-long, 25-ft-wide Charles and Mary Heider Reflecting Pool, which runs east to west and is parallel with the museum's glass atrium. In the middle of the reflecting pool is *The Omaha Riverscape*, an installation by sculptor Jesús Moroles that comprises a topographical map of the Missouri River—the river's shape is carved into the bottom of the pool—three 11-ft-tall columns each made with a different type of granite and a 26-ft-wide, 12-ft-tall water wall made from 8 ½ tons of granite.

Illuminated for the first time, the pink marble façade of the 1931 museum building glows under 3,000K CMH lighting. Ground-mounted 150-W floodlights evenly wash the monolithic façade, while 70-W spots give extra punch to bas-relief friezes that depict the history of the American west.

To illuminate the pool, the lighting had to be submerged underwater, which meant that it had to be wet-location rated and have a long lifetime to minimize maintenance. HDR considered LEDs and fluorescents, but determined that edge-lighted fiber optics were the best option. "The fixture recess was very limited, so it had to be a very small cross-section of fixture. Any LED or fluorescent was too large and wouldn't have fit in the lip carved in the pavers, but fiber-optic cable fit in quite nicely and was easily mounted with adhesive clips," says Niehaus. The fiber-optic illuminators were positioned in the underground fountain pump room at the far east end of the pool and in flush, in-grade vaults at the west end.

Initially, four wet-dry niche uplights were placed at the base of each of the three sculptural columns that rise in the center of the pool, but the team felt there was too much light and removed two lights from each sculpture. "Two sides of the columns are polished and two are rough, so we felt that having the light on the opposite corners would help bring out the different textures," explains Niehaus. At the end of the pool is the Broken Earth water wall, which also required a wet-location luminaire. Though HDR considered LED fixtures, they weren't within the budget, and 90-W halogen PAR38 wet-dry niche fixtures were ultimately selected to uplight both the Broken Earth wall and the 83-ft-long Sydney Cate Family Fountain Wall. In between the two water walls, the donor wall—which didn't require a wet-location luminaire—is lighted by cross-aimed 20-W floodlights.

FRAMING FAÇADES

Opposite the walls, which constitute the eastern boundary of the site, are the façades of the original museum building and the Foster + Partners addition. The façade lighting not only creates a frame for the sculpture garden, it also highlights the museum architecture in its own right. Previously unlighted, the pink marble façades now glow under 3,000K CMH lighting. "The warm color temperature really brings out the marble," says Niehaus. "We felt that it did the best justice to that material and had good color consistency from lamp to lamp."

With the help of Penn State's Kevin Houser (who was at the University of Nebraska at the time the façade lighting was conceptualized), Niehaus first came up with a concept to light the façade of the

Limited set back necessitated different luminaires for façade lighting of the 1994 addition. The same CMH lamps were used throughout for color consistency. *Sioux Warrior*—a statue 70 years in the making—sits in front of the newly lighted façade.

1931 structure. "There's not a whole lot to highlight architecturally because it's a big monolithic structure, but at the four corners there are some bas-relief friezes that tell an allegorical story of the American west, as well as George Joslyn's personal history. So, in addition to the even wash of illumination on the façade, we decided to illuminate those friezes because they were the only parts of the façade that had any shadow potential," says Niehaus. To give the friezes extra punch, 70-W spotlights were placed at the corners of the building. The spotlights supplement the overall wash from ground-mounted 150-W floodlights. (Spot and floodlights by ERCO.) Color-corrected metal halide downlights positioned behind the entry portico silhouette the four columns that line the entrance.

Illuminating the new addition was more complex. While the original building had unlimited space to set back the luminaires, the addition had only 18 ft of set-back space on the north side and virtually no space on the east side because of the placement of the sidewalks and entrances. On the northern side, HDR used luminaires (elliptipar) with a different asymmetric distribution than those used to light the 1931 building, but with the same lamp type for color consistency. Pole-mounted floodlights illuminate the eastern façade, where space prohibited ground-mounted luminaires. The 16-ft-tall poles each hold multiple CMH floodlights and are topped with an asymmetric parking lot luminaire.

The façade lighting isn't the only new enhancement to the museum's perimeter. Situated in front of the 1994 addition is a bronze sculpture more than 70 years in the making. Originally conceived in conjunction with the construction of the 1931 structure, *Sioux Warrior* was tabled after a dispute between the museum's architect and the sculptor halted its production. In 2009, the museum hired a local sculptor to complete the original work, which had been preserved in the form of a 3-ft-tall clay model. HDR worked with the sculptor to light the final statue, which was completed in time for the sculpture garden's grand opening. The work is a perfect representation of the museum's new additions—simultaneously old and new, it's art coexisting with nature. ■

METRICS THAT MATTER

Joslyn Art Museum, Façade and Sculpture Garden

Watts per sq ft: building façade = 0.13; walkways = 0.12; sculpture and landscape lighting = 0.19; parking lots and drives = 0.11 (complies with ASHRAE/IES 90.1-2007)

Lamp Types: 7

Fixture Types: 17

THE DESIGNERS

Randy Niehaus, P.E., LC, LEED AP, Member IES (1994) (left), is a senior lighting designer and electrical engineer with HDR Architecture in Omaha, NE.
Trevor Hollins, P.E., LC, LEED AP, Associate Member IALD, is a lighting designer and electrical engineer with HDR Architecture in Omaha, NE.

Moving Target

An illuminated 'moving room' travels leisurely along the façade of an art gallery on the Bowery in New York

BY PAUL TARRICONE

LED fixtures are mounted to three exterior sides of the moving room (i.e., elevator). As it climbs from the second to fifth floor, the lighting dims to adapt to the room's position.

At the top and bottom—and all points in between—the lighting design for the Sperone Westwater Gallery on the Bowery in Manhattan seeks to "balance" the upper and lower façades of the building, creating a measure of uniformity across the façade.

The strategy sounds easy enough, until you consider that an elevator, or "moving room" as it's officially called, travels up and down between the second and fifth floors and is visible through the floor-to-ceiling glass façade.

To bring the lighting concept to fruition, designers from Buro Happold, New York City, turned this moving room into a moving target of illumination, if you will. Mounted to the top, bottom and one side of the moving room are linear LED luminaires, which have transformed the shaft into a "strong architectural gesture at night" symbolizing a visitor's vertical movement between floors of the gallery, says Gabe Guilliams, associate/lighting group leader for Buro Happold.

Designed by architect Foster + Partners, the gallery building, which opened last September, sits on a compact 25-ft by 100-ft site. The signature element is the 12-ft by 20-ft moving room, which connects the upper four exhibition floors and allows visitors to move gradually between levels. The Ferrari red-colored moving room is also visible from the street, its gentle pace contrasting with fast-moving traffic.

The moving room is not only a medium of transportation but a gallery in its own right; the art within it changes along with exhibitions in the main gallery space. Thus, at any given floor, the exhibition space can be "extended." The moving room, "allows you to stay immersed in the art," as you move from floor to floor, says Guilliams.

LED WRAP-AROUND

The lighting system for the lower portion of the building features linear LED fixtures to create a glowing effect at night, while keeping the light sources concealed.

The same fixtures (from io)are affixed to the exterior side walls of the moving room (at the top and bottom), as well as directly on the back wall facing out to the street, so that a consistent color of light is achieved throughout the shaft. Wrapped around the bottom of the room are 36 ft of tight-beam LED (6-deg symmetric) fixtures. Grazing up the face is another 20-ft continuous run of the same luminaire. On top, 54 ft of linear LED fixtures are used in a variety of beam spreads (6-deg symmetric, 30-deg symmetric and an asymmetric wash). The majority of the fixtures on the top are mounted on unistrut channels to allow aiming and location adjustment, particularly for the moving room's extreme positions (the second and fifth floors). "All light emanates from the moving room. There are no luminaires on the shaft walls," explains Guilliams. At the highest position of the room, 60 ft of shaft wall is exposed, requiring the fixtures to graze the surfaces from less than 9 in. away.

As the moving room travels between the second and fifth floors, the lighting automatically dims to adapt to the room's position. "The smooth gradient from the top of the moving room to the upper façade dissolves the barrier between the two and makes the moving room the building's focal point," says Guilliams. There are four different lighting scenes—one each for floors two through five. When the moving room is at the second floor, for example, the lighting underneath the room is at its lowest level and the lighting above is at its peak. At the fifth floor (the room's highest point), the lighting level at the bottom is at its maximum while the lighting at the top is at its minimum. Simply put, the overarching goal was to avoid "a splotch of bright light in the middle of the façade" as the moving room travels its path, explains Guilliams.

The physical geometry and interior finishes behind the façade vary significantly in the upper and lower portions of the building, creating the need for two distinct lighting systems to ensure visual harmony across the entire façade. While the LEDs in the moving room shaft below dim in intensity to match the brightness of the upper façade for each position of the moving room, the asymmetric linear fluorescent fixtures illuminating the upper façade are gel-sleeved to match the color of the light below. "Their easy access on the sixth-floor terrace was critical for our long evenings of trialing various color adjustments," says Guilliams. "In the end, a bright orange color gel covering ⅜ of the total run length did the trick."

LOOKING GLASS

The other major challenge when illuminating the façade involved the glass, itself. The architect's original proposal called for milled glass with pronounced 50-deg ridges on the front and a flat surface on the back. Guilliams was skeptical about the effectiveness of using glass with such steep ridges and had his team produce a computer model showing that a high degree of reflectivity would occur because of the non-parallel surfaces on the front and back of the glass (Snell's Law of Refraction). As the ridges

Photos: Gabe Guilliams

Deep, narrow pockets were designed into the shaft of the moving room (right), creating a concealed location for the fixtures. At the room's highest position, 60 ft of shaft wall are exposed, requiring linear LED fixtures that could graze down the surfaces from less than 9 in. away.

The inside of the moving room (below) acts as an extension of the gallery, allowing visitors to stay immersed in the art.

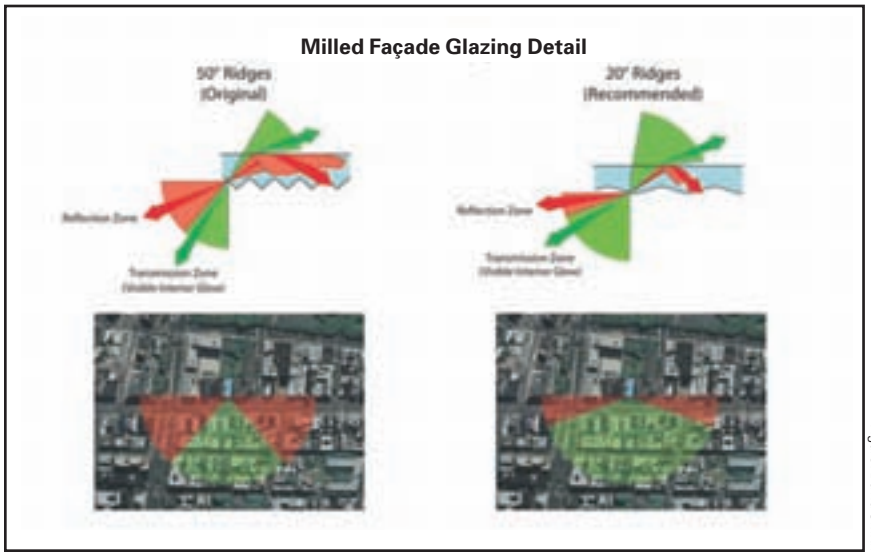


Figure: David Smith

Figure 1. Milled glass with less pronounced ridges (right) extends the glowing effect of the façade to each end of the block. The glass originally proposed (left) would only provide a glow when a viewer was directly in front of the building.

Passersby on the street experience the façade as they walk the entire block.

get steeper, more reflection and less transmission occur. "The model really helped us understand the reflectivity issue," he says. "With a largely reflective façade, the glow of the shaft would be muted, which would compromise the architectural vision for the building at night."

To bolster his case, Guilliams asked the architect if it knew of any other buildings in Manhattan that used a similar milled glass. The architect directed him to the Gucci store in Midtown, where Guilliams photographed the façade at night to provide the evidence of reflectivity. "We had to understand how that glass would respond to light. We also realized when photographing the Gucci building that any sources visible through the glass would create horizontal striations across the façade. This was at odds with our desire to emphasize the verticality of the shaft and it drove our decision to conceal all luminaires from street view."

Indeed, the glass originally proposed for Sperone Westwater would only offer the glowing experience when the viewer was directly in front of the gallery. From more oblique angles, the façade would become predominantly reflective. As a result, Buro Happold recommended a milled glass with a much shallower profile (20 deg) that would extend the glowing effect to each end of the block (**Figure 1**). This was the optimum scenario, says Guilliams, since "the majority of a passerby's interaction with the building happens over the course of walking the entire block, not just at that brief moment he is directly in front of it."

Up, down—and from the side, the lighting of the Sperone Westwater façade has it covered. ■

METRICS THAT MATTER

Sperone Westwater Gallery
Fixture Type: 1
Linear ft of fixtures: 110 ft of LED luminaires across the top, bottom and face of the moving room

THE DESIGNERS

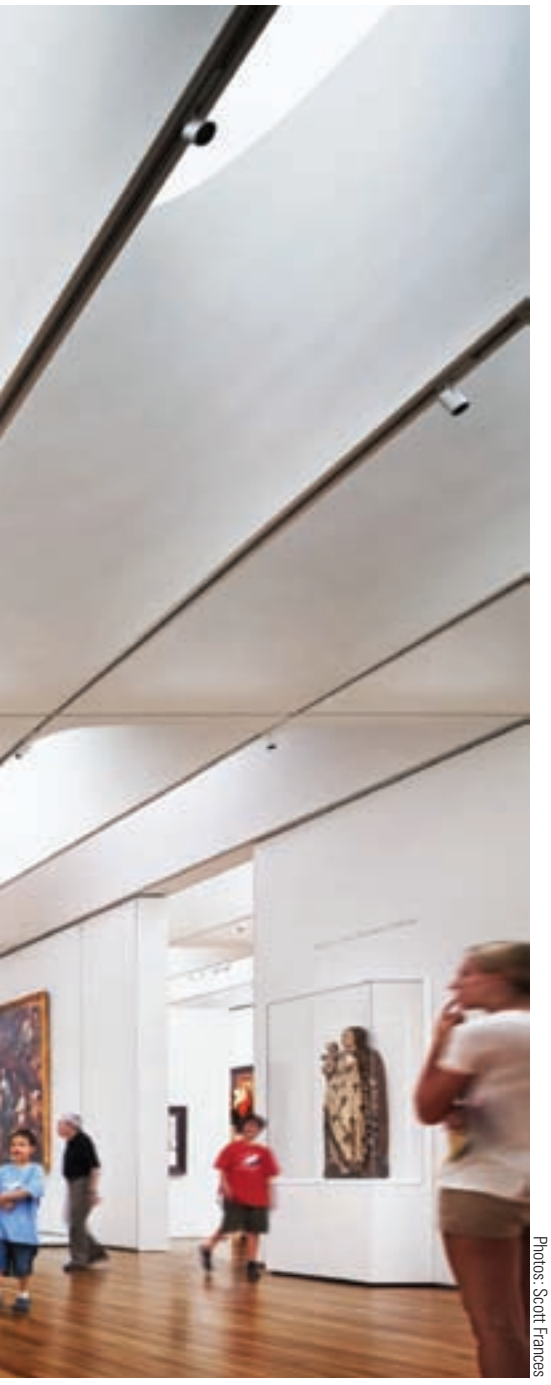
Gabe Guilliams, Member IES (1998), leads the New York lighting team at Buro Happold. He graduated from the architectural engineering program at the University of Kansas as the Mickey A. Woods lighting scholar, and has lectured at the New York Chapter of the AIA, Harvard, Columbia, Cornell and Parsons.

David Smith, Member IES (2008), Design Member IALD, is a lighting designer at Buro Happold.

Craig Danton is a lighting designer at Buro Happold.

The dimensions of each of the 362 skylights and the shape of the ceiling coffers that house them repeat across the museum. Together, the skylights and

Working Parts Protect



Photos: Scott Frances

coffers smoothly bounce light onto the walls.

the Art

A sophisticated, yet uncomplicated, daylighting system encapsulates the North Carolina Museum of Art from above and the side

BY PAUL TARRICONE

These are not your run-of-the mill, rudimentary, just-cut-a-hole-in-the-roof skylights. And this is not your garden-variety glass façade with low-tech, manually operated shades behind it. No, the individual parts and pieces of the daylighting system at the North Carolina Museum of Art—from the roof to the ceiling to the windows and the shades—work in harmony to usher natural light into the exhibition space while safeguarding the artwork from damaging exposure to direct sun and UV radiation.

To protect and to serve to borrow a phrase.

The three-year project adds a total of 127,000 sq ft of space to the Raleigh, NC, museum, including more than 60,000 sq ft of exhibition space. The museum contains an extensive permanent collection of more than 5,000 historic and contemporary objects from around the world.

Completed in April 2010, the addition was designed from the outset with the objective of incorporating daylight as a primary light source for the exhibits. Arup, NY, collaborated with design architect Thomas Phifer and Partners to design the daylight delivery systems and the daylight control system. The existing building, recently renovated to house special exhibitions, does not incorporate daylighting.

"The architect and the museum were committed to daylight as a primary source. They understood the benefit of color rendering using natural lighting and that colors would look even better than they would with tungsten halogen," says Arup senior lighting consultant Matt Franks. Daylight also suits the building site, which is characterized by greenery and nature. "Daylight enhances the connection to the outside and integrates the building with the landscape. [For example] when it becomes partly cloudy outside you can feel the change inside." While "energy wasn't ignored and the museum is happy to have the savings, it was not the primary driver," adds Franks.

A total of 362 skylights were constructed throughout the building. The dimensions of each oval-shaped skylight (approximately 8 ft by 3 ft) and the shape of the ceiling coffers that house them repeat across the museum. Together, the skylights and coffers smoothly bounce light onto the walls positioned parallel and perpendicular to the coffers. The objective being to provide "even light within conservation limits," says Franks.

The skylights are composed of four components (**Figure 1**), each responsible for a different function.

The first component of the skylight system is a fabric cover or "hoop," which is stretched over the skylight apertures on the interior. "The fabric doesn't diffuse the light; it cuts it down," says Franks. Three fabric types are used, depending on the type of art in the gallery and the amount of daylight it can be exposed to. The fabric can be easily switched out if new exhibits require less or more protection.

The second piece of the system is a plastic lens above the fabric. This lens, along

How to Build a Skylight System

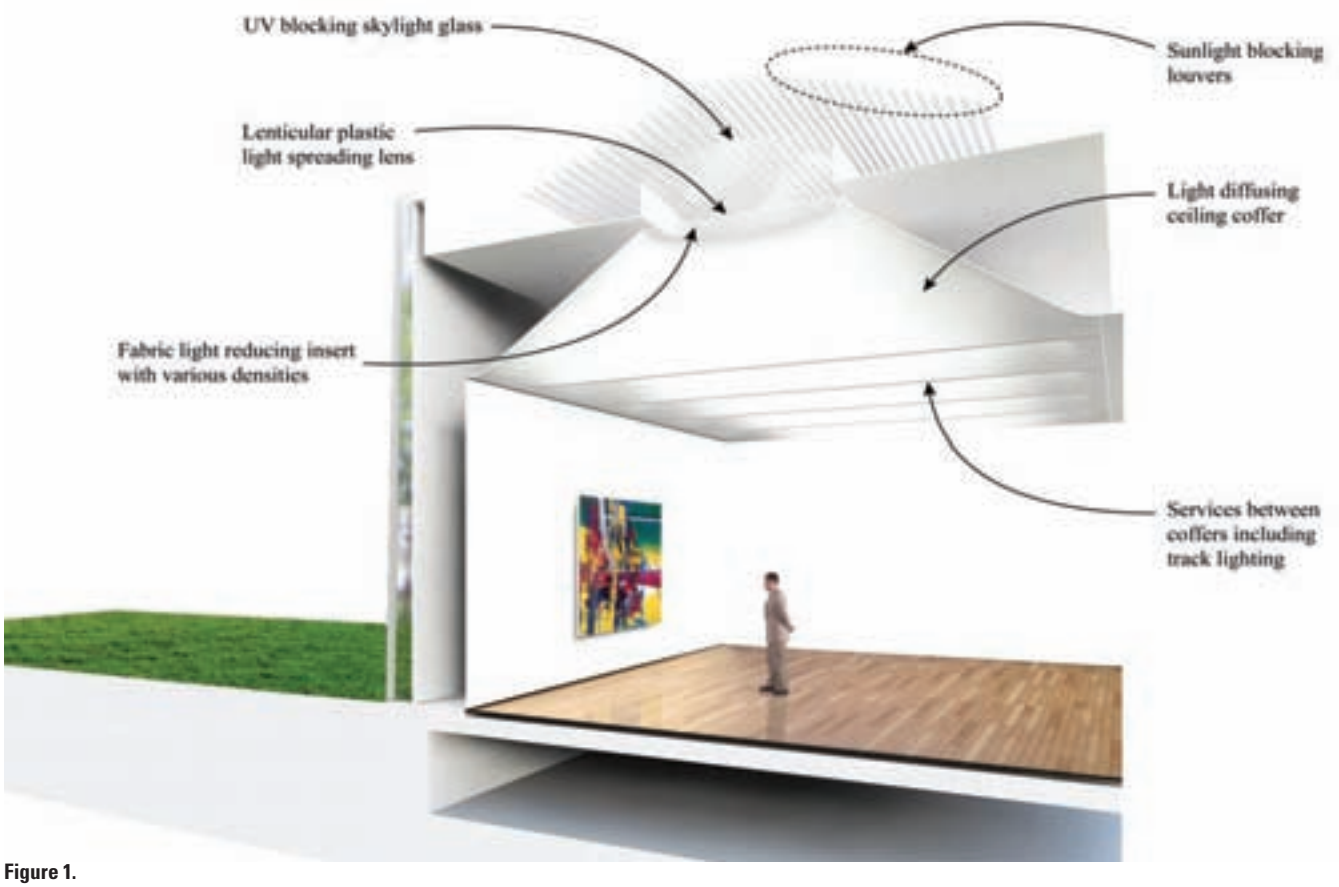
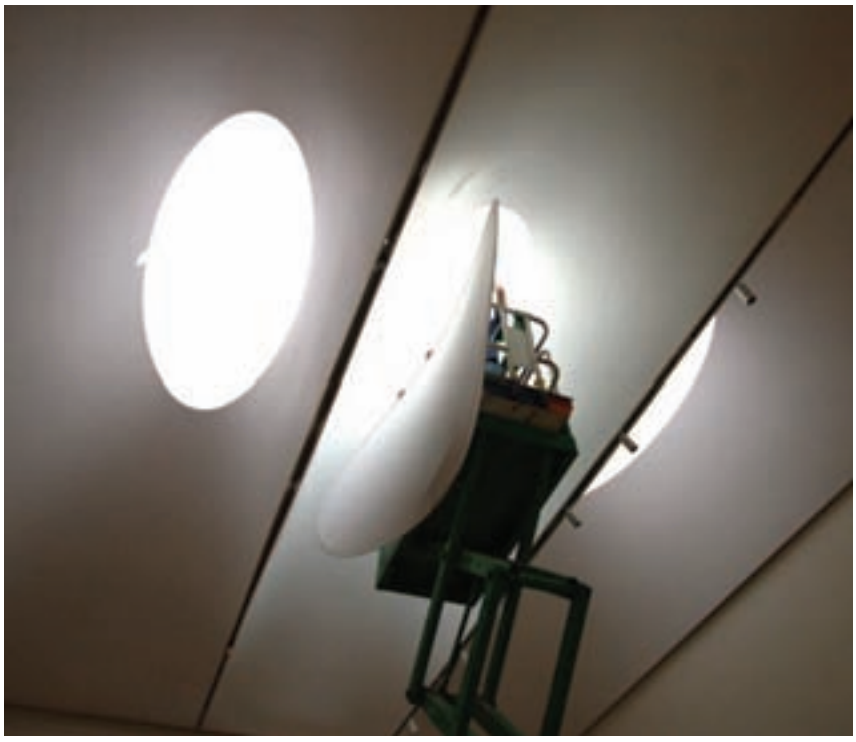


Figure 1.



The first component of the skylight system is an oval-shaped fabric "hoop," which is stretched over the skylight apertures. Three fabric types are used, depending on the artwork in question. Museum personnel can easily switch out the fabric covers if new exhibits require less or more protection from sunlight.

A combination curtain/roller-shade system controls sunlight entering the gallery space. Another control system operates the tungsten halogen track lighting mounted to spines between the ceiling coffers.

with the deep coffers, distributes the light.

The third and fourth components are the glass on the roof and a custom louver system above it. The glass blocks UV rays, while arrays of linear louvers open to the north to block direct sunlight from the south. It's a sophisticated daylighting system to be sure, but simple when considering that each component has essentially only one job to do.

FAÇADE IS FITTED

While the skylight has four components, the façade daylighting system is nearly as intricate and includes three elements. First, the exterior glazing has a high color-rendering fritted glass for UV protection. Second, pleated white fabric curtains—sized to the gallery application in question—control the total amount of light penetrating the gallery space. Three fabric densities are used: light, mid-range and opaque. Finally, to protect the artwork, a control system (from Mechoshade) senses when the sun hits the façade and deploys roller shades to stop sunlight from entering the space.

A separate computerized control system operates the electric lighting in the museum (tungsten halogen on tracks designed by Fisher Marantz Stone). The tracks are mounted to the spines between the ceiling coffers that house the skylights. There are two scenarios for the electric lighting: all lights on or half the lights on. The museum, however, is considering turning all the lights off one day per week if the amount of natural light available would accommodate this. "We designed the systems so that the museum could operate with no electric lighting, but it was a curatorial and aesthetic decision to include it. The museum staff likes the extra warm punch it provides," Franks notes.

When the switched off lights are turned on late in the day, they ramp up gently to full brightness so the extra light will not appear too jarring to visitors.

A dynamic visitor experience was only one objective of the daylighting system. More important, of course, was to preserve the integrity of the sculptures, paintings and photographs that call the North Carolina Museum of Art home. To ensure appropriate light levels, Arup and the museum used the metric of "cumulative exposure" to determine the allowable light levels in the space. Since daylight is such a variable source, the illuminance on a work of art can vary greatly throughout the day and year, says Franks. The more sensitive the piece of art, the lower the footcandle-hours per year exposure and vice versa. Using this metric, the average illuminance levels within the galleries range from 5 fc to 20 fc, depending on the piece being illuminated.

At those levels, both visitors and artwork get just the dose of daylight they need. ■

METRICS THAT MATTER

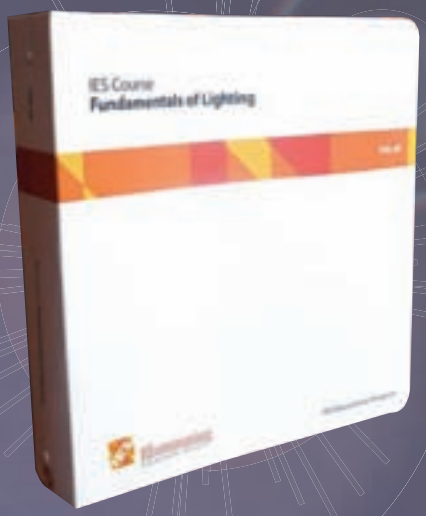
North Carolina Museum of Art
Number of Skylights: 326
Illuminance Levels: 5 fc-20 fc; varies based on the sensitivity of the art

THE DESIGNER

Matt Franks, PE, Member IES (2002), LEED AP, is a senior lighting consultant in Arup's New York office. He also serves as a Board member of the Designer's Lighting Forum of New York.

LIGHTING EDUCATION

from the IES



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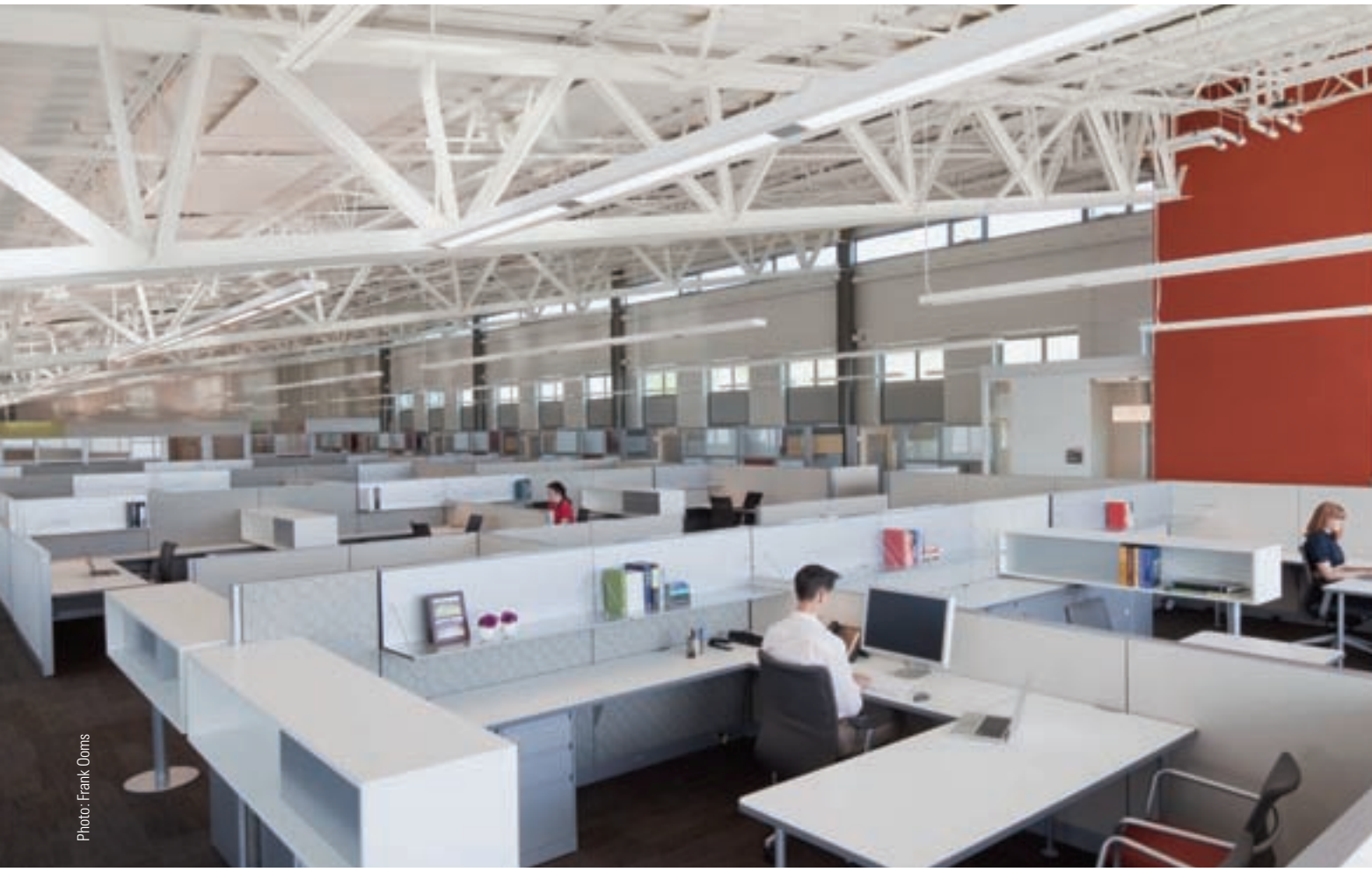

Photo: Frank Ooms

A local manufacturer created a new, visually pleasing T8 luminaire that would not compete with the exposed structure.

Countdown to Zero

With lighting systems and solar panels in place, a DOE research facility aims for net-zero energy use

The "net-zero energy building" is becoming more than just a buzzword. There are actual bricks and mortar supporting that idea in Golden, CO, where the U.S. Department of Energy's (DOE) new Research Support Facility (RSF) at the National Renewable Energy Laboratory (NREL) has been designed to be one of the nation's largest net-zero energy office buildings.

The 222,000-sq ft facility is pursuing LEED Platinum certification from the USGBC and is designed to consume 50 percent less energy than a baseline code-compliant building (**Figure 1**). Construction was completed in June 2010. The building will ultimately house 800-plus employees and is currently about 80 percent occupied.

The building is designed to operate annually at net-zero energy due to its efficient design combined with power collected from on-site solar panels. However, the facility needs to operate for a year

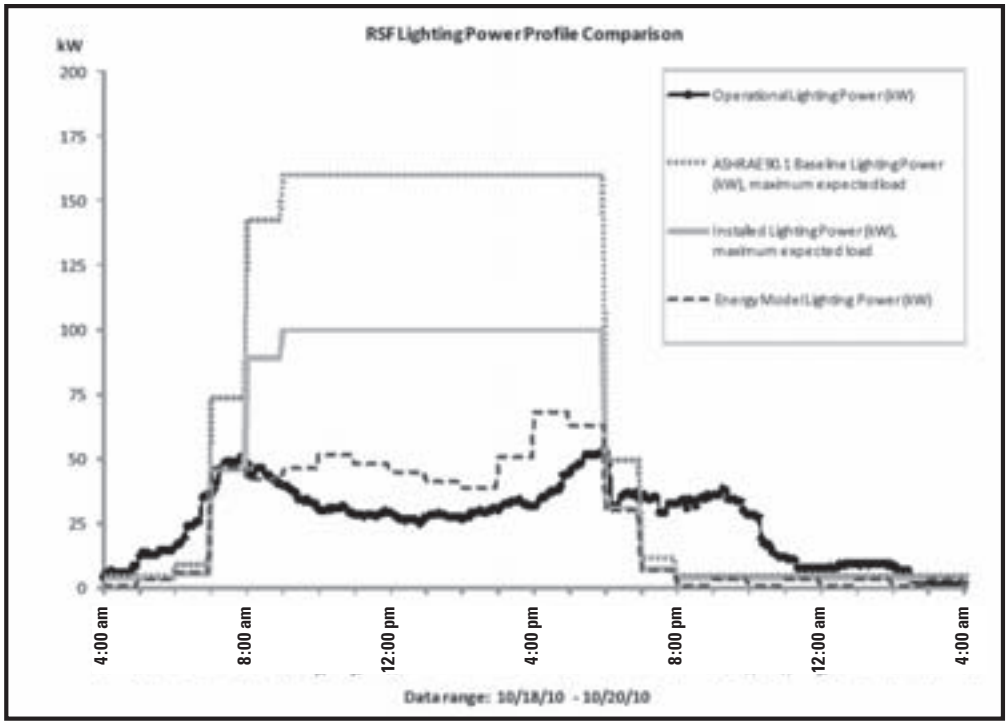

Figure 1. The building lighting load profile for a post-Equinox day, excluding exterior fixtures. The estimated installed lighting load is 125 kW. The model data is presented as a preliminary comparison of metered and modeled energy use on a day with similar calendar dates and sky conditions. Note—building not fully occupied, preliminary data to be validated over the course of upcoming year.

after the installation of the photovoltaic panels to determine if it is indeed meeting the net-zero goal.

DOE brought a diverse group of firms to the project that included the design/build team of RNL and Haselden Construction; daylight engineer and LEED consultant Architectural Energy Corporation; and the sustainable design and engineering consultant Stantec. Project construction cost was $57.4 million—slightly more expensive than a conventional building. The cost for the lighting and controls systems was $1.1 million ($5 per sq ft). A baseline code-compliant design is presumed to cost $800,000. The energy savings would equate to a traditional payback of less than eight years.

The RSF incorporates new technologies and techniques while drawing upon centuries-old concepts. Its operable windows allow natural ventilation. It monitors indoor and outdoor temperatures and displays messages on each computer about opening or closing windows. A basement labyrinth stores thermal energy and provides additional passive heating and cooling capacity.

Natural daylighting was also a critical part of the design, substantially reducing the energy needed to operate the electrical lighting systems. The RSF has an east-west orientation with a 60-ft floor plate that allows daylight to penetrate throughout. Optical louvers redirect daylight to the ceiling of the open office space.

RETHINK ASSUMPTIONS

The lighting scope included corridors, conference rooms, the main lobby, lunchroom and exteriors, but open and private offices constitute most of the square footage and can thus provide the greatest energy savings. DOE requested light levels of 25 footcandles here, despite the IES *Handbook* recommendation of 30 fc for open office environments and 50 fc for private offices. Considerable daylight penetrates the building during a normal workday, so the lighting system was designed as a supplement and to provide light in the evenings. Taking that into account, it's understood that the human visual system is adapted for lower levels of light at night, both for visual comfort and to promote natural sleep patterns. Additionally, it had to be considered that in pursuing LEED certification it was desirable to provide each workstation with a locally controlled task light. Thus, 30 fc were provided initially, and with light loss factors the system would provide 25 maintained fc. Occupants can use their task lights to supplement their work areas to 50 fc.

The RSF has a raised floor system and exposed structure; there are no ceilings and all ductwork is in the floor plenum. Thus, linear fluorescent suspended direct/indirect lighting is used rather than recessed 2-ft by 4-ft type luminaires.

The design team looked at the lamp, luminaire and ballast as an integrated system, and determined that T8 fluorescents provide higher efficiencies than T5 or T5HO lamping. This system performs better than a T5 lamp-ballast combination, even though T8 luminaires are slightly less efficient.

Photos: Frank Ooms

The lighting layout was determined by the orientation of the main structural girders and support beams. The idea was to place the lights parallel to the east-west footprint for easier daylight zoning and control. Four runs of luminaires, approximately 16 ft on center, run parallel to the window walls.

An efficient, visually pleasing luminaire that would not compete with or detract from the open structure was difficult to find, so a local lighting manufacturer, Corelite, created a new T8 product. The Element has two T8 lamps in cross-section and a linear microprismatic diffusing lens. It is slim and simple, with a 6.75-in. by 2.5-in. housing, and is 93 percent efficient.

MATCHING THE FOOTPRINT

The lighting layout was largely determined by the orientation of the main structural girders and support beams. The idea was to place the lights parallel to the east-west footprint for easier daylight zoning and control. Four runs of luminaires, approximately 16 ft on center, run parallel to the window walls. The T8s performed very well but with a higher-than-expected LPD with regard to the energy model loads, so the lamping had to be reevaluated.

The luminaires could not be reduced to three runs because the resulting distributions would result in unacceptable uniformity ratios. High-output lamps were considered but rejected because of their lower lumen per watt outputs. Reduced energy T8 lamps were the best solution. These are available in 30-, 28- and 25-W lamps, all of which offer high lumen-per-watt outputs. The team used AGi32 photometric calculations to determine that the 25-W Philips Energy Saver lamp provides the target illumination levels with the lowest energy consumption, resulting in an average lighting power density of 0.54 watts per sq ft for all office areas.

For the RSF to capitalize on available daylight, an integrated control system must automatically daylight harvest and provide enhanced control options to reduce all possible energy consumption. Originally the team wanted an addressable lighting control system installed, however budgetary limitations led to a relay-based control system that meets all of the client's needs, taking advantage of energy savings opportunities while providing simple user interfaces.

Philips Advance 0-10V dimming ballasts are used in conjunction with the lamps to daylight dim the central and northern sections of

the office areas. Stepped bi-level ballasts and on/off control are used in southern perimeter areas adjacent to the window glazing and in areas with enough daylight that the lights would typically be turned off during most normal operating hours. This saved cost over utilizing dimming ballasts throughout.

NO ONE IS LEFT IN THE DARK

Private offices, conference rooms, storage rooms and other enclosed spaces (except restrooms) are controlled by occupancy sensors with local manual override switches, all of which are programmed for "manual on," a requirement added to ASHRAE/IES 90.1-2010. The hope is that occupants will not turn on lights unnecessarily. The restrooms have no access to daylight, so the lights come on automatically when people enter and turn off when they leave.

Local switches and the relay time-clock system—which is programmed for "manual on"—control open office and circulation spaces. However, when the lights are turned on in the morning, they stay on until 6:00 pm, when the control system will begin to automatically sweep the lights off in unoccupied areas. Occupants who are still in the building have to engage the local override switch to reset the lights in that control zone which also engages the associated egress path to remain on for two more hours. Ideally, people turn the lights out when they leave, but the automatic sweep prevents lights from staying on unnecessarily. The entire building goes dark after hours; very few lights are left on as nightlights at secure access points.

Local and global daylight harvesting systems work together with some redundancy to ensure optimal energy savings. Local photocells connected to the 0-10V lighting systems automatically dim the lights based on the amount of daylight at any given time. To prevent the lights from staying on while dimmed to their minimum output, the global photocell ties into the relay system turning the lighting zone off/on according to the available daylight. This saves energy and increases lamp life. The global control system also turns off the bi-level controlled and non-dimmed lighting loads that are daylight harvested.

Energy and environmentally conscious designs were implemented throughout the RSF's auxiliary spaces. Very few lights are purely decorative. Although decorative elements are important for visual interest and to set tone and mood, the decorative elements have greater purpose, because the contract-based goals required cost and energy optimization above all other design goals. Therefore, in spaces such as the entry lobby and the lunchroom, decorative elements provide the general ambient and task lighting so layers of additional decorative lights are not needed. In the lunchroom, linear fluorescent luminaires are artfully arranged

Photo: Frank Ooms

The main corridors are illuminated with bare-strip fluorescent luminaires with 25-W lamps suspended above orange acrylic panels. The design adds vibrancy with 5 fc of illumination on the walking surface.

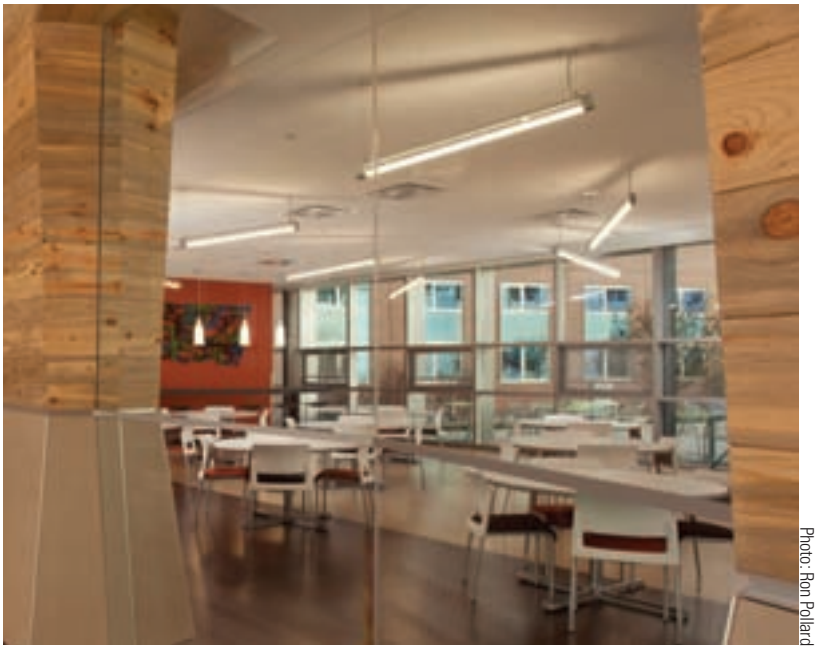

Photo: Ron Pollard

In the main lobby, adjustable accent lights highlight a striking wall of beetle kill pine. The lunchroom is outfitted with linear fluorescent luminaires artfully arranged at angles and randomly located.

The Ultimate Client

Designing lighting for a DOE facility is sort of like catering a party at the home of Emeril Lagasse or designing a gown for Vera Wang's personal use. Working for a client "in the know" can be intimidating, but the DOE-RNL client-consultant relationship on the National Renewable Energy Laboratory (NREL) project managed to leverage the expertise of both parties.

Jennifer Scheib of DOE's NREL and Rachel Petro, lighting designer for RNL, discuss how an uncommonly knowledgeable owner and its consultant worked through the design process for a net-zero energy building.

Scheib notes that DOE's internal team of managers, engineers and researchers, which helped put together the RFP, did "offer opinions and suggestions throughout the process, which likely caused more disruption and deliberation than with a typical owner. However, the design-build team was ultimately responsible for decision making."

Indeed, Scheib points out that DOE did not micromanage individual slices of the design. For example, while the LPD figure came in at a skinny .59 watts per sq ft (40 percent below 90.1-2004), the DOE did not come to the table with that specific LPD number in mind. "The RFP did not dictate an LPD reduction," notes Scheib. "Instead, the owner prescribed whole-building energy goals to promote integrated design. Specifically, a two-tiered energy goal was presented in the RFP. A primary energy-use intensity goal of 25 kBtu per sq ft per year required verification of design decisions via energy modeling. The secondary goals of annual, net-zero energy and 50 percent whole-building energy cost savings over an ASHRAE 90.1-2004 baseline added support to the LEED Platinum design requirement."

For RNL, there were certain advantages to designing a lighting system for a client with a keen interest in energy efficiency. One was that interior design decisions—e.g., the color of interior surfaces; reflectivity of surfaces, etc—were made with an eye on how they would impact the lighting. "Absolutely," says Scheib. "Not only were interior design decisions made with lighting in mind, the illumination system (encompassing daylighting, electric lighting and controls) was a primary driver in all aspects of design. Building form, envelope and interior design concepts evolved from a pre-proposal energy model that highlighted the importance of passive systems in meeting the energy target. Specifically, elongated east-west office wings, daylight window treatments in the form of reflective louvers, low workstation partition heights and high-reflectance surfaces were mainstays of the design to ensure high daylighting saturation. No system was designed without the consideration of its impacts on other systems and occupants."

For RNL's Petro, partnering with a lighting-savvy client like DOE was an eye-opener. "Working for such an educated client definitely poses a unique set of challenges. On the bright side, they truly understand things like footcandles and illuminance ratios and the benefits of quality lighting," she says. "But on the other hand, their level of education on energy consumption and energy efficiency definitely forced me to step outside the box of conventional design and push the boundaries. My vocabulary and knowledge was expanded, particularly to include 'parasitics' and 'vacancy control.' "

— Paul Tarricone

at canted angles and randomly located to induce relaxation and to express the space's unique function. In the main lobby and circulation areas, adjustable accent lights highlight a striking wall of beetle kill pine and provide transitional illumination.

USE ONLY WHAT YOU NEED

The concept of using light, and thus energy, where and when needed, is used without sacrificing visual interest and variation. Primary corridor areas are illuminated with bare-strip fluorescent luminaires that have 25-W energy-saving lamps suspended above variegated orange-colored 3form acrylic panels. The simple design adds color and vibrancy with 5 fc of illumination on the walking surface. This is more than sufficient for the simple task of walking through one space to the next. Secondary corridor areas are illuminated with 6-W LED step lights. Again, this provides a safe level of illumination for the task of walking through the space. The effect is somewhat striking as a person transitions from the moody main corridor with the illuminated orange ceiling elements, to the demure secondary corridor with low-

Photo: Ron Pollard

All exterior site lighting is LED. To the right of the main entry path are linear LED luminaires that graze stone walls.

level ground illumination from the step lights, while the daylight from the open office areas pulls you through to your final destination.

Seven lamp types are utilized, along with LED sources for light coves and step lights throughout the RSF. All interior lighting is roughly 4,100K, except in the restrooms which are 3,000K to provide for warm facial illumination at the vanities. Ballast types and manufacturers were specified for every product to use as few product types as possible. The facility will thus be easily maintained over its lifetime.

LIGHTING THE GROUNDS

Energy savings aren't confined to the interior of the building. The entire site associated with this facility is illuminated with LED lighting. The parking lot and pedestrian walkways are illuminated with 6,000K LED area pole lights because the higher lumen-per-watt performance allows for the use of lower wattage systems. In the entry courtyards, linear LED lights in 4,000K graze stone walls and silhouette plantings while the undersides of pedestrian bridges are washed in soft illumination to designate the walking paths. LED downlights in canopies at egress areas provide soft illumination for safety. Solar-powered LED paver lights are incorporated into seating areas to provide interesting off-grid accent light.

Site lighting is controlled by occupancy sensors, photocells and time-clocks for optimal energy savings; the courtyard accent lights are photocell and time-clock controlled and are on during regularly occupied hours of darkness only. Pedestrian pathway lighting leading to the parking area is switched such that every other luminaire is controlled together. The LED lighting allows for low, medium, and high output levels with independent control. The control zones are programmed such that during occupied hours, until 6:00 p.m., the lights are all on high. After 6:00 p.m. the lights transition down so every other light is on low. This provides minimal illumination to define the path. Once a person enters the pathway, occupancy sensors turn the lights to medium output for safety; to reduce energy consumption only the perimeter of the parking lot is illuminated after hours.

The end result is a striking facility that utilizes light only where it is needed and does so in a manner that minimizes energy consumption, maximizes occupant comfort and is sensitive to the environment. Zero is a winning number. ■

METRICS THAT MATTER

Research Support Facility at the DOE National Renewable Energy Laboratory

Illuminance Levels: open office = 25 fc (50 fc with task lights); private offices = 50 fc

Watts per sq ft: .59 including task lighting, .56 without task lights (38-40 percent reduction over ASHRAE/IESNA 90.1-2004 and IECC 2006); site lighting 58 percent better than allowed by 90.1-2004

Energy Use: nighttime (unoccupied) use = 3.5 kW; daytime (occupied) use = 35kW; total connected load = 125kW

Lamp Types: 7 (in building)

Fixture Types: 29 (in building)

LEED Platinum registered

THE DESIGNER

Rachel Petro, LC, Associate IALD, LEED AP, Member IES (2006), is a lighting designer and associate with RNL. She currently serves on the Board of Directors for the Denver-area Designers Lighting Forum.

The Howard Brandston Student Lighting Design Education Grant was established to encourage and recognize students who have demonstrated exceptional professional promise through the presentation of an original and ingenious solution to a supplied design problem.

The award comprises a plaque and a check in the amount of $1,000. The award is presented in conjunction with the IES Annual Conference each year.

Group entries will be accepted. However, if a group entry is selected, the group will receive the plaque and the $1,000 check will be presented to the group as a whole.

To be eligible to enter this competition, applicants must be enrolled as full-time students in an approved academic degree program. Approved programs are those offering a substantial core of illumination studies and are either engineering technology programs accredited by the Accreditation Board for Engineering and Technology; architecture programs accredited by the National Architectural Accrediting Board; interior design programs accredited by the Foundation for Interior Design Research; or theatre programs accredited by the National Association of Schools of Theatre. If there is a question about accreditation, please query.

Please note that the deadline for receipt of completed entries to the New York office of the Illuminating Engineering Society of North America is **May 1, 2011**. Judging of entries will take place in mid-May.

The purpose of the Howard Brandston Student Lighting Design Education Grant is to foster good lighting and to advance the appreciation of lighting as an art.

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Student Lighting Grant

THE HOWARD BRANDSTON

STUDENT LIGHTING DESIGN EDUCATION GRANT

2011

This Is Your Brain on Lighting

The author reviews what we've learned and what we still don't know about cognitive and emotional responses to lighting

BY ROBERT G. DAVIS

Stimulus-response. It serves as the foundation of any basic psychology class. It defines our relationship to the world around us. From Pavlov's dogs salivating at the sound of a bell to you quickly pulling your finger away from a hot pan, familiar examples of an involuntary response to a stimulus abound. And it all seems pretty simple—present this sort of stimulus, and you can count on a certain response.

Lighting practitioners work hard at getting the stimulus right to attain a desired response. Historically, that has in large part meant a detailed and careful characterization of visual tasks under different lighting conditions—the stimulus—and a variety of important methods for measuring visual performance as those conditions are varied—the response. From Blackwell's Visibility Level to Rea's models of Relative Visual Performance, we have learned much about the nature of the stimulus-response relationships relating to human visual performance. But what about those responses to lighting that go beyond considerations of task performance? Lighting can help create excitement in a themed environment. Lighting can help a person navigate through a new space. Lighting can help bring about a sense of calm and peacefulness in a sacred setting. Lighting can help add mystery in a theatrical production. And lighting can cause us to strongly dislike a room which we would otherwise find appealing. How does our mind process the visual stimulus to produce these sorts of responses? What do we understand today about the way we light buildings that enables us to link the stimulus of a lighted environment to the full array of cognitive and emotional human responses?

The answer, unfortunately, is—not much. The depth and wealth of our research and knowledge of lighting's impacts on visual task performance only underscores the dearth of information on these other aspects of human responses to lighting.

But we do know a few things. And, if we look outside our own industry to the broader fields of environmental cognition and human emotional response, we may be able to make connections that can help us establish a framework for a more holistic view of lighting's impacts. In this article, we'll examine three threads of this framework—one familiar to lighting practitioners and two that are probably less familiar—and explore how weaving these threads together can help move us along to a deeper understanding of the broad range of human responses to the lighting stimulus.

THREAD ONE: LIGHTING PSYCHOLOGY

For most lighting practitioners, the phrase "lighting psychology" immediately brings to mind the work of the late John Flynn. Flynn's research has been widely documented and discussed within the lighting community and is only briefly summarized here. (If you want a more comprehensive overview, I recommend both *Architectural Lighting Design* by Gary Steffy and *Light: The Shape of Space* by Lou Michel. Both books provide excellent details on Flynn's findings and how they relate to architectural lighting design practice.) Flynn and his colleagues explored what were at the time new research and analytical techniques, in an attempt to document and understand the full range of human impacts of lighting. Flynn examined the human response to lighting by studying an array of subjective impressions related to architectural settings, in order to determine which of those impressions were affected by changes in the lighting stimulus. For some impressions,

changes in the lighting produced significant changes in the response—impressions such as spaciousness, visual clarity, privacy, pleasantness, relaxation and complexity. By linking lighting to these impressions, Flynn demonstrated that architectural lighting plays a much more significant role in the human experience than simply as an enabler of task performance.

In addition to studying human responses to lighting, Flynn also sought to understand the nature of the stimulus that produced those responses. Which attributes of lighting in a space seemed to relate to the various impressions that could result? Flynn identified four of these attributes, which he called the "lighting modes." The modes each express a continuum of changes in lighting between two extremes. Flynn's lighting modes express the basic parameters of lighting which designers manipulate in creating the environments they desire: bright/dim; uniform/non-uniform; central/perimeter; and warm/cool. Flynn's message was that as you change the lighting stimulus along these dimensions, you will produce changes in the human response in terms of the impressions that are reinforced. And, importantly, these responses will occur whether you planned for them or not.

The practicality of Flynn's work for lighting designers resided in his attempts to link the lighting modes to the human subjective responses. To reinforce a particular impression in a space, a designer could focus on certain aspects of the lighting mode descriptors in designing the lighting system. For example, the designer could reinforce a feeling of relaxation by employing non-uniform lighting on the perimeter room surfaces from warm-tone light sources. Uniform lighting on the perimeter room surfaces reinforces an impression of spaciousness. Although the design guidance that resulted from the Flynn work is qualitative in nature, many practitioners have found the linkages between the lighting modes and the subjective impressions to be a useful characterization of the stimulus and responses to lighting that move beyond task performance.

THREAD TWO: ENVIRONMENTAL COGNITION

Whereas Flynn's research focused specifically on lighting, other researchers with no particular interest in lighting examined the broad range of human responses to environmental stimuli. From the field of environmental cognition, the work of Kaplan and Kaplan provides important insights of relevance for lighting practice. These researchers sought to understand the factors that drive human preference for environments. One factor that emerged from their research is the desire to make sense of our surroundings. According to the Kaplans, when we are exposed to a new environment, finding a cognitive match for the environment in our memory is a primary goal, as a way of helping us to interpret and understand the new environment. Oftentimes we enter a new environment that has many similarities to other spaces we have experienced. The high degree of familiarity elicits a pleasant, comfortable reaction as we immediately are able to make sense of the setting. Other times we enter an unusual space that poses an entirely new experience and find it disconcerting as we struggle to make sense of the environment. The fundamental human need to make sense of our environment explains both of these disparate experiences, according to the Kaplans' research.

But what about the "wow" factor in a new environment? We have all experienced a time when we encountered something completely new, but somehow the uniqueness and unfamiliarity were stimulating and exciting. And no doubt we share the common experience of entering a highly familiar space and finding that its very familiarity produces a low preference—"Oh please, not another drab hotel seminar room with boring uniform lighting!" In this case, highly familiar leads to low preference. (**Figure 1** summarizes these conditions.) Clearly, a second factor must interact with our desire to make sense of the environment in determining our preference.

	LOW PREFERENCE	HIGH PREFERENCE
LOW FAMILIARITY	That's weird	I've never seen anything like that before! Wow! That's neat!
HIGH FAMILIARITY	That old stuff again	No place like home

Figure 1

The factor that supplements our drive to make sense of our environment, according to the Kaplans, is a desire for involvement with the environment. We want the environment to be interesting, we want it to invite us to explore and engage, we want a sense of complexity and mystery. This underlying purpose of involvement makes some novel environments seem exciting rather than just plain weird or overwhelming, and it also makes some very familiar environments seem just too uninteresting to us.

Kaplan and Kaplan use two key words to capture the essence of these environmental aspects that drive our preference: *coherence* and *complexity*. Coherence relates to our ability to make sense of the environment—does the environment provide us with cues that enable proper interpretation? Are there enough familiar elements in the environment that allow us to make mental matches to our prior experiences? If we are able to quickly make sense of an environment that is coherent, then the likelihood that we will develop a positive preference for the environment increases.

Although Kaplan and Kaplan were environmental psychologists who primarily focused on outdoor environments in their research, they recognized the connections between coherence and lighting effects. Consider this quote: "It is also important that a change in texture or brightness in the visual array is associated with something important going on in the scene. In other words, something that draws one's attention within the scene should turn out to be an important object or boundary. . . .If what draws one's attention and what is worth looking at turn out to be different properties, then the scene lacks coherence." (Kaplan 1988, p. 49)

So a brightness emphasis that helps to make sense of an environment increases its coherence, making it a more pleasant space. Conversely, a change in brightness that is unrelated to anything important in the visual scene creates a lack of coherence, makes it more difficult to properly make sense of the space and thereby reduces a person's preference for the space.

Coherence is critical, but a space that is completely coherent but overly simplistic fails to provide the stimulation and involvement that we desire. Complexity in the environment relates to our innate desire to engage, to be active participants with our environment. This cognitive link between complexity and preference also occurs in the realm of music appreciation. In his excellent book, *This is Your Brain on Music*, Levitin writes: "When a musical piece is too simple we tend not to like it, finding it trivial. When it is too complex, we tend not to like it, finding it unpredictable—we don't perceive it to be grounded in anything familiar. Music, or any art form for that matter, has to strike the right balance between simplicity and complexity for us to like it."

Apparently, our desire for a certain level of complexity holds true for a wide range of stimuli, whether a musical piece or an architectural environment. We desire coherent environments that we can easily interpret, while at the same time we desire an appropriate level of complexity to keep us interested.

THREAD THREE: EMOTIONAL RESPONSE

From Flynn, we see a thread of thought that describes the lighting stimulus in terms of some basic modes of variations and links those variations to the human

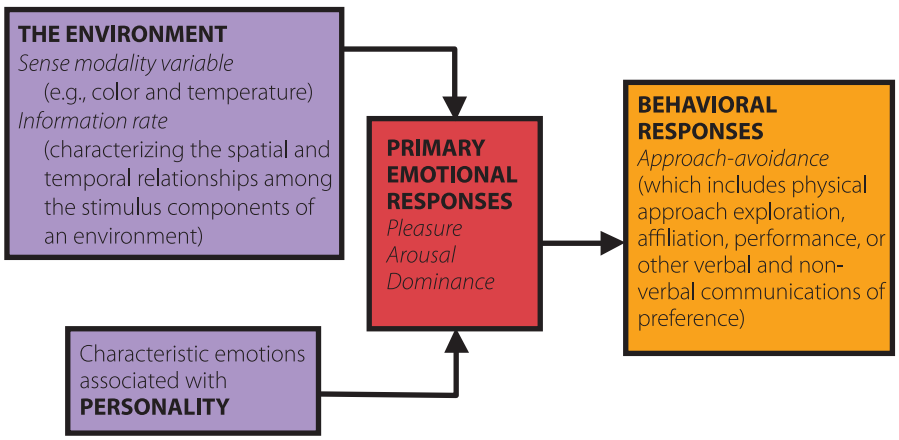

Figure 2

response of subjective impressions of environments. From Kaplan and Kaplan, we weave in a thread that characterizes the stimulus along the parameters of coherence and complexity and relates those parameters to the response of human preference. And for our third thread, we look to the work of James Russell, whose career has been devoted to understanding human emotional development and response.

In Russell's model (**Figure 2**), the primary emotional responses to the environment determine the behavioral responses. According to this model, human sensory systems process the environment and characterize the relationships between various aspects of the stimulus. This sensory input combines with personality characteristics to produce primary emotional responses in three areas—the pleasure that a person finds in the environment, the amount of arousal or stimulation that the environment provides and the extent of dominance or control that people feel they have while in the environment.

The dominance response has some fascinating implications for lighting, as it depends on how much control we feel we have over the environment compared to how much we feel the environment controls us. The connections to automatic vs. manual lighting controls are intriguing. We've seen studies that document greater energy savings when people have manual control, and we all know stories of negative reactions to fully automatic controls. We may be able to weave this thread together with the Kaplan's "desire for involvement" thread to derive a general principle about human reactions to environments. But that exploration is beyond our scope for now.

Ultimately, Russell settled on the pleasure and arousal emotions as the two primary ways that we respond to environments. In Russell's view, whenever we enter a new environment, we quickly place it into one of four quadrants that are defined by the two axes of pleasure and arousal. This structure is shown in **Figure 3**.

While Russell's initial work related directly to architectural environments, he later explored human emotional response to all types of stimuli. His model has been used in a variety of industries and applications, from advertising studies to experiments in childhood development. (In fact, his seminal paper in the *Journal of Research in Personality* titled, "Evidence for a three-factor theory of emotions," was recognized by the journal as one of the 10 most frequently cited papers in its 43-year history.) So it seems that these emotional responses are fundamental to the human condition.

Russell argues that our emotional response to a stimulus along the two dimensions of pleasure and arousal is a single, integrated response rather than two distinct responses. The words we use to describe spaces reflect this sort of integrated response. An environment that we call "stimulating" is one that is both arousing and pleasant, while one that we call "tense" is also arousing but a bit unpleasant. A "relaxing" space rates low on arousal but relatively high on pleasure, while a "gloomy" space is also low on arousal but elicits a response that is low on pleasure as well.

WEAVING THE THREADS TOGETHER

So Flynn gives us a thread of a stimulus described by lighting modes, linked to the human response of subjective impressions of environments. Kaplan and Kaplan give us a thread of a preference response that appears to be linked to environmental stimuli that are both coherent and complex—we can make sense of them and they are interesting enough to elicit our involvement. And Russell gives us a thread of primary emotional responses to stimuli that apparently drive our assessments of any environment, as we integrate a response along the dimensions of pleasantness and arousal. How can we weave these disparate threads together?

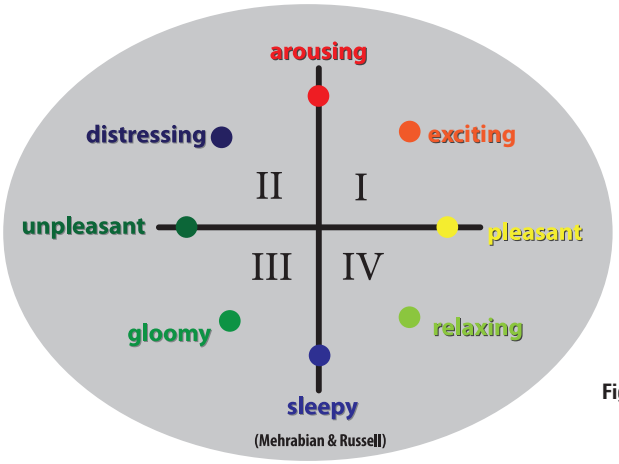

Figure 3

Consider a conference room application. The designer wants to provide uniform illuminance across the tabletop as the first layer of the lighting. Experimental evidence indicates that this central, uniform lighting increases the arousal level of the space, which seems to be preferred for a working environment. Next the designer adds some uniform perimeter lighting along two walls, to reinforce an impression of spaciousness.

Whereas Flynn's research focused specifically on lighting, other researchers with no particular interest in lighting examined the broad range of human responses to environmental stimuli

This layer articulates the architectural boundaries of the space, adding to its coherence. Accent lighting on some artwork on an end wall provides an additional layer of light. The non-uniformity of this layer increases the complexity of the visual scene, making it more interesting, inviting the occupant to engage with the environment. The space succeeds because the designer has structured the lighting solution so that it reinforces the desired architectural impressions (according to Flynn), it balances the human needs for coherence and complexity (according to Kaplan), and it provides levels of arousal and pleasantness (according to Russell) that are appropriate for the architectural context of the space.

We can think of many open questions that remain. Can we map the Flynn modes on to the Russell emotional responses? That is, what attributes of the lighting cause a space to seem more stimulating? Or less pleasant? Does increasing complexity as defined by Kaplan lead to higher levels of arousal? At what point does this increased complexity begin to compromise coherence, producing a less desirable emotional response? How do we match the cognitive and emotional needs to the context, so that we have differing guidelines depending on the desired human response to a work setting, a social setting or a retail setting? These are all important and intriguing questions to explore as we seek to better understand the human brain on lighting. ■

THE AUTHOR

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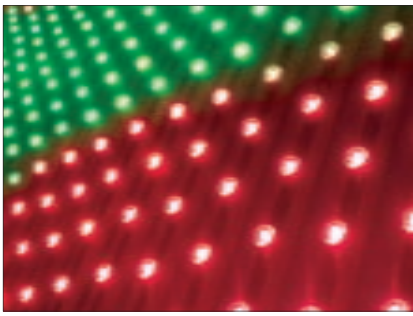

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Who Says You Can't Go Home Again?

After the Hollywood limelight, Dan Gerstenhaber follows his heart back to Massachusetts

Gerstenhaber's lighting installation for the premiere of *Fast and Furious* (top) captures the action, energy and excitement of the film. In this centerpiece for the premiere party for *Land of the Lost* (directly above) he uses iconic California images.

Daniel Gerstenhaber has been referred to as "a daring and innovative lighting designer" by his new boss Steven Rosen, president of Available Light, which recently recruited Gerstenhaber to help lead the company's Special Events and Trade Shows division. Born and raised in Beverly, MA, Gerstenhaber studied lighting design at Salem State College. "I originally went to college for biology actually, and I joined the Theatre Club because it was something I found interesting in high school. However, in college my eyes were opened to a whole world of color, music, form and shadow. There was no going back to dissecting frogs."

Indeed, why go through that messy business when you're more intrigued by lighting and how it "can set the mood and timbre for an entire event," says Gerstenhaber. "If you walk into a space, or go to a show that is beautifully lighted, you can immediately sense the tone of what you are walking into. Lighting can also bring a sense of class, style and elegance to a presentation. I will always remember the Grateful Dead concerts; Candace Brightman's work was brilliant. There wasn't the usual 'flash and trash'—nothing over the top—but a true style and class to her work. Candace just told the story of the music with light, and it all just blended perfectly."

Over the past decade, Gerstenhaber has held a number of positions in theater and special events production, including a four-year stint as a technical production coordinator at Los Angeles-based Entertainment Lighting Services (ELS), where he designed and produced the lighting and media systems for television shows, film premiers and red carpet events. His projects include *CSI Las Vegas*, *11th Hour*, the *MTV Movie Awards*, the *Guys Choice Awards* and the *BET Awards*, for clients such as Universal Studios, Twentieth Century Fox and Paramount Pictures.

Gerstenhaber's move to Available Light offered not only the opportunity to work for a high-profile firm, but to return to his home on the East Coast.

Why leave TV for trade show events?

Gerstenhaber: I am not at all leaving one industry to participate in another. In fact, it was my success in design and production work for corporate communications that naturally led to an expanded career that now includes video and broadcast work. In the 21st century, the lines between these two disciplines are growing evermore blurry. Lighting designers must evolve or die. The "art" of video production requires a skill set that goes beyond a strong technical knowledge of how to design, specify and install systems. Besides all the technical wizardry, lighting designers employ color, form, movement and timing to a presentation—in many ways it is the transitions between moments or looks that transcend mediocre lighting or video production and head into the area of magic. My boss calls this the "truth and beauty" part.

What about leaving the glamour of Hollywood?

Gerstenhaber: I had many reasons for leaving Los Angeles. Though I love what I do, most of the work I did was far from glamorous. People think that because you are working on shows, parties and events revolving around top celebrities that you are a guest at these huge fêtes and you get to be at the center of the action. Nothing could be further from the truth.

Along with TV and film shoots, I mostly worked on film premieres and parties. Lighting a movie premiere party is a laborious and time-consuming process that can grind on for a number of excruciatingly long days. My role would usually involve transforming a mundane location never built for a party and making it look like the most exciting and compelling place on earth for a party that would last two hours. By the time the party tipped off, all you wanted to do was collapse. My job was to make sure the event was perfect for my client, not to attend their event. I would be there of course, waiting in the wings, just in case anything needed doing. The idea was always to make the task look effortless for the client—my role was to ensure that "ease."

In many ways it is the transitions between moments or looks that transcend mediocre lighting or video production and head into the area of magic

Will you be doing any architectural lighting in additon to events?

Gerstenhaber: I was brought on board at Available Light to work in their SEATS (Special Events and Trade Shows) division and I don't have much experience in permanent architectural lighting design. I feel that working with Steven Rosen and the Available Light team is a great opportunity for me to expand my horizons, while helping others in the company. Steven encourages the cross-party-lines collaboration that happens as a natural extension of lighting designers with diverse skills and interests working together in one place. We all learn from one another. Indeed, I do expect to expand my portfolio into architectural lighting one day.

Where is Available Light headed?

Gerstenhaber: I think, like all responsible companies in this economy, Available Light is looking to expand its market by both enhancing its in-house expertise and developing new strategic alliances with other complementary, like-minded and successful companies—that's partly why I have joined the Available Light team. To ensure long-term success and growth it helps to do a little bit of everything. Our clients have never liked the word "no"; don't you agree that "yes" is far more satisfying? Sometimes that means expanding the services we offer and sometimes it means partnering with someone.

What are the differences between a production house and a lighting design firm?

Gerstenhaber: At Available Light, the genesis of a project is firmly rooted in design. Lighting production houses tend to start with the priorities of the production house (i.e., What hardware do I have on my shelves and how can I mold my approach to best accommodate my current inventory?) Available Light doesn't have shelves—we have ideas and vision. We're interested in developing a compelling visual link to our clients' marketing message. The hardware we choose to deploy must serve the overriding visual concept—not the other way around. Our clients express frustration with past vendors that do not think to either ask the right questions or make the appropriate conceptual connections that will show them in their best, well, light. ■

—Roslyn Lowe

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[LEFT TO RIGHT] ZA –KOENJI LIGHTING DESIGN: Hiroyasu Shoji, IALD; Yumiko Tanaka, Associate IALD; LightDesign Inc | ARCHITECTS: Toyo Ito & Associates PHOTOGRAPHY: © Toshio Kaneko **STEPHEN M. ROSS SCHOOL OF BUSINESS AT THE UNIVERSITY OF MICHIGAN** LIGHTING DESIGN: Keith J. Yancey, IALD, AIA, LC, P.E.; Carlene M. Geraci; Nathanael C. Doak; Jennifer Pieszak, IALD; Lam Partners Inc | ARCHITECTS: Kohn Pederson Fox Associates PC PHOTOGRAPHY: © Barbara Karant / Karant+Associates, Inc; © JJR LLC / Ken Cobb; © Lam Partners Inc; © Michael Moran

IN A MODEL ROOM, LESS IS MORE

British real estate company Land Securities typically invests in large, high-end commercial buildings, but knows that even small-scale developments deserve quality lighting. Recently, it had the opportunity to illuminate some of its tiniest structures yet—the architectural models of its properties. And, appropriately enough, it did so in a small way: After relocating to a new facility, Land Securities swapped out the 56 tungsten halogen downlights and MR50 track spotlights used in its previous model room for 31 LED downlights.

To lessen energy and maintenance costs, Land Securities wanted to reduce the number of luminaires. Rather than using two different lighting systems to light the models, it preferred one product that could meet multiple lighting objectives—ambient illumination, adjustable accent lighting and emergency egress lighting.

Fitted with white LED modules (Xicato) in 3,000K with an 80-plus CRI, the downlights (from Wila Lighting Limited) are "fully recessed, but also adjustable and the reflectors can be easily changed" to accommodate the changing model layouts, says Wila group technical director, Peter Le Manquais. Each luminaire is capable of 20-, 40- and 60-deg beam angles and has a 360-deg rotation, eliminating the need for supplemental track lighting.

Additionally, the downlights are controlled by an architectural dimming system that is programmed with various model-lighting scenes. Using an inverter that reduces the luminaires' 1,000-lumen output, Wila was able to add emergency lighting capabilities to the downlights. The luminaires offer an estimated 60 percent energy savings compared to the previous lighting system.

Elizabeth Hall

PRODUCTS IN PRACTICE

The Challenge: Flexible, high-quality lighting for a model room

The Solution: Fully adjustable LED downlights with changeable reflectors

PRODUCTS + LITERATURE

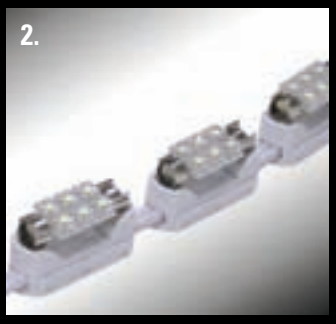
1. USAI has fused the design features of its NanoLumen product with the performance features of its BeveLED to create NanoLED. The new luminaire has a 2.5-in. aperture; a light-weight, high-performance proprietary aluminum heatsink; 10-W Cree MP-L EasyWhite LEDs; and an LED driver sliding tray that allows for simple driver replacement.
www.usaillumination.com

2. Tivoli introduces Covelum Designer Series LED Color, bendable low-voltage cove color LED lighting for commercial and residential applications. Modules are 2-in. long and feature six triple-chip .75-W color LEDs each. LEDs can be spaced 2.5-, 3- or 4-in. on center and may be specified in four standard colors, or 45 Colormix Pantone or CIE X/Y non-white coordinating colors.
www.tivolilighting.com

3. Beacon Products announces the UrbanLED collection of full-cutoff LED outdoor pole-mounted lights in early 20th-century designs. Four radial light-housing designs can be selected, in a range of three sizes, each with deep heat sinks and integral cooling fins. Choices of 24 32-W, 36 48-W, 36 60-W and 36 80-W radial LED arrays, in high milliamp and Kelvin color-temperature ranges are available.
www.beaconproducts.com

4. LEDirect Lighting introduces its newest NaturaLED PAR lamp series that is a direct replacement for halogen PAR lamps.


1.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4.


5.

NaturaLED PAR lamps come in PAR20, PAR30 and PAR38 sizes and meet Energy Star, IES LM-79 and LM-80, UL, FCC and RoHS compliance requirements with luminance output reaching 1000lm.
www.ledirectlighting.com

5. Active ES Lighting Controls introduces its LiteOwl lighting control device designed for use in cobra-head streetlight applications. LiteOwl features a compact, low-profile housing that is designed to sit atop and plug into the standard photocell socket within any cobra-head fixture. Currently available for lamps up to 250 watts, the LiteOwl is UL listed, RoHS-compliant and recyclable.
www.ActiveES.com

6. LED Roadway Lighting Ltd. has released a new small-body LED streetlight fixture. The SAT-S is part of the company's "Satellite Series" of lights. The fixture has a 20-year lifetime with an MTBF rating of up to 3,302,411 hours. It is designed to meet IES RP-8, CIE and BSI light level guidelines and is dark-sky approved.
www.ledroadwaylighting.com

7. Intematix introduces two new phosphor families to its product line: green aluminate and red nitride materials that enable high-quality white illumination when applied to blue LEDs. The new phosphor families meet the material requirements for display backlighting and general lighting applications.
www.intematix.com

8. Cree, Inc. introduces the XLamp MX-6S and MX-3S LEDs, which offer new high-voltage configurations designed for space-constrained LED lamps and bulbs. The XLamp MX-6S LED delivers luminous flux of up to 139 lumens at 60 mA/20 V in 6,000K and 114 lumens in 3,000K. The XLamp MX-3S LED provides up to 122 lumens at 115 mA/10.7 V in 6,000K and 100 lumens in 3,000K.
www.cree.com

9. Thomas & Betts has developed the Emergi-Lite Premier Series Combination Unit, a combination exit sign/emergency light in an energy-efficient compact unit. Designed and manufactured in North America, the Premier Series Combination Unit is available with MR16 halogen lamps or white LED lamps.
www.emergi-lite.com

10. Tyco Electronics introduces the Nevalo SSL system, which includes more than 60 LED Light Modules (LLMs) options, ranging from 300 to 3400 lumens; optics in total internal reflection and reflector styles; drivers with constant current output, dimming-control capabilities and temperature monitoring; and a new ribbon-based, four-wire configuration wiring system.
www.nevalo.com

EVENTS

February 9-11: Cooper Lighting SOURCE is offering "Lighting Fundamentals/Lighting Basics." Held at the Peachtree City, GA, facility, this seminar is geared to newcomers and those interested in a refresher course. Focus is on lighting terminology, photometry, LEDs, fixture types, lamp-ballast systems, energy and lighting legislation with an introduction to lighting controls. CEUs available. Contact: Jere Greiner 770-486-4680 or go to *www.cooperlighting.com/education*

February 10: Acuity Brands Lighting is offering "Visual Training." Held at the Light & Space Center, Conyers, GA, the session offers a hands-on experience with "Visual Professional Edition." Follow on computers (provided), as instructors demonstrate how to create real-world applications and discover new features of Visual 2.6, navigating the Visual interface, creating and modifying models and walk through a project. Ground transportation, food and one night hotel stay will be covered. Participant is responsible for airfare to Atlanta. Contact: Tricia Foster 770-860-2049; E-mail: Tricia.Foster@acuitybrands.com

February 21-23: Acuity Brands Lighting presents "Product Workshop" held at the Light & Space Center, Conyers, GA. The workshop provides an overview of all Acuity Brands Lighting companies, focusing on the benefits and applications of key Lithonia Lighting products. Contact: Tricia Foster 770-860-2049; Email: Tricia.Foster@acuitybrands.com

February 22 and 23: Venture Lighting Institute is offering "The Sound of Pulse-Start Technology." The (two) one-day classes held in Toronto, ON, cover lamp and ballast basics, controls, dimming, regulatory sustainability trends and product training. 8 CEUs available. Contact: Amanda I. Foust, 440-836-7523 or E-mail: amanda_foust@TheVLI.com or go to *www.TheVLI.com*

March 2: Venture Lighting Institute is offering, "LeafNut Wireless Controls." Held at VLI Streetsboro, OH, focus is on wireless control trends, how they work, what you need to know to install them and in-depth training on the LeafNut system. 4 CEUs available. Contact: Amanda I. Foust 440-836-7523 or E-mail: amanda_foust@TheVLI.com or go to *www.TheVLI.com*

March 10-11: Cooper Lighting SOURCE is offering "LED Exterior Lighting Solutions." Study exterior lighting design basics and principles for area, roadway and floodlighting applications and current lamp technologies including the latest in LED lighting systems and testing methodologies such as LM79 and LM80. Contact: Jere Greiner 770-486-4680 or E-mail: Source@cooperlighting.com or go to *www.cooperlighting.com/education*

March 10-12: The IES Roadway Lighting Committee (RLC) will hold its spring meeting at the Hilton Kansas City Airport, Kansas City, MO. The RLC is responsible for developing and writing technical documents related to lighting of all types of public roads, including tunnels and underpasses, parking lots and toll plazas. Contact: William A. Smelser 519-856-0377, E-mail: bill.smelser@acuitybrands.com

March 14-16: Acuity Brands Lighting presents "Application and Solution Basics Workshop." Held at the Light & Space Center, Conyers, GA, the program equips participants with cutting-edge technology enabling them to develop the best designs in the least time, and targets lighting for offices, classrooms, warehouses and parking lots, pointing out benefits and limitations of products typically used in these spaces. Review regulations and energy codes with a number of web-based support tools. Contact: Tricia Foster 770-860-2049; E-mail: Tricia.Foster@acuitybrands.com

March 16: The Designers Forum of New York (DLFNY) is offering "LEDucation 5" at the Hotel Pennsylvania, New York City. Four credited programs are offered. Speak with manufacturers and see firsthand the speed at which products have progressed by viewing the latest innovations on display at 96-plus LED and control manufacturer exhibits. Cost: free for DLF and IES members, $20 for all others (pre-registration required). Contact: *www.dlfny.org* or *www.Leducation.org*

March 16-17: GE is offering "Lighting Retrofits," geared to facility managers, engineers and those involved with specification and implementation of energy-saving strategies. Retrofits offer easy and direct ways to reduce energy consumption. Learn about legislation making a variety of lighting products obsolete and about products that offer the best retrofit solutions. Cost: $400. 1.0 CEUs available. Contact: Rose Marie Davis 216-266-2039, E-mail: rose.davis@ge.com or go to *www.gelighting.com*

March 31-April 1: Cooper Lighting SOURCE is offering "Energy Solutions for Commercial and Industrial Lighting Design." Held at the Peachtree City, GA facility, this workshop on lighting techniques for industrial, commercial, manufacturing and warehouses focusses on sustainability and minimizing environmental impact of buildings, lighting legislation, current lamp and ballast technologies and LED solutions as they relate with emphasis on requirements and exceptions in LEED, ASHRAE 90.1, IECC and EPACT. Contact: Jere Greiner 770-486-4680 or E-mail: Source@cooperlighting .com or go to *www.cooperlighting.com/education*

April 11-13: GE is offering "Advanced Selling Tools." This is a "deep dive" into GE Lighting sales tools including the new Value Light 4.0 and the new Lighting Assistant. Become fluent in financial measures, i.e., Life Cycle

Costing (LCC), Net Present Value (NPV) and Internal Rate of Return (IRR), while exploring cost-justifying LED upgrades and "Cost of Light" models. Analyze retrofit options, estimate environmental impact and bring all this together into a proposal. Cost: $550. CEUs available. Contact: Rose Marie Davis 216-266-2039 or E-mail: rose.davis@ge.com or go to *www.gelighting.com*

April 11-13: Cooper Lighting SOURCE is offering "Lighting Fundamentals & Specification Training for Agents." Held at the Peachtree, GA facility, this class focuses on Cooper Lighting Products pertaining to the specification market and competitive differences. Also see (**February 9-11**).

April 14-15: Cooper Lighting SOURCE is offering "Residential Lighting Solutions Workshop," held at the Peachtree City, GA, facility. Learn to use today's technologies, study lamps and LEDs and luminaires in applications control systems. Use class project to analyze a variety of lighting techniques in both theory and practice. Also LEED, Energy Star and legislation for residential design. Course will help prepare for the CLC certification exam. Contact: Jere Greiner 770-486-4680 or E-mail: Source@cooperlighting.com or go to *www.cooperlighting.com/education*

April 15-16: The IES St. Louis Section is offering "Fundamentals of Lighting." This course replaces the IES ED-100 Course covering the basic and most important principles of lighting. Topics are presented by expert lighting designers, i.e., Randy Burkett and James Benya. For those with a basic understanding of lighting or those seeking a refresher course. Cost: $275 for IES members, $325 for nonmembers and $175 for students. CEUs: 16 available IES, USGBC CEs and 16 AIA, LUs with Health, Safety and Welfare (HSW) credit. Contact: KJWW Engineering Consultants *www.kjww.com*

April 20-21: Venture Lighting Institute is offering "Pulse-Start Dimming & Controls." Held at VLI in Streetsboro, OH, this class covers the basics of metal halide in engineering, lamps, ballasts and controls, including how to design metal halide controls systems, when to use them and with what control technologies. See first-hand control systems for dimming metal halide and the capabilities of HID electronics and the future of pulse-start under the EISA 2007, CA Title 20 and the National Energy Efficiency Enhancement Act of 2010. 12 CEUs available. Contact: Amanda I. Foust 440.836.7523 or E-mail: amanda_foust@TheVLI.com or go to *www.TheVLI.com*

April 27-29: Cooper Lighting SOURCE is offering "Lighting Fundamentals for Distributors & Contractors." Held at the Peachtree, GA, facility, focus is on fundamentals with an emphasis on Cooper Lighting products. Contact: Jere Greiner 770-486-4680 or E-mail: Source@cooperlighting.com or go to *www.cooperlighting.com/education*

May 3-5: GE is offering "Fundamentals of Lighting." This fast-paced comprehensive lighting course contains lectures and full-scale lighting demonstrations. Topics include: lighting terminology, measurements and color, an overview of major light source families and systems and application modules for retail, office, industrial and outdoor lighting. Geared to newcomers. Cost: $550. 1.5 CEUs available. Contact: Rose Marie Davis 216 266 2039 E-mail: rose.davis@ge.com or go to *www.gelighting.com*

May-12: Acuity Brands Lighting presents "Visual Training." See (**February 10**).

May 15-19: LIGHTFAIR International 2011, the world's largest annual architectural and commercial lighting trade show and conference. Join thousands of lighting professionals including lighting designers, architects, specifiers, engineers, etc., at the Pennsylvania Convention Center, Philadelphia, PA. LFI blends continuing education courses with innovative products ranging from high-end design to cutting edge technology. Contact: *www.lightfair.com*

May 18-20: "RLC 2011." This Romanian Lighting Convention, "Lighting and Community," will be held at the JW Marriott Bucharest Grand Hotel, Bucharest, Romania. Topics include lighting design and architecture, daylight, light and health, night and city, lamp disposal, LEDs, legislation, lighting education, luminaire design, lighting master plan, control systems, interior and exterior lighting. Contact: *www.rlc.org.ro*

May 19: Venture Lighting Institute is offering "HID vs. the Competition – Part 1." This half-hour webinar (11-11:30) reviews induction interior and exterior applications vs. metal halide. Discuss pros/cons of the systems from new construction and retrofit/upgrade solutions. Analyze interior induction and pulse-start, exterior layout options and energy and the advantages and disadvantages of each system. 5 credits available. Contact: Amanda I. Foust 440.836.7523 or E-mail: amanda_foust@TheVLI.com or go to *www.TheVLI.com*

June 1-3: Cooper Lighting SOURCE is offering Lighting Fundamentals/Lighting Basics. See (**February 9-11**).

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IES MEMBERS

Membership committee Norm Waff announced the IES gained three Sustaining Members and 122 members (M), associated and student members in December.

NEW MEMBERS

Sustaining Members

HD Supply - Utilities, Oviedo, FL
LED One, Inc., Oklahoma City, OK
Richporter Research in Lighting, Montreal, QC

Midwest Region

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Richard G. Eberts, Energizer Holdings, Inc., Westlake, OH
Mitch G. Gaida, Millerbernd Lighting, Winsted, MN
Pam K Hodge (M), A.L.P. Lighting, Charlevoix, MI
Mark Kaner (M), Western Extralite, Maryland Heights, MO
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Robert J. Lombardi, Lighting Dynamics, Inc., Akron, OH
Xiaomei Lou (M), GE Lighting Solutions, East Cleveland, OH
Tami Martens, TechSmart Environments, Saint Louis, MO
Steven Matthews, Paramount Industries, Inc., Croswell, MI
Abby S. McKain, GE Lighting Solutions, East Cleveland, OH
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Jon D. Rowe (M), MSKTD & Associates, Fort Wayne, IN
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Mohamed Djebara, Aecom, Montreal, QC
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Benoit Essiambre, GE Lighting Solutions, Lachine, QC
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Rachel D. Zegart, Kopp Glass, Inc., Pittsburgh, PA
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Ku'uipo J. Curry, ICF International, Washington, DC
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Maria Teresa Sierra, Bogata, Colombia

SUSTAINING MEMBERS

The following companies have elected to support the Society as Sustaining Members which allows the IES to fund programs that benefit all segments of the membership and pursue new endeavors, including education projects, lighting research and recommended practices. The level of support is classified by the amount of annual dues, based on a company's annual lighting revenues:

Diamond: $15,000 annual dues
Lighting revenues over $500 million

Emerald: $10,000 annual dues
Lighting revenues to $500 million

Platinum: $5,000 annual dues
Lighting revenues to $200 million

Gold: $2,500 annual dues
Lighting revenues to $50 million

Silver: $1,000 annual dues
Lighting revenues to $10 million

Copper: $500 annual dues
Lighting revenues to $4 million (Copper members are listed in the IES Annual Report.)

DIAMOND

Acuity Brands
Cooper Lighting
GE Lighting
Hubbell Lighting, Inc.
OSRAM SYLVANIA Products, Inc.
Philips Lighting Co.

EMERALD

Holophane

PLATINUM

Finelite, Inc.
H E Williams, Inc.
Lightolier
Lutron Electronics Co, Inc.
Musco Lighting
Philips Day-Brite
Renova Lighting Systems, Inc
Watt Stopper/Legrand

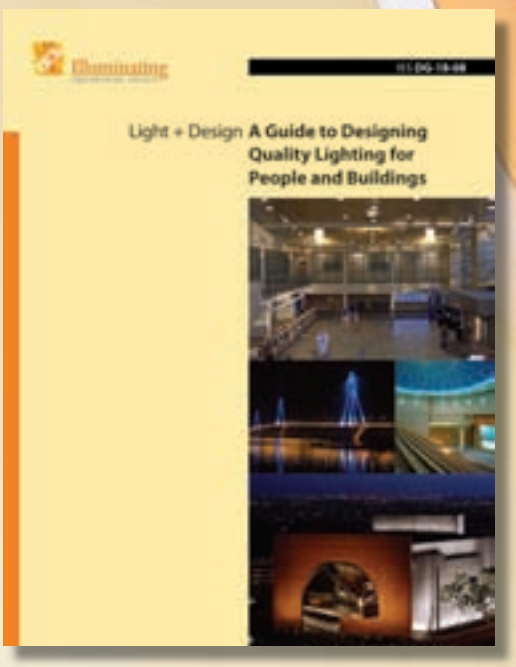
GOLD

A.L.P. Lighting Components Inc.
Altman Lighting, Inc.
Canlyte a Philips Group Brand
Con-Tech Lighting
Contrast Lighting ML, Inc.
Duke Energy
Edison Price Lighting, Inc.
ETC
EYE Lighting Int'l of NA
Focal Point LLC
Intense Lighting
IOTA Engineering LLC
Kenall Mfg Co.
The Kirlin Company
Kurt Versen Co.
Lighting Science Group Corp
Lighting Services, Inc
Louis Poulsen Lighting, Inc.
LSI Industries, Inc.
Lucifer Lighting Co.
National Grid
Neonlite Electronic + Lighting (HK) Ltd.
Philips Emergency Lighting
Philips Gardco
Prudential Lighting Corp
RAB Lighting, Inc.
San Diego Gas + Electric
Sternberg Lighting
Visa Lighting
Vista Professional Outdoor Lighting
Zumtobel Lighting, Inc.

SILVER

Associated Lighting Representatives. Inc.
Axis Lighting, Inc.
BAERO North America, Inc.
Bartco Lighting, Inc.
Barth Electric Co., Inc.
Beta Lighting
Birchwood Lighting, Inc.
BJB Electric Corporation
Black + McDonald
Border States Electric Supply
Bulbrite Industries, Inc.
Carmanah Technologies
Celestial Products
Con Edison of New York
CV Energy & Water Technologies
Day Lite Maintenance Co.
Delta Products Corp.
EAE Lighting Co.
Eastern Energy Services, Inc.
Echelon Corporation
Eclipse Lighting, Inc.
Eco Lumens
Eiko Ltd
Encapsulite International, Inc.
Energy Network Service
ENMAX
Enterprise Lighting Sales
EPCOR Technologies Inc
Fawoo Tech North America, LLC
Gammalux Systems
Illuminating Technologies, Inc.
Illumivision, Inc.
Kramer Lighting
Lam Lighting
LCA Holdings P/L
The L.C. Doane Company
Ledalite Architectural Products, Inc.
LED Roadway Lighting Ltd.
Lee Filters USA
Legion Lighting Co.
Leviton Mfg. Co., Inc.
Lighting Analysts, Inc.
Lighting Design Lab.
Litecontrol Corp
Litelab Corp
LiteTech
L. J. Illumination S. A. deCV.
Lumascape USA, Inc
Luma Stream, LLC.
Luxim Corporation
Manning Lighting
Medga Lighting Group, Inc.
Megalite USA, Inc.
Metalumen Manufacturing, Inc.
MP Lighting
Neidhardt, Inc.
Nora Lighting
OCEM Acquisition Corp. dba
Optical Research Associates
Paramount Industries, Inc.
Peter Basso Associates, Inc.
Reflex Lighting Group, Inc.
Richard McDonald & Associates, Ltd. - Calgary
Richard McDonald & Associates, Ltd. - Edmonton
Rosco Laboratories
Ruud Lighting Canada Corp.
Senso Lighting
Sentry Electric Corporation
Shakespeare Composites & Structures
Smedmarks Inc.
Southern California Edison
Strand Lighting, Inc.
StressCrete King Luminaire Co.
The Climate Group
The Lighting Quotient
Tivoli, LLC.
Toshiba International Corporation
Traxon Technologies
US Energy Sciences, Inc.
Utility Metals.
Velux America, Inc.
Westpac LED Lighting, Inc.
Xal, Inc.

As of December 2010



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FEBRUARY 2011

Member Mentions

Oty

Craig Oty has joined Cammisa & Wipf in San Francisco as the director of lighting design.

Ted Konnerth has been appointed executive director of the International Retained Search Associates.

Schuett

Rick Schuett has been appointed vice president of sales for Encelium Technologies.

Kenneth A. Douglas, Illumination Arts, LLC, was elected IALD treasurer for 2011.

David Ghatan, CM Kling & Associates, and **Andreas Schulz**, Licht Kunst Licht AG, were elected to the IALD Board of Directors for 2011.

Mary Ann Hay, Syska & Hennessy, was elected to the IALD Membership Committee for 2011.

LD+A Strikes Gold

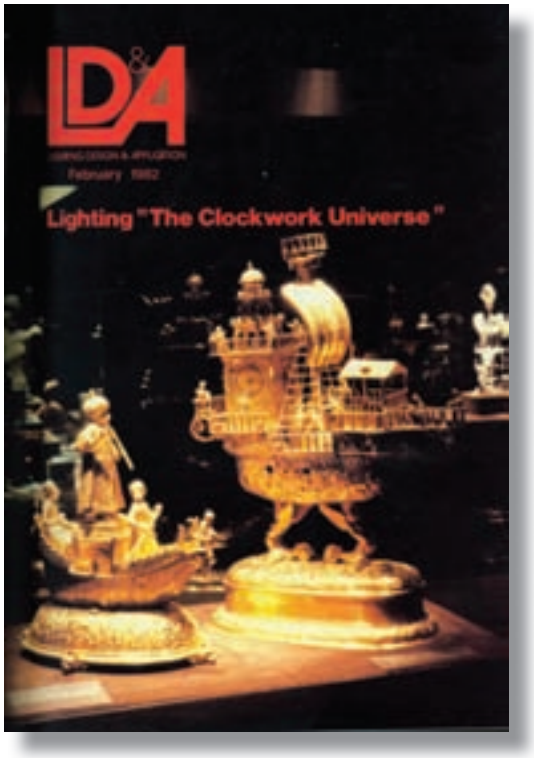
LD+A has been honored with two awards from the 2010 *Association TRENDS*' 2010 All-Media Contest, which recognizes outstanding communications materials from associations. The magazine received a Gold Award in the "Monthly Professional Society Magazine" category for the October 2010 issue and a Bronze Award for its 2011 Media Kit. *LD+A* was one of more than 470 entries in this year's association publications contest, and the magazine has been a recipient of *Association TRENDS* Awards in prior years: one in 2008, one in 2007 and three in 2006. However, 2010 marks its first Gold Award.

"*LD+A* has had the good fortune to receive six awards in the past five years from *Association TRENDS*, and we're especially proud to receive the Gold this year," says editor/associate publisher Paul Tarricone. "Through a small cadre of dedicated editorial contributors and IES staff, we've been able to write about the many issues facing the lighting community—conserving energy while maintaining quality lighting, sustainability, adopting new lighting technologies, to name a few—and put them in an attractive package that subscribers feel compelled to read. Much of the editorial inspiration actually comes from the broad range of interests of IES members. Their interests and the variety of challenges facing the lighting community have made the role of editor for *LD+A* a rewarding experience."

Both the magazine and the media kit will be honored at the 32nd Annual Salute to Association Excellence, to be held February 16, 2011, at the Capital Hilton in Washington, D.C.

OUT OF THE ARCHIVE

February 1982



Volume 12 No. 2

» ***Project.*** The cover story—"The Clockwork Universe"—detailed Edwin Robinson's lighting design of a traveling exhibit of 15th and 16th-century German clocks. The exhibit started in Munich, but when it reached the Smithsonian, the curator and exhibit designer changed the lighting approach, calling for a "highly focused" presentation. A dark brown, almost black, surround space was created in the basement's Special Exhibit gallery where all light could be completely controlled, and the exhibit was located far from the building entrance so visitors' eyes could completely adapt to low light levels. The project received a 1981 Lighting Design Section Award and Edwin F. Guth Memorial Award of Merit.

» ***Policy.*** Lighting R&D was looked upon favorably by U.S. legislators. The February issue reported on a recently enacted tax credit equal to 25 percent of a company's additional investment in R&D. The R&D could pertain to a new product or a significant improvement in an existing product.

» ***People.*** An IES Annual Conference in Toronto sounds vaguely familiar. The 1981 conference in that city (which also marked the Society's Diamond Jubilee Anniversary) saw the first "IES Membership Ideas Contest Award" given to Vic Mikulich of the Indiana Section. George Clark received the IES Medal, the Society's highest honor, while Rita Harrold became an IES Fellow.

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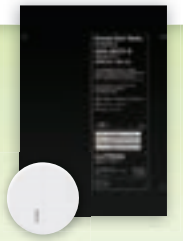

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- EcoSystem ballasts — dim fluorescent lights and save energy
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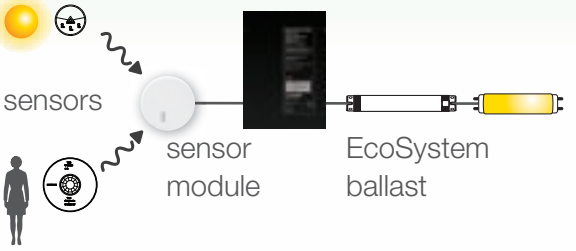
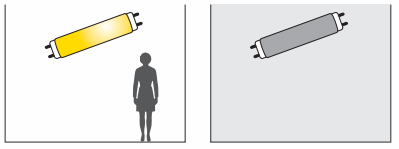


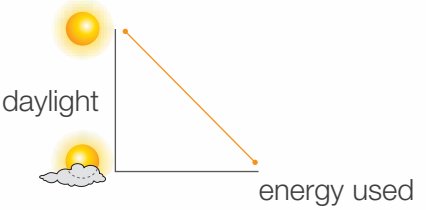
Occupancy Sensors

- Sensors automatically turn lights off when a room is vacant
- **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



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