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AL CELEBRATES
30 MOMENTS IN LIGHTING

NOV/DEC 2016

hw

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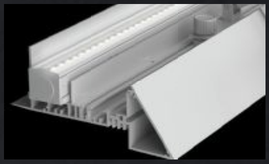

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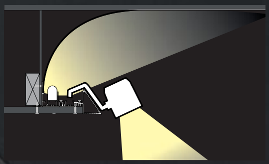
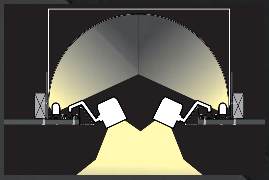
Our LED Light Units boast 4 points of articulation with locking joints. Anything from hidden accent lighting to exposed down-lighting is possible.



Cove and Perimeter Lighting

The EF Channel can be utilized to build out a cove or follow the perimeter of a room. Both linear indirect and direct LED lighting may be used together.



Accent Slots with Uplighting

Channel may be mounted in opposing positions to form linear ceiling slots. Linear LED may be used to illuminate a rounded slot interior while LED Light Units handle downlighting and accents.

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A·L 30 YEARS
ARCHITECTURAL LIGHTING

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DEPARTMENTS

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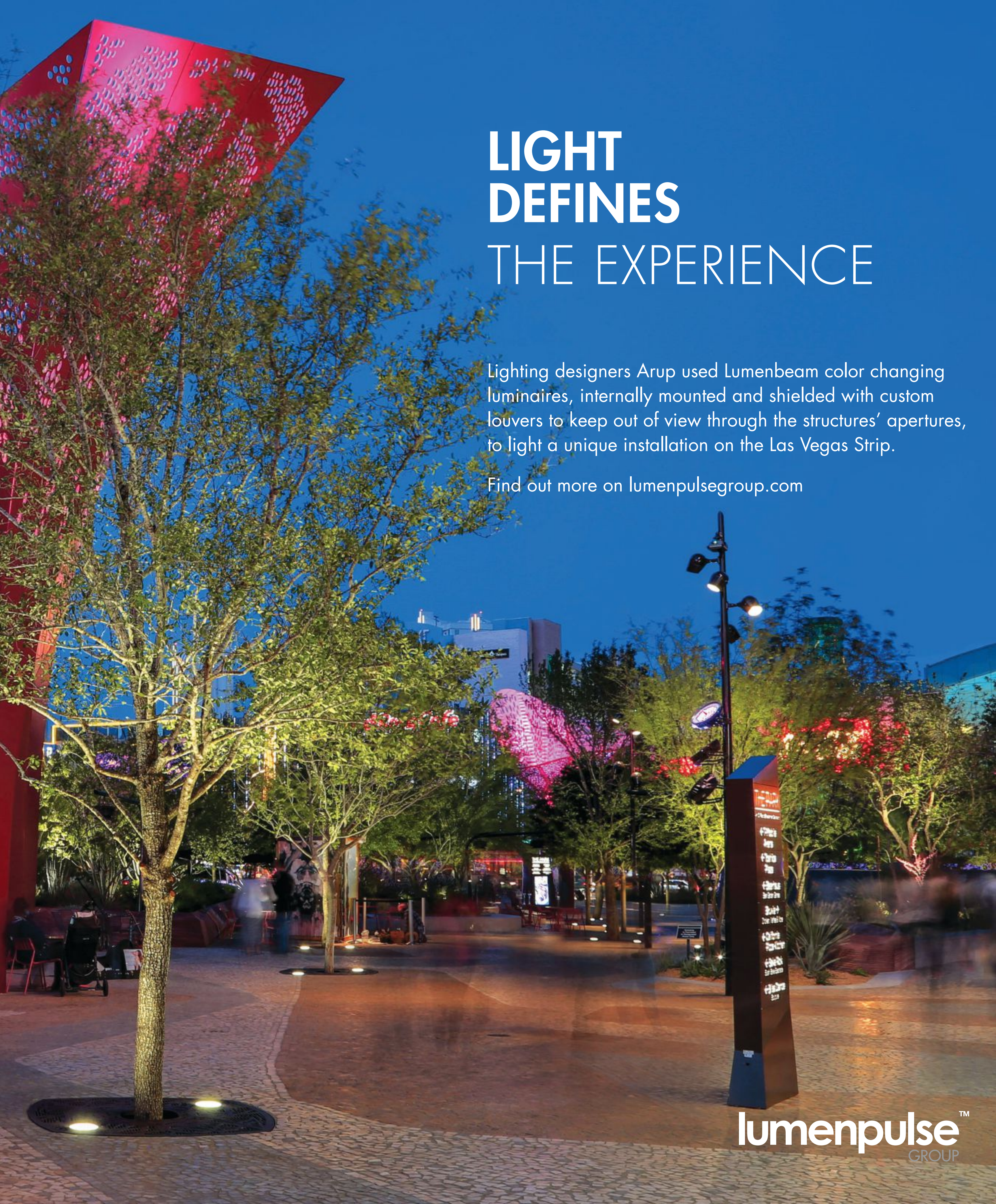
As always, check out our website for expanded article coverage, videos, and news. Also, subscribe to our email newsletter, AL Notes, and find a link to ARCHITECTURAL LIGHTING's digital edition.

On the Cover: On the occasion of our 30th anniversary, we explore the play of light, form, and shadow through a specially commissioned photograph by Ania Wawrzkowicz.

Project: The Park – Shade Structures
Photographer: Ryan Linton
Landscape Architect: !melk
Architect: !melk
Lighting designer: Arup
Client: Marnell Companies
Design Director: Marnell Architecture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30 MOMENTS IN LIGHTING

Thirty years doesn't seem like a long time, but when you consider all that has occurred in architectural lighting design since this publication was launched in November 1986, it's incredible how much has come to pass. This special 30th Anniversary issue presented an opportunity to think about lighting in a new way—in terms of the key moments that have contributed to shaping the contemporary practice of lighting design as we now know it.

On the following pages, you will find our attempt to look at all facets of the profession: design, manufacturing and business, technology and product developments, education, and research. This is not a list of a specific number of influential people, projects, or products. (That was in part how we approached the 25th Anniversary issue.) Instead, what you'll find on the ensuing pages is a different way of looking at lighting by connecting ideas and trends that have weaved themselves across the years and through each generation of lighting practitioners and manufacturers.

Determining which "30 moments" to pick and how to order them was a challenge. The organization of this issue stems from the many conversations and meetings I've had with all of you over the past 13 years. The information, knowledge, and experiences that you have shared with me personally, and with our publication, has been critical to ARCHITECTURAL LIGHTING's capacity to document the profession. ARCHITECTURAL LIGHTING and the lighting community have grown up in tandem.

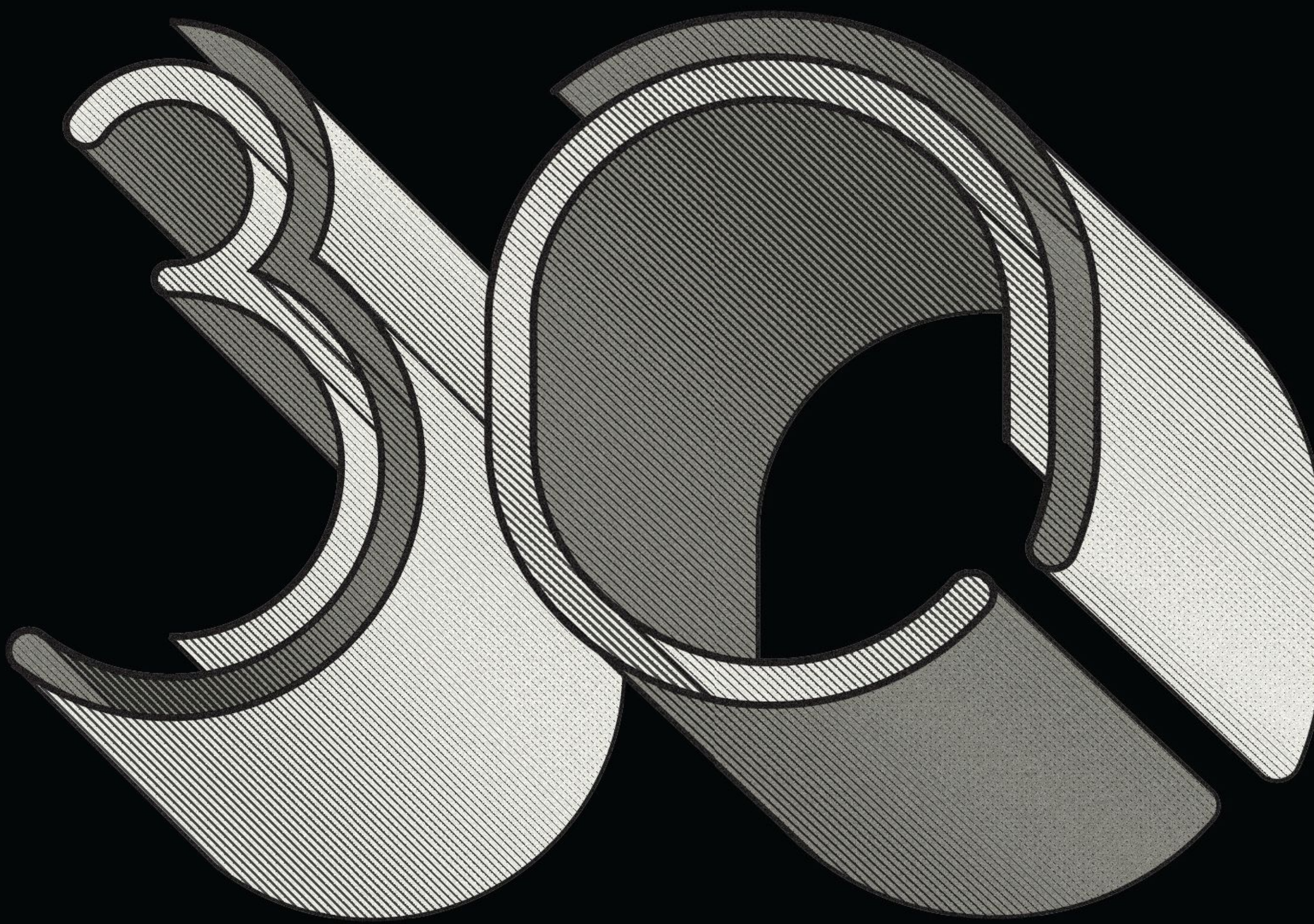
Most importantly, this issue's list is not meant to be an endpoint, but a starting point. As I set out on this project, I was reminded, as I was when we prepared our 25th Anniversary issue, of the complexity involved in attempting to map out lighting design's significant moments. There is no single entity in the lighting community that serves as a historical repository for the profession's many accomplishments. Now, having gone through the process of putting together two anniversary issues, I am more convinced than ever that one of the critical tasks for the members of the lighting community going forward is to document the industry's important ideas as well as the people, projects, and technologies that have made those ideas possible. It's time for the lighting community to build that repository and my challenge to all of you is this: Help ARCHITECTURAL LIGHTING continue this list. My goal is to expand it to include 100 moments, and I am eager to hear your thoughts on the "first draft" you'll find in this issue. What would you add? What would you omit? How would you change the order?

Over the course of the next year, as we celebrate this latest anniversary, we will be connecting with you on a series of special projects as we continue to expand the list and do a deep dive on each moment. It's not just critical for the practitioners of today but also for the next generation of lighting designers.

In my editor's comment for the 25th Anniversary issue, "Celebrating Light," I wrote: "I hoped you would spend some time with this issue and continue to provide your thoughts and opinions about who and what has influenced the profession, that it would be your homework in preparation for our 30th anniversary." My wish five years later is the same, I hope you will spend an equal amount of time with this anniversary issue, as you did with it predecessor. So, have you done your homework? I look forward to hearing from you. •

Elizabeth Donoff
Editor-in-Chief
edonoff@hanleywood.com

Stephen Voss



MOMENTS IN LIGHTING

RICHARD KELLY'S THREE TENETS OF LIGHTING DESIGN

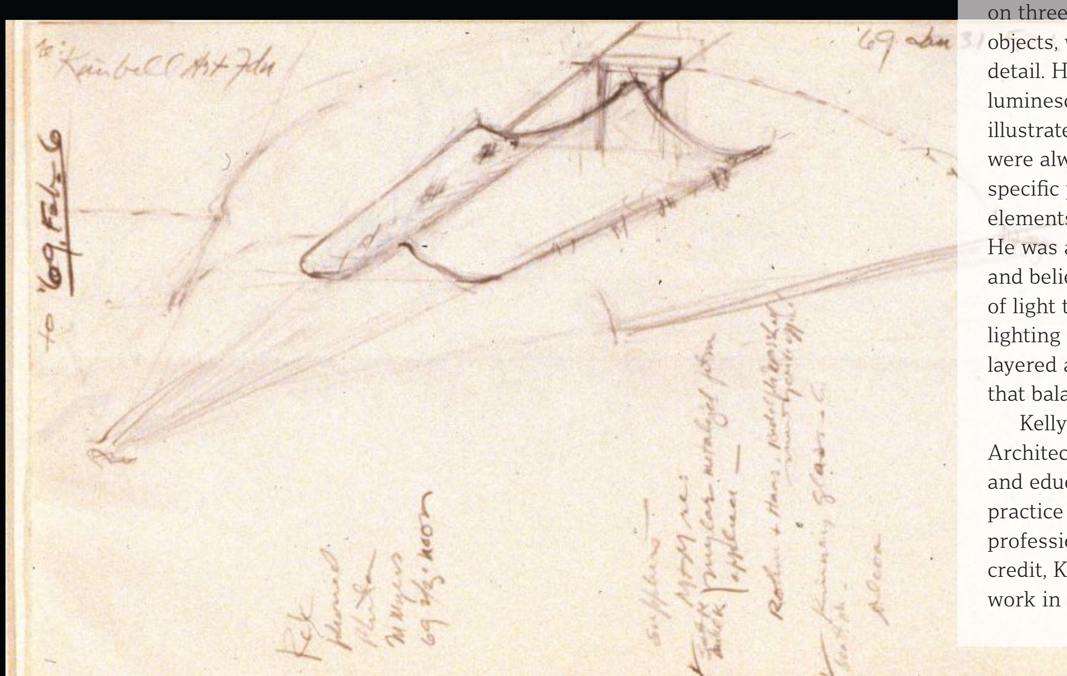
Focal Glow. Ambient Luminescence. Play of Brilliants. Those three tenets from Richard Kelly (1910–1977) remain the core theoretical statement on lighting design. No other practitioner has ever articulated lighting design concepts in such a way. He formally presented these ideas in a lecture titled "Lighting as an Integral Part of Architecture" to a joint meeting of the American Institute of Architects, the Society of Industrial Designers, and the Society of Illuminating Engineers on April 23, 1952, in Cleveland. The lecture was later published in the *College Art Journal* (Vol. 12, No. 1) in 1952.

Kelly understood light's ability to shape space and create a sense of visual awareness that could evoke a range of human emotions. Through his collaborations with architects Ludwig Mies van der Rohe, Louis Kahn, Philip Johnson, and Eero Saarinen, Kelly established a modern architectural lighting vocabulary that addressed the material palette of Modernism—glass, steel, and concrete—and the particular challenges these "modern" materials presented, most notably with reflection.

Kelly's approach to lighting design centered on three principal techniques—highlighting objects, washing surfaces, and creating sharp detail. He used the terms "focal glow," "ambient luminescence," and "play of brilliants" to illustrate these ideas. These three techniques were always present in his work, although a specific project's criteria might require one of the elements to be more pronounced than another. He was also an early proponent of daylighting and believed natural light to be the primary type of light that defines a space, and that electric lighting should serve a supplementary role. This layered approach to lighting created solutions that balanced both interior and exterior lighting.

Kelly trained at the Yale University School of Architecture. As an architect, lighting designer, and educator, he transformed the emerging practice of lighting design into a respected profession. With more than 300 projects to his credit, Kelly accomplished a prolific amount of work in his 40-year career. —Elizabeth Donoff

Right: Kimbell Art Museum, Fort Worth, Texas; constructed 1969–72; north galleries; Louis I. Kahn (1901–1974), architect



Bottom: Kelly's sketch for the skylight design at the Kimbell Art Museum

2

ESTABLISHMENT OF THE IALD

Lighting design is a relatively young profession. Prior to 1969, there was no formal organization that represented the interests of lighting designers. The profession's early practitioners—people such as Lesley Wheel, David Mintz, Martin Garon, Howard Brandston, Ray Grenald, Jules Horton, Jim Nuckolls, Abe Feder, and Donald Gersztoff, to name a few—met regularly to discuss issues that were impacting them as individual designers trying to run a business and make a living. As Mintz recalls, the International Association of Lighting Designers (IALD) was born out of a discussion he had with Garon about the possibility of forming a group so that people could get health insurance at a reasonable cost. There was also the issue of establishing a standard contract that lighting designers could use for clients, and even maybe some type of license that lighting designers could use as a professional credential.

At the start of 1969, the group, now numbering 15, held its first formal meeting, a dinner at Luchows restaurant on 14th Street in New York City. A five-person committee was established to address the following items: What is the profession of lighting design? How does one define a professional lighting designer? And what might be the goals of an association of professional lighting designers?

In 1971, the group officially incorporated. Today, the IALD has more than 1,200 members around the world and a lineup of activities that includes annual conferences, award programs, education outreach, and liaising with the lighting manufacturing community. A lot has been accomplished since those first meetings, and there is still much more to be done, but the IALD has never wavered from its core mission: to represent the interests of the independent lighting designer. —E.D.

Berenice Abbott (1898-1991)/Museum of the City of New York. 49.282.96

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MASTER OF FINE ARTS IN LIGHTING DESIGN

ESTABLISHMENT OF THE LIGHTING PROGRAM AT PARSONS

In autumn 2005, I walked through the doors of the Parsons School of Design as the new director of the Master of Fine Arts (MFA) Lighting Design program. I arrived with great enthusiasm for my commitment to full-time academic work, as well as significant naïveté about what lay ahead and, more importantly, what herculean work had already been accomplished by my predecessors who began this esteemed program at a time when the lighting design profession was still establishing its roots.

Lighting design education started at Parsons in the 1970s under the direction of the late James Nuckolls, a pioneer in lighting design education and practice. With no pre-existing academic models for lighting education, initial study at Parsons began through a framework of isolated design problems, or "projects." These lighting projects evolved into formal classes in the mid-1970s and were offered in the evening through the Continuing Education Department.

In 1984, because of Nuckolls' persistence, the classes that he had initiated became the basis for the first MFA in Lighting Design degree and the official establishment of the Lighting Design program. The program experienced a number of transformations in its first few years, not the least of which was the untimely death of Nuckolls in 1987. Despite the significant loss of the program's founding visionary, lighting design education at Parsons continued its evolution with him in mind.

In 1996, even though the program still consisted primarily of evening classes, the Lighting Design program was moved from the purview of the Continuing Education Department to the Department of Architecture. In 1998, due to declining enrollment, the two-year MFA curriculum was replaced with a one-year (three-semester) Master of Arts (MA) curriculum. However, this change was short-lived due to compromises with intellectual depth and, in 2004, returned to the two-year, four-semester MFA format. Significant to this transition was the development of an entirely new program and, most notably, a migration toward daytime classes to align with other departmental programs and foster improved interaction between students and faculty. In the interest of advancing these cross-disciplinary relationships throughout Parsons, the university initiated a substantial change to the administrative structure in 2008 when it disbanded its many siloed departments and consolidated them into five schools that aligned disciplines and areas of academic interest. This resulted in the merger of Architecture, Interior Design, Lighting Design, and Product Design into the School of Constructed Environments—an equitable alliance of disciplines that share interests in the design of the built world at all scales. Furthermore, this school structure positions the Lighting Design program as an equal to its peer disciplines.

Today, the MFA Lighting Design program enrolls an international roster of approximately 70 students across three master-level degree tracks. As I consider the early days of lighting education at Parsons and compare the work that James Nuckolls initiated to our teaching today, its easy to recognize the many changes that have taken place. These differences reflect the technological evolutions in contemporary practice and current trends toward complex, integrated design thinking, most of which are positive transitions that further validate the work that we do and the need for independent lighting practitioners. Despite these differences, there are core elements from the initial Parsons lighting program that remain fundamental to our teaching today. This includes a progressive vision toward professional preparedness—one that aspires to push forward the intellectual future of the profession in addition to teaching skills that are applicable today—and the recognition that lighting design is an established professional practice that has a substantial impact on the daily lives of people and, therefore, a responsibility to conduct our work in a qualitative, balanced manner with the well-being of the inhabitant in mind. I imagine Nuckolls would be proud of the advancements made at Parsons, and the lighting design profession more broadly, fully recognizing that there is always more work to do.

—Derek Porter, IALD, MIES, principal, Derek Porter Studio, New York and associate professor, Parsons School of Design, and director, MFA Lighting Program (2005–14)

Courtesy Parsons School of Design

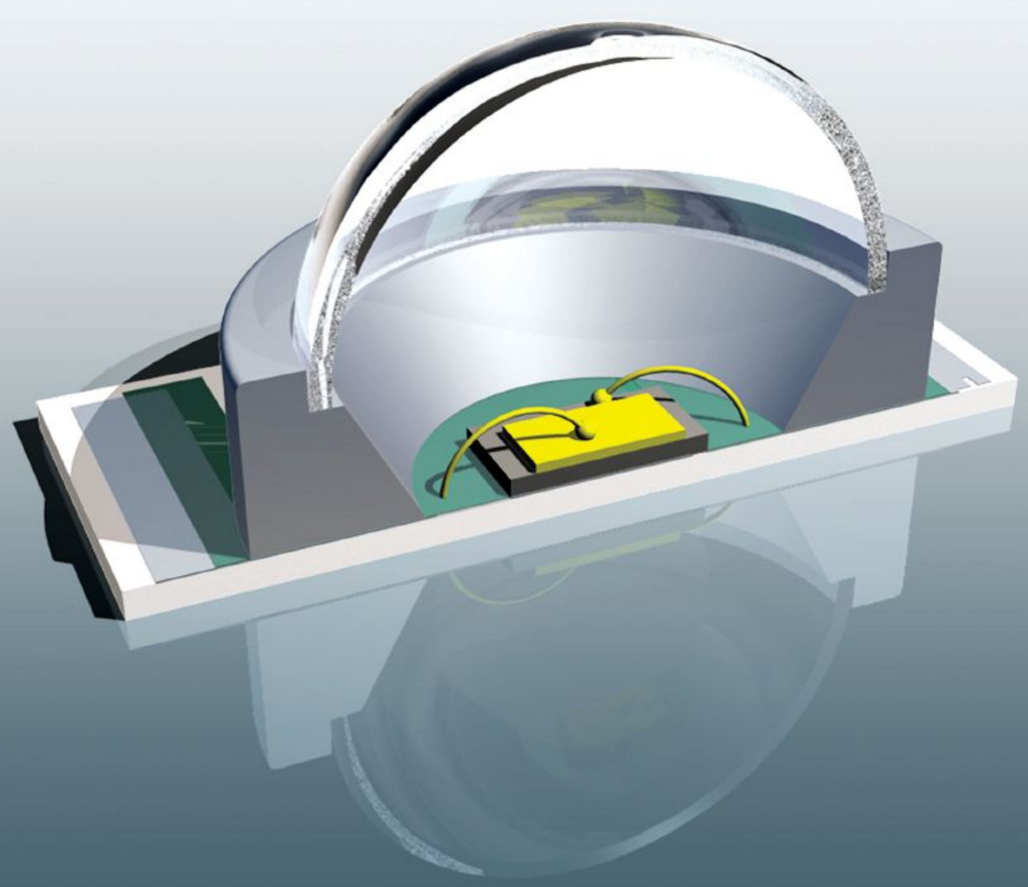
INTRODUCTION OF LEDs INTO THE ARCHITECTURAL LIGHTING MARKET

The introduction of LEDs into the architectural lighting design market has been a paradigm shift unlike any other the lighting industry has seen. And while it has been dynamic in terms of the possibilities that it affords designers and manufacturers for new design and technology, it certainly has been a disruptive force, and has caused the lighting community to rethink many of its assumptions about lighting.

The greatest challenge has been the rate at which solid-state lighting technology changes. LEDs have introduced an added level of complexity for designers and manufacturers who are trying to keep up to date with both new products and the new metrics developed, such as LM-79 and LM-80, that are now needed to monitor and measure the new source's photometric performance.

Another challenge has been in form factor. The point source allows for slimmer fixture profiles, but early generations of luminaires didn't use that feature and instead just put LEDs in an existing housing. LED luminaire design has come a long way in the past decade, and the current generation of products now reflect a high level of color rendering and control capabilities.

And then there's the financial impact. A 2011 McKinsey report, "Lighting the Way: Perspectives on the Global Lighting Market," estimates that "the LED lighting market will amount to $91 billion by 2020—close to 60 percent of the overall lighting market." —E.D.



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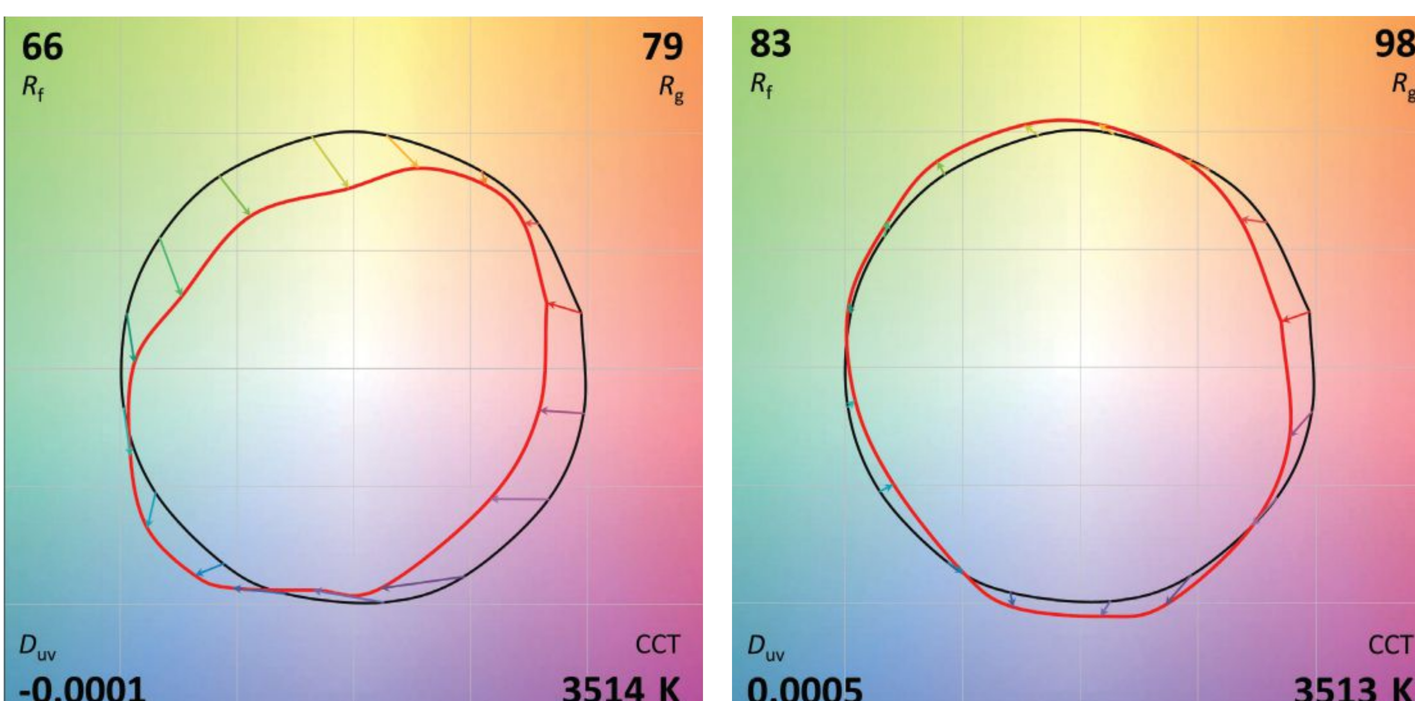
TM-30 IES METHOD FOR EVALUATING LIGHT-SOURCE COLOR RENDITION

The much maligned Color Rendering Index (CRI) has proved an inadequate tool for professional designers fixed on a discerning consideration of light-source color rendering capabilities. Although useful, color fidelity as defined in the CRI system is, at its best, only a part of what is needed to adequately assess color rendering. At its worse, it is a misleading indicator of color rendering. The Illuminating Engineering Society's (IES) TM-30 color fidelity metric (Rf) is a significant improvement over CRI. Its use of 99 color samples, a more-uniform color space, and calculations more fitting and expressive of real-world conditions are confident steps forward. However, taken singularly, this advance alone does not provide the comprehensive insight needed to fully consider color rendering. TM-30's addition of a color gamut metric (Rg), however, delivers an accounting of a light source's saturation. When used with the procedure's color distortion icon (two, shown)—a saturation "fingerprint" of sorts—an understanding of how a light source will reveal color is heightened.

With the emergence of solid-state lighting, we now have the capability to manipulate a source's spectral content in a manner that was not previously practical. With the arrival of multicolor emitter arrays and other blended LED source options, white light and its color rendering abilities can be structured to a specific project need. Manufacturers can use TM-30 as a tool to develop new sources, further increasing options for designers and end users.

There is still much to learn about the potential impacts, both purposeful and unintended, of spectral shaping. Diligence must be exercised so as not to alter the spectrum in a way that expresses an intellectual dishonesty in revealing color reality. Just how that boundary is defined is open to spirited debate. —Randy Burkett, FIALD, FIES, president and design principal, Randy Burkett Lighting Design, St. Louis



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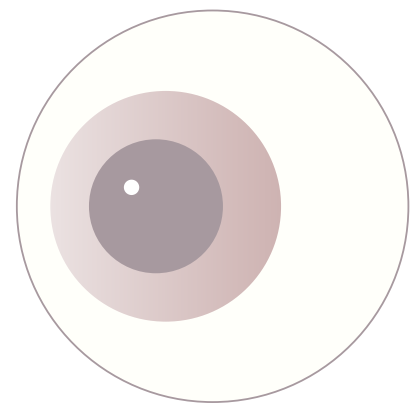
DISCOVERY OF THE PHOTOSENSITIVE RETINAL GANGLION CELL



In *The Art of Scientific Investigation,* (W.W. Norton, 1950), W.I.B. Beveridge writes that the reception of an original contribution to knowledge can be divided into three phases. First, it is ridiculed as untrue, impossible, or useless. Second, people then acknowledge that there may be something to the idea, but declare it would never be of any practical use. Third and finally, when the discovery has received general recognition, people say that the idea is not original and had been anticipated by others.

The reception of the newly discovered intrinsically photosensitive retinal ganglion cell (ipRGC) in the mammalian retina was no different. What is now considered general knowledge was ridiculed in the early 1990s. Russell Foster, a scientist at Imperial College in Great Britain, recounts how he was practically thrown out of a meeting room when he presented his results showing that animals with no functional rods and cones (the two types of photoreceptors in the human retina) were still able to shift the timing of their wheel-running activity in response to a light pulse. Vision scientists refused to accept that they had, for 100 years, missed a class of photoreceptor in the eye. In 2002, Brown University scientist David Berson found the last piece of the puzzle: an entirely new class of photoreceptor, the ipRGC.

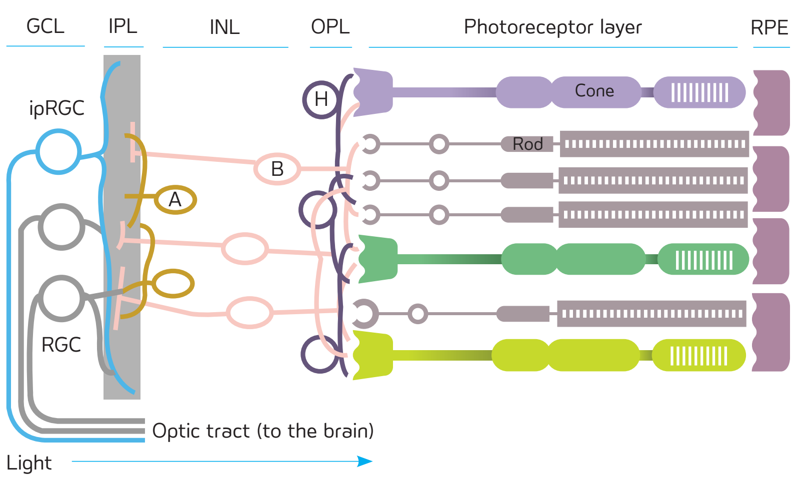
Studies were performed to better understand how the ipRGC responded to light and how it interacted with rods and cones. It is now well established that the ipRGC is sensitive to short-wavelength (blue) light and, although it is the main conduit of light signals from the retina to the brain, that it receives processed input from rods and cones. Simply put, the science surrounding the ipRGC led to a paradigm shift in how lighting is measured, manufactured, specified, and applied.

Based on this new knowledge, we at the Lighting Research Center (LRC) proposed a model of human circadian phototransduction (the means by which the retina converts light signals into neural signals for the circadian system) to quantify circadian effective light. The model is constrained by the neuroanatomy and neurophysiology of the human retina; the ipRGC is central to the model but not synonymous with the model. A new way of quantifying light's impact on the circadian system called circadian stimulus (CS) allows one to predict how different spectral power distributions and light levels will suppress the hormone melatonin at night. We also developed the Daysimeter, a personal sensor that is calibrated to measure CS in the field. We have been working with the National Institutes of Health, the General Services Administration, the National Institute of Occupational Safety and Health, among others, to quantify the impact of CS on sleep quality and quantity, performance, fatigue, mood, and behavior in various populations, including older adults with Alzheimer's disease, office workers, and cancer patients. We have also formed a Light and Health Alliance with a group of manufacturers to inform them of this new research. Finally, we are developing lighting patterns that will serve as tools for designers to learn how to implement 24-hour lighting schemes to promote circadian entrainment in the built environment.

Researchers, even the vision scientists, now believe ipRGCs are real. However, the application of this knowledge into lighting practice is still in Beveridge's second phase. Lighting designers, manufacturers, and users embrace the idea that lighting isn't just for vision, but lighting professionals are still struggling with how to implement the knowledge. For example, static, warm-color lighting systems installed in a ceiling are not necessarily going to be the optimal

Josh McKenna

Detail of Retina in the Human Eye



solution for circadian entrainment in schools and offices. Personalized, dynamic lighting delivered at the occupants' desks would be more effective although portable, dynamic plug-in products are not yet widely available. When delivering light, designers should measure vertical light levels instead of horizontal footcandles on the workplane. Designers also need to specify not only when to deliver light, but when to deliver darkness. Undoubtedly, the ipRGC discovery resulted in a paradigm shift in science, but the application of this knowledge to lighting will only be fully embraced when that discovery is thought to have been obvious all along.

—Mariana G. Figueiro, Light and Health program director, Lighting Research Center, and professor, Rensselaer Polytechnic Institute, Troy, N.Y.

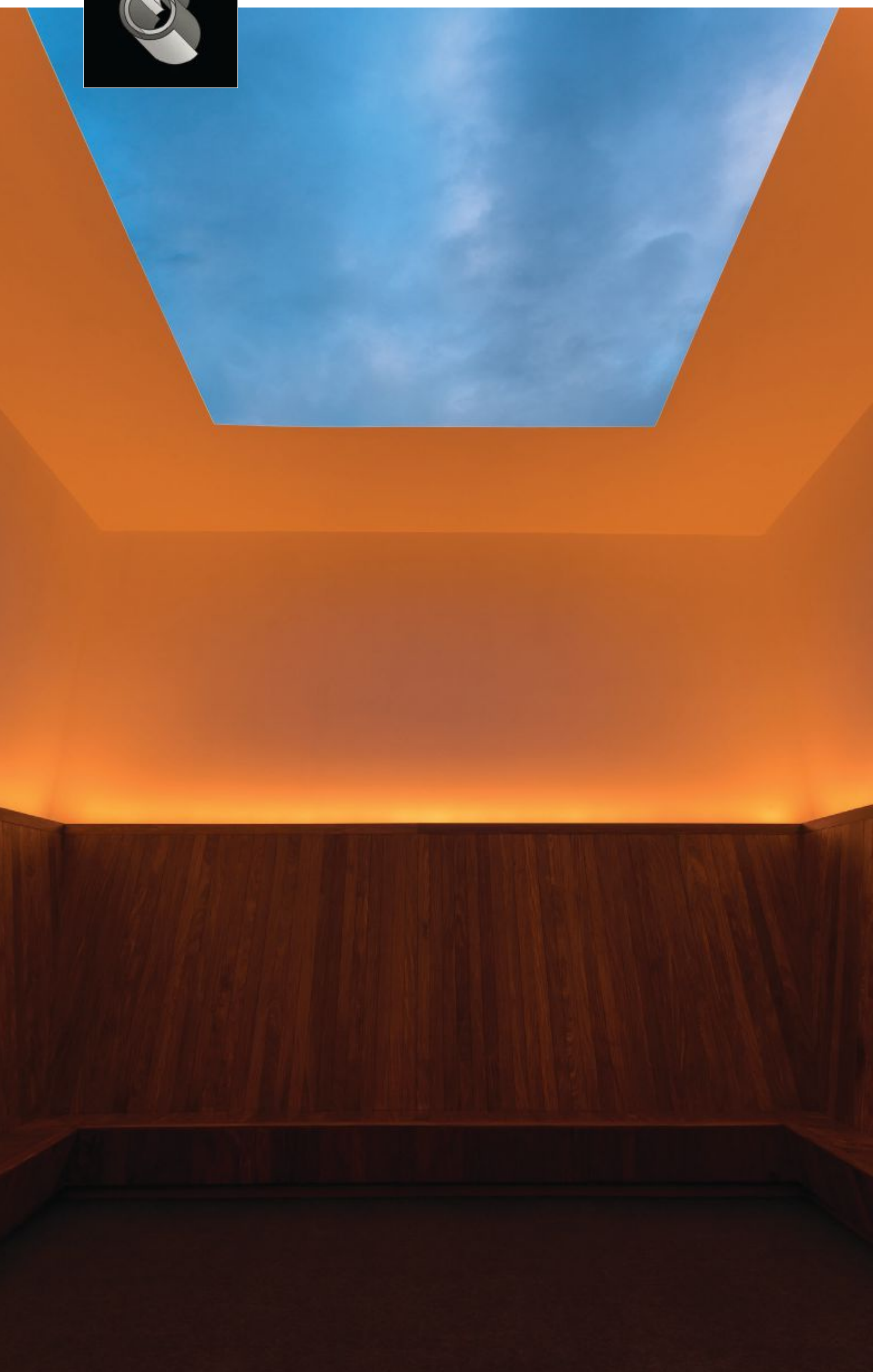
DAYLIGHTING

The Pantheon in Rome. The Sir John Soane House Museum. The Kimbell Art Museum in Fort Worth, Texas. These three projects represent seminal examples of daylighting that serve as benchmarks for both architecture and lighting.

The Pantheon, originally built as a Roman temple, now a church, was completed under the emperor Hadrian in approximately 126 A.D. The circular building features a Corinthian column portico and a rectangular vestibule that leads to the rotunda. This space, with an oculus opening to the sky in the concrete dome (shown), is one of the purist expressions of natural light entering a building and illuminating a space. Measuring 43.3 meters (142 feet) tall and wide, the Pantheon's structure remains the largest unreinforced concrete dome in the world.

Sir John Soane (1753–1837) was enamored with light, considering it an essential building material. He developed a number of innovative daylighting systems using skylights, mirrors, and concealed lamps in his London home at 12-14 Lincoln's Inn Fields (now the Soane Museum) that served as his laboratory. The breakfast room, for instance, features an octagonal skylight with colored-glass panels and two side skylights. Strategically placed mirrors reflect the colored light. Soane's experimentation goes well beyond just bringing natural light into a room but how, through its manipulation, light can craft space and create atmosphere.

A modern tour de force of the unification of architecture and illumination was realized in the Kimbell Art Museum in 1972. A collaboration between architect Louis Kahn and lighting designer Richard Kelly, the skylight design features a curved reflecting screen made of perforated anodized aluminum that distributes a "silvery" light evenly across the cycloid curve of the ceiling and only allows indirect sunlight to come in contact with the artworks. (Downlights provide supplementary illumination when needed.) Kelly also worked with engineer Isaac Goodbar from lighting manufacturer Edison Price, who devised a computer program to determine the reflector's curve, one of the first uses of computer technology in either architecture or lighting design. —E.D.



The Museum of Modern Art, New York. Photograph: Pablo Enrique

THE INFLUENCE OF JAMES TURRELL

Long before the 2013 trio of blockbuster exhibitions in New York, Houston, and Los Angeles, many lighting designers had experienced the work of James Turrell, a key figure in the "Light and Space" art movement of the 1960s, for the first time in museums. His early installations were undeniable demonstrations of the potential of light to create powerful and new perceptual experiences and they paved the way for more ambitious architectural lighting design solutions throughout the built environment.

By framing a view of the sky, viewers of Turrell's Skyspaces, such as *Meeting* (1980-86/2016) at MoMA/PS1 in New York (shown), perceive shifting environmental conditions with no spatial depth. Eliminating cues of distance and scale, Turrell presents a familiar composition of passing clouds against the sky as a flattened picture, causing us to question our assumptions about the most common of lighting conditions: daylight. At dusk, a linear warm-white light source concealed behind the high bench back softly illuminates the frame of the ceiling aperture. By illuminating the Skyspace interior with a complementary color, the viewer's perception of the shifting color of the sky is intensified as they watch the sky transform from a pale blue to a deep indigo and finally to an inky black.

Alternatively, Turrell's wall aperture pieces, such as the Space Division Constructions he began in 1976, use light to create a disorienting spatial experience: the space beyond a rectangular aperture in the end-wall of an enclosed gallery appears infinite. Turrell creates the effect by placing a series of diffuse sources on the back surface of a knife-edge aperture, detailed so the sources remain hidden. Once the viewer's eyes adapt to the dark environment, an illusion of infinite depth becomes visible.

Many artists have influenced lighting designers, but Turrell introduced the practice to a new way of seeing. His immersive Skyspaces and wall aperture installations created a framework for optical experiences that forever changed the way we view and experience the medium of light.

—Glenn Shrum, IALD, MIES, founder and principal, Flux Studio, Baltimore, and director and assistant professor of Lighting Design, Parsons School of Design, New York

ENERGY INDEPENDENCE AND SECURITY ACT OF 2007

On Dec. 19, 2007, President George W. Bush signed into law the Energy Independence and Security Act (EISA) of 2007 (HR6). The bill implemented some of the most sweeping energy initiatives since the oil embargoes of the 1970s, including the setting of higher fuel-economy standards for cars and light trucks and new efficiency requirements for households and government buildings.

Although the law's principal focus was not directed at lighting, two of its provisions did have a major impact. First, the law moved to introduce energy-efficient lighting measures by 30 percent, leading to a phaseout of traditional general-service incandescent and halogen light sources from 2012 to 2014. And, like all rules, there were exceptions: A long list of specialty lamps such as traffic signals and infrared were excluded. The second provision that impacted lighting, which halted the production of 150W to 500W probe-start metal halide magnetic ballasted fixtures, went into effect at the beginning of 2009.

EISA's promotion of research and innovation was also significant. It established the Bright Tomorrow Lighting Prize, also known as the L Prize. The competition, launched in 2008 by the federal government, encouraged the implementation of high-performance, energy-efficient lighting with a specific focus on solid-state lighting. The competition had three categories: 60W incandescent replacement lamps, PAR38 halogen replacement lamps, and the Twenty-First Century Lamp Prize, which called for the development of an LED replacement lamp that attained 150 lumens per watt or better. In the end, the U.S. Department of Energy (DOE) only moved forward with the competition for the 60W replacement.

On Aug. 3, 2011, the DOE announced that Philips Lighting North America had won the L Prize. The $10 million purse included a federal contract purchasing agreement. Philips introduced the prize-winning lamp in early 2012 to market. Since then, a number of lighting companies have introduced A19 LED replacement lamps, pushing the price point below the critical $10 threshold. —E.D.

Legend

1 Philips Soft White 100W incandescent
2 Lighting Science LED Light Bulb
3 Philips L Prize lamp
4 GE Energy Smart 9W A19 LED replacement lamp
5 Sharp LED Bulb
6 Samsung 13.5W LED A19
7 Cree 9.5W LED 60W replacement lamp

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THE LUMINOUS CEILING

Today, luminous surfaces are an often-seen design move. But in the 1940s and 1950s, particularly in the United States, the concept and implementation was rarely seen. But all of that changed with the luminous ceiling at the Seagram Building in New York.

The ceiling was a collaboration between the Seagram's design team—architects Ludwig Mies van der Rohe and Philip Johnson, and lighting designer Richard Kelly—with lighting manufacturer Lightolier and that company's lead designer Noel Florence. In *The First 100 Years: A History of Lightolier* (Lightolier, 2004), Daniel Blitzer recounts his father, William Blitzer, and Florence explaining that the desired panel size was larger than anyone knew how to produce at the time. Florence had developed a vacuum-formed diffuser in a frame to show to the Seagram team. They liked it, awarded Lightolier the job and requested a larger on-site mock-up. But that demonstration revealed surface buckles. Not wanting to lose the job, Florence revisited his design and figured out a way to stretch rigid vinyl by heating it to eliminate the irregularities.

The luminous ceiling became one of the signature features of the building, and cemented Lightolier's place in architectural circles as a leading manufacturer of architectural luminaires. Its also symbolic of the designer/manufacturer collaboration, which has been so critical to the practice of lighting design. —E.D.

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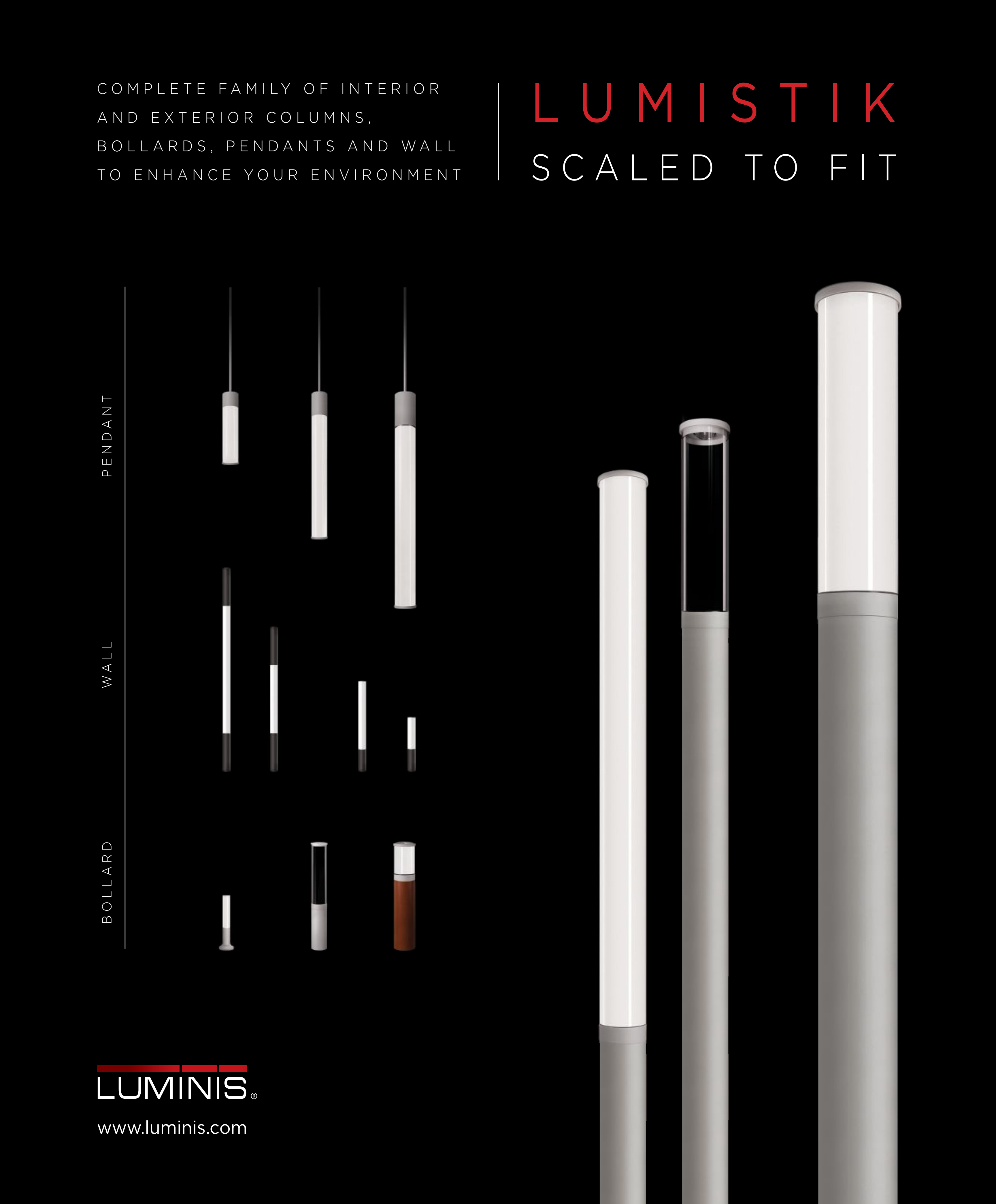
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THE SOLID-STATE ELECTRONIC DIMMER

Lighting without lighting controls would be like trying to drive a car without a steering wheel. It's one of the most important areas of illumination technology, and its development continues to evolve to meet the challenges of today's solid-state lighting advances. But no matter the control device or suite of sensors and digital readouts, lighting controls would not be what they are today without the contribution of Joel Spira (1927–2015), chairman and founder of Lutron Electronics and his invention of the sold-state electronic dimmer.

Spira's idea first came to him while serving in the Navy during World War II. Tasked with designing a trigger for an armament, he tried assembling a switch relay which shattered. A colleague showed him a silicon-controlled rectifier (SCR), an electronic device no bigger than a pea. Seeing how the SCR could harness a lot of power, he wondered if it could be used to control an incandescent lamp.

Spira went on to create the first electronic solid-state dimmer in 1959 and established Lutron Electronics in 1961 to sell his invention. The Capri dimmer (above left)—with its tunable dial—was the first dimmer Lutron brought to market in the early 1960s. Controlling a light via dimming opened up the opportunity for tremendous energy savings.

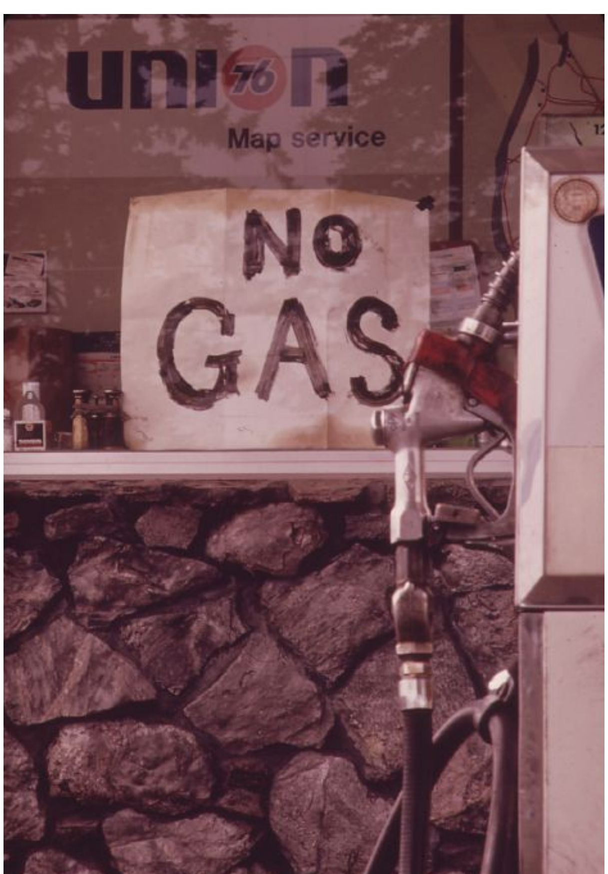
But it was the Nova (above right), the first linear slide dimmer introduced in 1971, that was perhaps even more revolutionary. The device's slide interface was novel and Nova could accommodate power inputs of up to 2,000W. The product was so well received that Spira expanded the line so that it could be used for all light sources. Amazingly, looking at a Nova slide dimmer today, the interface seems so contemporary that you'd be hard pressed to know if what you're looking at is an original or something released this year. In 2010, Lutron donated several items from its 50-plus-year history to the Smithsonian's National Museum of American History in Washington, D.C., where it has become part of the museum's Electricity Collection—a testament to Spira's contribution to not just lighting but lighting history, invention, and entrepreneurship. —E.D.

Courtesy Lutron

THE ENERGY CRISES OF THE 1970S

The energy crises of the 1970s changed the way we think about natural resources, inspired environmental advocacy, and laid the ground work for government oversight with the establishment of the Department of Energy in August 1977.

But seeds of environmental awareness had already taken root. Rachel Carson's seminal 1962 book *Silent Spring* raised public awareness about the environment, and the first U.S. Earth Day was held on April 22, 1970. Twenty million Americans rallied from coast-to-coast demonstrating for a clean environment. Earth Day 1970 also pushed the creation of the United States Environmental Protection Agency (EPA).



The same year, the federal Clean Air Act of 1963 was amended, giving the EPA the authority to set air quality standards and control emissions.

But it was the Energy Crisis of 1973–74 that served as the real wake-up call for most Americans. On Oct. 17, 1973, the Organization of Petroleum Exporting Countries (OPEC) instituted an embargo that reduced the amount of oil produced and sold to the United States. Up to that point, Americans had been used to abundant access to cheap resources such as gasoline—even though U.S. domestic oil production had been in decline, imports had increased to maintain the low prices. The embargo, however, created gas shortages, led to rationing and long lines at gas stations, and made gasoline more expensive. Although the embargo was finally lifted in March 1974, oil prices remained high. The crisis also resulted in the establishment of a national speed limit as well as the Energy Policy and Conservation Act of 1975 and the creation of the Department of Energy by the Carter administration. The overthrow of the Shah of Iran by the Iranian Revolution led to a second oil crisis in 1979. Instability in the Middle East led to decreased oil output and world supply.

The energy crises also impacted the way spaces were designed and lit. Prior to the 1973 oil embargo, commercial interiors were typically illuminated with bright ceilings and fluorescent lamps. But as electricity prices increased, facility managers removed lamps, disrupting lighting layouts and damaging ballasts and fixtures. The result was unevenly lit spaces. Designers countered by utilizing more tasklighting and returning to daylighting strategies.

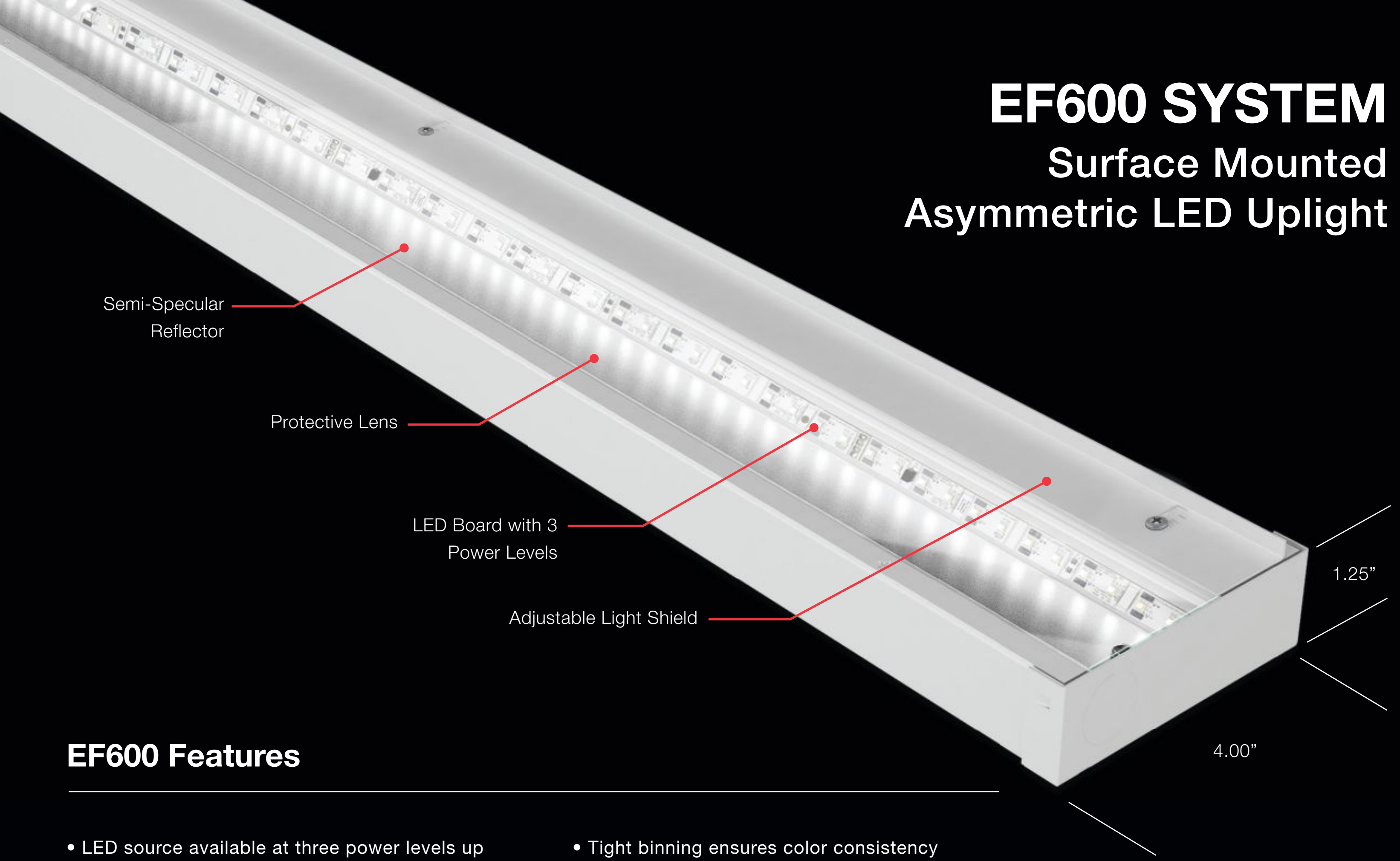
Manufacturers introduced products that were more energy efficient with names that spoke to a more energy-conscious population. General Electric introduced the "Watt-Miser," Philips introduced the "Econowatt," and Sylvania debuted the "SuperSaver." These energy-saving lamps reduced the wattage of a 4-foot linear fluorescent from 40W to 34W.

Electric and utility companies also introduced incentive programs to encourage customers to install and use more efficient equipment and lamps as a move toward reducing overall electricity consumption. —E.D.

David Falconer

EF600 SYSTEM

Surface Mounted Asymmetric LED Uplight



EF600 Features

- LED source available at three power levels up to **1200 Lumens per foot**
- Backlight Shield for variable ajustment of distribution
- Advanced Optics with asymmetric distribution
- Dense Pitch for uniform output
- Integral semi-specular reflector
- Captive lens for horizontal or vertical mounting
- Tight binning ensures color consistency within 2 MacAdam Ellipses
- Field-Replaceable integral LED driver
- Integral wiring compartment and thermal protection
- Quick disconnect through wiring
- Hinged joiners for following contoured coves
- Long continuous runs with a single feed

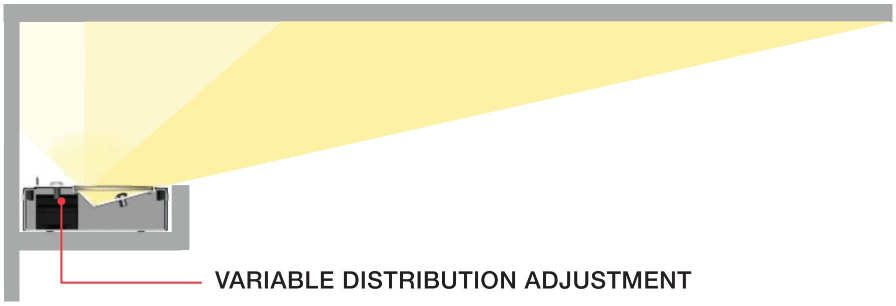
Distribution Per 4’ Fixture

Total Output: 3328 lm

Efficacy: 100 lm/w

CRI >80

The EF600 from LF Illumination, is a complete linear cove / surface mounted lighting system. Available in fixed lengths from 2’ to 8’, the fixtures may also be ordered in custom lengths. The small 4” wide x 1.25” high footprint ensures that the EF600 will fit into the tightest of mounting spaces. A unique feature to the EF600 is the adjustable light shield. This provides variable distribution for different applications. The shield is easily adjusted at the top of the fixture. Position markers are present to assure consistent placement of the shield in longer runs.



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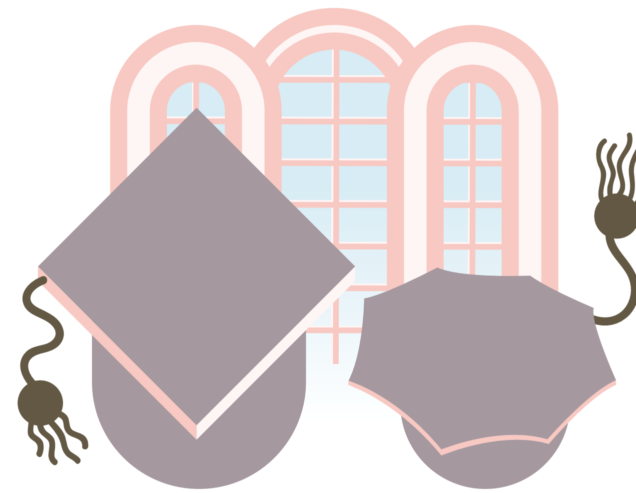
13 FLUORESCENT LIGHTING

Fluorescent technology helped lighting to enter the modern age. The first patent for a fluorescent lamp was filed on April 22, 1936, by George E. Inman of General Electric (GE) Lighting. Inman and co-inventor Richard Thayer headed a research group at GE's Nela Park laboratories outside of Cleveland. A second GE research group, under the direction of Philip J. Pritchard, was established to develop the equipment needed to manufacturer these new lamps; other groups in the company were called on to develop the appropriate ballasts and circuit design.

At the same time, other U.S. manufacturers such as Westinghouse and Sylvania had also started to research fluorescent technologies, as had European lighting manufacturers such as Dutch company Philips. In 1939, the fluorescent lamp was publicly displayed by GE at the New York World's Fair (shown) and by Westinghouse at the Golden Gate Exposition in San Francisco. Linear fluorescent lighting technology evolved from T12s and T8s to today's T5s and T5HOs. LED replacements for fluorescent have yet to prove themselves, and for a number of lighting applications, fluorescent remains a viable option based on performance, lamp-life, and cost. —E.D.

Wurts Bros. (New York, N.Y.)/Museum of the City of New York. X2010.7.1.14279

THE LIGHTING RESEARCH CENTER



Josh McKenna

When the Lighting Research Center (LRC) was founded in 1988, independent lighting research was largely nonexistent and lighting education was conducted by a disparate handful of enthusiastic professors teaching undergraduates. As one lighting professor retired, that brand of education retired as well because there was no one else at that university interested in lighting. Like education, lighting research was usually led by single enthusiasts working at a university or at a national research laboratory, like I did at the National Research Council (NRC) of Canada. There were very few nonmanufacturer research laboratories devoted to lighting with more than one person; I can only think of two, the Building Research Establishment in the United Kingdom and the Lawrence Berkeley National Laboratory in the United States. Perhaps most seriously, there were no graduate education programs in lighting anywhere in the world that could produce the next generation of academics and researchers. Everyone came to lighting, as I did, from disciplines outside of lighting. Without successive generations of thought leaders, lighting could never be more than a trade.

Since the LRC and our graduate program at the Rensselaer Polytechnic Institute in Troy, N.Y., were founded, independent lighting research and education have become much more common. Today, there are more than 10 universities across the globe that grant degrees directly related to lighting. Collectively, our institutions are transforming lighting from a trade to a field.

Starting the LRC was a significant challenge. Fred Heller, former CEO of Genlyte and a member of my Director's Council, pointed out that the lighting industry spent less than 0.5 percent of its revenue on research, in sharp contrast to other industries. Pieter von Herrmann, a former GE executive, advised me not to give up my NRC job to become director of the LRC because, as he rightly pointed out, there was no more than $250,000 in total that the industry would spend on independent lighting research each year.

What I quickly learned was that funding for lighting research and education was not going to come from the people who make good lighting, but rather from the people who need good lighting. Organizations that support our research and educational activities today include the General Services Administration, the Federal Aviation Administration, the United States Navy, the U.S. Department of Energy, the U.S. Environmental Protection Agency, the National Institute for Occupational Safety and Health, the National Institutes of Health, the New York State Energy Research and Development Authority, Natural Resources Canada, and the Swedish Energy Agency. Today, our outside funding is slightly more than $6 million per year, 85 percent of which comes from the people who need good lighting. The lighting industry is now investing about $900,000 per year in the LRC; this is about twice the amount, in 1988 dollars, that Pieter von Herrmann said was available from the entire lighting industry for independent lighting research.

The LRC is a diverse group of men and women devoted to its mission: "To advance the effective use of light for society and the environment." I believe that devotion is also held by lighting researchers and educators around the world. Lighting is indeed becoming a field.

—Mark Rea, professor and director, Lighting Research Center, Rensselaer Polytechnic Institute, Troy, N.Y.

NOBEL PRIZE FOR THE DISCOVERY OF THE BLUE LED

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In October 2014, lighting science received one of the greatest acknowledgments possible: The Nobel Prize. That year, the Royal Swedish Academy of Sciences awarded the Nobel Prize in Physics to three scientists—Isamu Akasaki, Hiroshi Amano, and Shuji Nakamura—"for the invention of efficient blue light-emitting diodes which has enabled bright and energy-saving white light sources." Never before had researchers working so directly in the lighting field been recognized on a world stage for their scientific achievement.

Red and green LEDs had been developed in the 1950s and 1960s using gallium phosphide. What made Akasaki, Amano, and Nakamura's line of research novel was the idea that blue-light gallium nitride (GaN) was the material needed to make up the diode's architecture. The breakthrough came in 1986 when Akasaki and Amano created a high-quality GaN crystal. In 1990, Nakamura was also successful in producing a high-quality GaN crystal. The first blue diode was presented in 1992 and even though a relatively young discovery, revolutionized lighting technology. –E.D.

ESTABLISHMENT OF THE USGBC'S LEED PROGRAM

In 1993, the U.S. Green Building Council (USGBC) was launched with a mission to transform the marketplace for environmentally preferable building design and construction practices. In less than a decade, the USGBC was well on its way toward that goal. Not only did it popularize the terms "green building" and "sustainable design," it also launched LEED—Leadership in Energy and Environmental Design—a green building benchmarking system. Since its debut in 2000, LEED has driven the global demand for quantifiable "green" buildings. It rapidly gained acceptance among progressive municipalities, school systems, universities, institutions, and corporations seeking a metric to encourage and reward efficient, high-performance facilities.

LEED has changed the way the architectural design, engineering, and construction professions practice. To meet the program's stringent criteria practitioners have had to collectively learn to deliver buildings with a highly integrated design approach. But, LEED did not originally include lighting design as a qualitative element in its quantitative metrics. Lighting designers may have been miffed by this oversight, but nonetheless they still sought to achieve LEED accreditation because it offered a competitive advantage with architects seeking consultants who could address energy efficiency, daylight integration, and controls.

Lighting designers had long been advocating for sensible energy codes. The International Association of Lighting Designers (IALD) had its Energy Committee and the closely allied Quality of the Visual Environment Committee pushed for smart energy legislation regarding lighting systems. As the USGBC gained influence, many lighting designers adopted LEED design principles and contributed to the refinement of lighting-related credits in the early versions of LEED. In 1999, the IALD converted its Energy Committee into the Energy and Sustainability Committee, with its members volunteering for USGBC working teams to interpret and improve the original credits for sustainable site lighting, daylight and views, and individual controllability of lighting. The Illuminating Engineering Society (IES) formed a Sustainability Committee in 2001 to influence credit development and to assemble its own *"Design Guide for Sustainable Lighting"* (IES DG-22-12). Many of these committee members volunteered to become voting members for the ASHRAE Standard 90.1 for energy efficiency, referenced by LEED.

As someone who started in theatrical lighting design and then found himself working on energy-efficient lighting and daylighting projects in the 1990s, I saw the green building movement as a significant business opportunity. From my involvement in the Environmental Protection Agency's Green Lights Program to eventually co-chairing the IALD Energy and Sustainability Committee, I understood that LEED could be a powerful market driver for lighting. When the LEED exam was first offered in 2000, a few IALD members, including myself, took and passed the test. Within a couple of years the IALD and IES joined the USGBC. Lighting design firms have also steadily joined the USGBC and encouraged their staff to take the LEED-AP exam.

LEED's popularity has raised the awareness of lighting as a critical component of energy efficient and environmentally responsible design. While it may have originally caught the lighting design profession by surprise, it has become part of the profession's standard vocabulary and scope of work.

—Mark Loeffler, IALD, LEED FELLOW, director, Atelier Ten Environmental Design Consultants + Lighting Designers, New Haven, Conn.

82,000+

Number of commercial projects that have participated in LEED

15.7 billion

square feet of LEED-certified space

198,000+

individuals who have become LEED accredited professionals

LOW-VOLTAGE LIGHTING

In the mid-1980s, low-voltage lighting started to become a very popular option for architectural lighting applications due to its optical control and small footprint. Sidney M. Pankin, a lighting applications engineer at Pankin & Associates who wrote "The Part Department," a regular article series in the early days of this publication, discussed low-voltage lighting in our November 1987 issue. He explains that one of the more exciting aspects of low-voltage lighting was that it was designed as a system. It could be used in a variety of fixture types—recessed, track, or as individual point sources—and with a wide variety of wattages and beam-spread options. Considered most beneficial for accent or tasklighting, it's not considered a good strategy for ambient lighting. Additionally, low-voltage lighting needs to use an AC step-down transformer to lower the power to 12V. Low-voltage lighting systems can be dimmed, to extend lamp life, but must be used with magnetic transformers specially designed for use with low-voltage lighting components.

One of the most famous low-voltage halogen lighting systems was the YaYaHo (shown), first introduced in Europe in 1984 by Munich-based designer Ingo Maurer. The fixture heads were fully adjustable and could be positioned anywhere along the parallel set of horizontally mounted cables. This particular system was designed for 230V or 125V with a secondary output of 12V; the transformer had a maximum capacity of 200W while the maximum capacity of the cables was 350W.

Aesthetically, low-voltage lighting systems might seem out of date today, but the complexity of installing such a system and the coordination of components has a number of affinities with today's LED lighting when it comes to source, power, circuitry, and dimming. —E.D.

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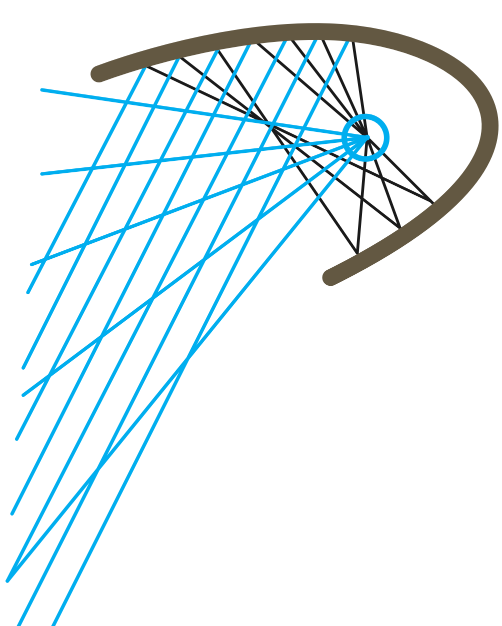
DEVELOPMENT OF THE ASYMMETRIC REFLECTOR SYSTEM

The asymmetric reflector system is both a lighting technique and a technology that has been incorporated into luminaires. It was developed by Sylvan (Sy) Shemitz, who, as a young lighting designer, could not find the market-ready fixtures he needed for his lighting design projects. So Shemitz, along with colleague Ben Stahlheber, began to develop the luminaires they needed and that incorporated an asymmetric distribution of light with tight beam control. They experimented with different reflector shapes and came up with a design made of an ellipse and two parabolas that could illuminate a surface or a plane more efficiently and effectively than anything on the market at the time. Unable to find a manufacturing partner who was interested in producing his fixtures, Shemitz started his own company, Elliptipar, in 1976.

The beauty of Shemitz's concept for the asymmetric reflector design is that it allows light to create a luminous surface from a minimal setback. Depending on the reflector orientations, the luminaire can wallwash, uplight, or downlight. The contours of the parabolas drive light down or across the illuminated surface from one edge. The shape of the elliptical section (from which the company name was derived) shields the lamp from viewing angles and reshapes the light into a parabola. The lamp placement at the optical center of the reflector prevents the light rays from re-entering the lamp source. —E.D.



THE JEFFERSON MEMORIAL

The Jefferson Memorial in Washington, D.C., on the south edge of the National Mall's Tidal Basin, was designed and began construction in 1939 and opened to the public in 1943. The original design of the monument did not include any provisions for exterior lighting, and it was not until 1964 that an exterior lighting solution was implemented. That task fell to lighting designer Sylvan (Sy) Shemitz (1925–2007), whose design used a combination of high-wattage incandescent and high-pressure sodium lamps with a combination of colored key and fill light to model the architectural surfaces. When the project was completed in 1973, the statue of Thomas Jefferson was the first to use an asymmetric reflector system.

In 2001, to mark the occasion of the 200th anniversary of Jefferson's presidential inauguration—which also happened to coincide with the 100th anniversary of Sylvania Lighting—lighting designer David Mintz of the Mintz Lighting Group was asked to devise a new lighting scheme for the memorial. The fixtures and sources used for the 1973 design, while appropriate at the time, no longer met the energy and maintenance requirements. Mintz and his team developed a new scheme that incorporated a combination of metal halide, ceramic metal halide, and induction lamp technologies that allowed for close to 80 percent energy savings.

In addition to the technical achievement of illuminating the 129-foot-tall monument while maximizing energy use is the design achievement of using light to provide a greater grounding of the structure to the site. The steps leading up from the Tidal Basin to the rotunda had never been illuminated. In the new scheme, floodlights placed at the northeast and northwest edges of the basin accomplish that task. David Mintz recalls how everything looked the time when they were doing on-site mock-ups to show the Fine Arts Commission and the National Park Service: The minute they turned the floodlighting on for the steps, people began to gather and sit, drawn to the welcoming nature of the new illumination. —E.D.

Peter Aaron/OTTO

C02047, Austin History Center, Austin Public Library

TRANSFORMATION OF THE NIGHT

With the introduction of gas light in London in 1813, the nighttime environment of cities was transformed. As lighting educator and historian David Di Laura writes in *The History of Light and Lighting* (IES, 2006), “As gas lighting spread and its availability became ubiquitous in cities, it produced an independence from darkness that changed the social, work, and personal habits.” Prior, society had equated “night” and “darkness” with fear, danger, disease, and death. Conversely “day” and “light” represented goodness, health, purity, and life. It’s a complex symbolism still at play today.

As gas lamps gave way to early forms of streetlighting, such as Austin, Texas’ Moonlight Towers (shown), cities became more navigable and accessible to a greater number of economic classes. Lighting became a neutralizer of sorts. Today we inhabit a 24/7 world that has ironically reminded us to reconsider the importance of darkness as a complement to light. —E.D.

LIGHT POLLUTION AND THE NIGHT SKY

In our increasingly illuminated world and rapidly expanding urban centers, one of our greatest challenges is managing light and maintaining areas so that low light levels, even darkness, can be achieved in desired areas. In fact, the study “World Atlas of Artificial Night Sky Brightness” published in the open access journal *Science Advances* in June 2016 found that “80 percent of the world’s population lives under light-polluted skies. The United States and Europe have it the worst, with 99 percent of their denizens experiencing sky glow at night.”

Light pollution, defined as “the wasteful upward light from electrical sources that is scattered in the atmosphere and reflected back to Earth,” is just as serious as any other type of pollutant. One group that has been working to keep the balance between light and darkness in check is the International Dark Sky Association (IDA). Established in 1988 and made up of astronomers and environmentalists, it is “dedicated to protecting the night skies for present and future generations.”

The IDA acts as an “advocate for the protection of the night sky” and works with a variety of constituencies that have an interest in the illuminated landscape, everyone from members of the public to city planners, from policy makers to lighting designers and lighting manufacturers, from the National Park Service to environmental activists. To date, through its International Dark Sky Places conservation program launched in 2001, the IDA has certified more than 65 Dark Sky Places around the world, across six continents, totaling 58,000 square kilometers (21,200 square miles). A small percentage of the Earth, but a start to preserving the night sky, a critical component in how we think about the illuminated—and nonilluminated—world. **—E.D.**

Herbert Heinsche

22

TRIBUTE IN LIGHT

If ever there was a project that represented the singular power of illumination, Tribute in Light would be it. Conceived to commemorate the terrorist attacks of Sept. 11, 2001, lighting designer Paul Marantz of Fisher Marantz Stone (FMS) was asked to realize the design of architects John Bennett and Gustavo Bonevardi, artists Paul Myoda and Julian Laverdiere, and architect Richard Nash Gould. Bold and dynamic, the symbolic "pillars of light" are meant to recall the silhouettes of the fallen Twin Towers. As the shafts of light disappear into the night sky, the clarity of the design becomes evident, and stands as a powerful reminder of what was lost. (FMS also designed the lighting for the National September 11 Memorial and Museum.)

First lit six months after the attacks on March 11, 2002, in a vacant lot in Battery Park City at West and Vesey Streets, the seemingly simple approach is anything but. Each pillar of light was created from 44 individual 5000K, 7,000W xenon spotlights set in a 50-foot square. The light shafts shine 4 miles up into the night sky and are visible from up to 20 miles away. Over the course of construction, the installation moved around the World Trade Center site. The Municipal Art Society, with funding from the Lower Manhattan Development Corp. oversaw the project through 2011. In 2012, the National September 11 Memorial and Museum assumed responsibility. Through this metaphorical use of illumination, light becomes the language of absence and presence, remembrance, and hope. —E.D.

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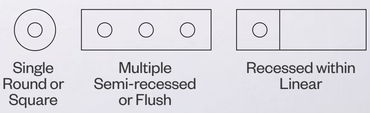
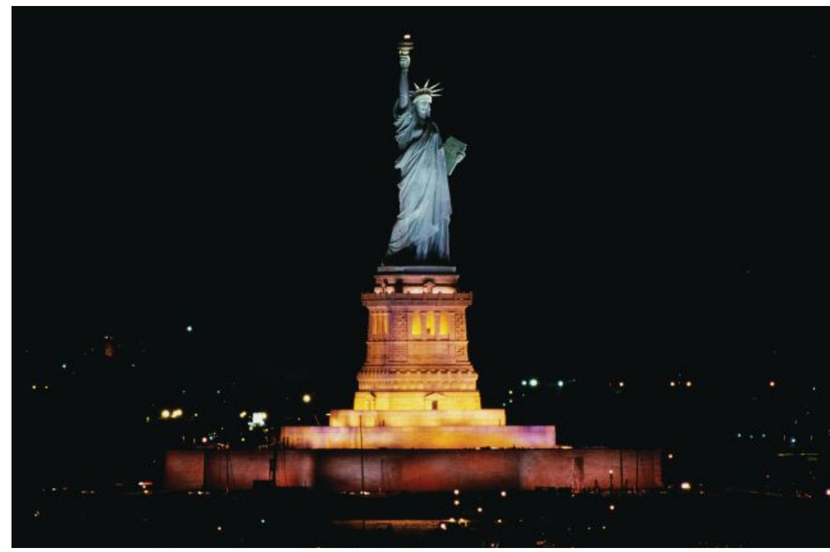


THE DESIGNER–MANUFACTURER COLLABORATION

It is not uncommon for a lighting designer to discover that no matter how many lighting products there are on the market, the luminaire or light source they need to realize their design concept does not exist. As a result, there is a long tradition in lighting of designers partnering with manufacturers to customize a luminaire to meet the specific project scenario or even to develop a completely new luminaire. Two projects that serve as examples are the relighting of the Statue of Liberty by the Brandston Partnership in 1986 and the lighting for the September 11 National Memorial by Fisher Marantz Stone in 2007.



Joseph Sohm

The Statue of Liberty (shown) has proved a lighting challenge ever since it was installed in New York Harbor in 1886. As the 150-foot-tall copper-clad Lady Liberty neared her centennial in 1986, lighting designer Howard Brandston was asked (in 1984) to give her a "lighting makeover." Brandston studied the sculpture, noting that the statue looked its best in early morning light. His design called for creating a hierarchy of illumination—four zones from the base to the top of the statue that would increase in intensity culminating with the glowing focal point, the torch. To do this Brandston realized that he would need "one lamp to mimic the morning sun and one lamp to mimic the morning sky" but soon discovered that no such lamp existed that could meet these criteria. Partnering with General Electric, Brandston worked with a team of engineers to design a new light source for the project. It took two years, but in the end they delivered a "cool" and a "warm" metal halide lamp that could achieve the desired effect.

The design for the September 11 National Memorial, a competition-winning scheme called "Reflecting Absence," by architect Michael Arad and landscape architect Peter Walker, called for a landscape of trees surrounding two reflecting pools that would echo the void of the Twin Tower's footprints. Lighting designer Paul Marantz, of Fisher Marantz Stone (FMS), was asked to illuminate the project and find a way to stay true to the design while meeting the security criteria. The two main fixtures developed for the project—the site pole and the submersible fixture at the waterfalls—break new ground in achieving technical performance previously thought impossible.

For the site fixture, FMS used prismatic refractors around a 4-foot linear fluorescent light source to achieve the necessary vertical illuminance. The technology had only ever been used in a cylindrical form but the plaza design required a square-shaped luminaire. FMS worked with lighting manufacturer Selux, who had been instrumental in developing this technology, to adapt it to the new form factor.

The other technical lighting achievement happens at the two reflecting pools. The challenge was how to create an uplight that would be bright enough while withstanding the constant volume of water coming from the 30-foot waterfall. FMS partnered with Winona Lighting, an Acuity Brand, to design a new luminaire using early LED lamp technology that incorporated water cooling to dissipate the heat produced by the LEDs. The fixture's wiring is also designed so that the luminaire can be disconnected and replaced from an access space adjacent to the pool and out of public view. In both instances, collaboration was essential for the design and for advancing lighting. —E.D.

MERGERS AND ACQUISITIONS

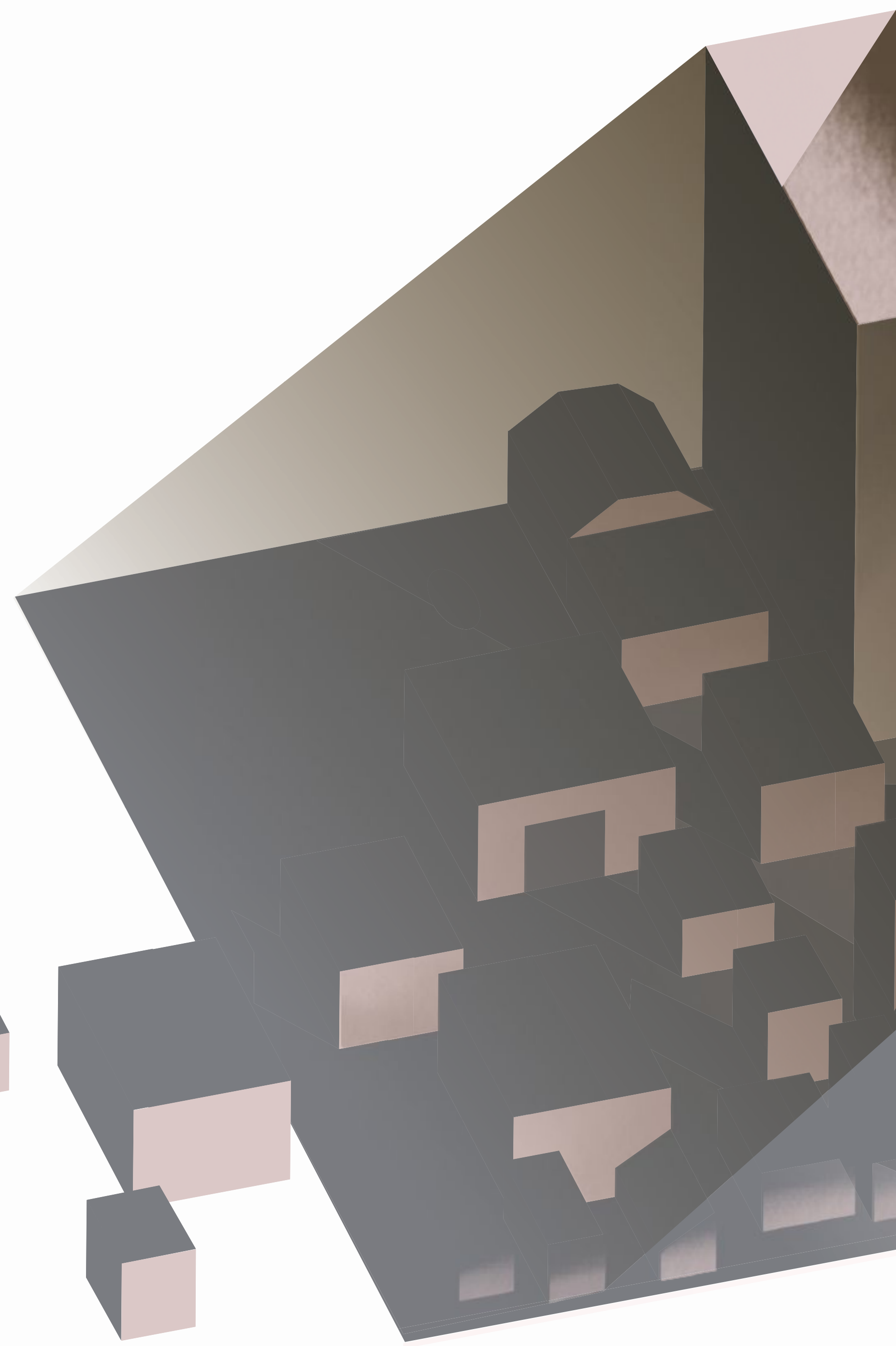
Lighting manufacturers have typically grown their businesses in one of two fundamental ways: organically from within or by an external merger or acquisition. The catalyst for the most recent cycle of mergers and acquisitions over the past 15 years was the introduction of LEDs into the lighting market.

With such a disruptive and unknown technology, many companies opted to get into the LED game by acquiring existing LED businesses. The first of these notable realignments occurred when Philips Lighting acquired Boston-based LED company Color Kinetics in late 2007. Philips had already acquired LED chipmaker Lumileds in 2005 and TIR Systems in early 2007. With this addition to their portfolio, it gave Philips, primarily known as a lamp company, the ability to transform its business and growth at a system level. It also set in motion a similar set of acquisitions, as other legacy companies such as Cooper Lighting sought to add LEDs to their portfolio. Cooper would go on to acquire io Lighting, also at the end of 2007, and then later would be acquired itself by Eaton in 2012.

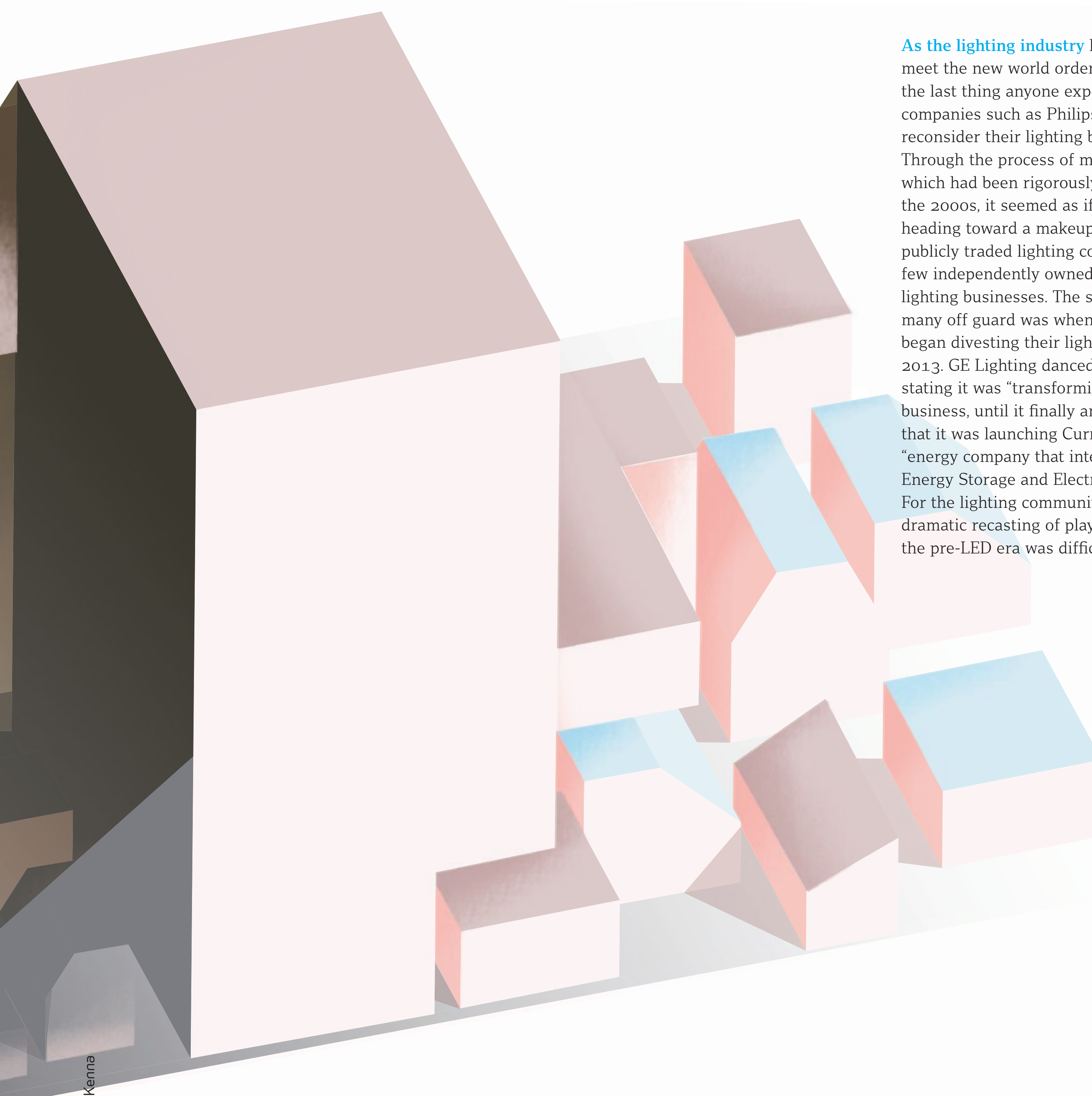
But some companies like Ruud Lighting ventured to establish their own LED business units. Ruud's BetaLED, in time would become attractive to LED companies who were looking to add the missing component of luminaires from their businesses. Cree acquired Ruud Lighting/BetaLED in 2011.

Once companies had added LEDs to their portfolios, they looked next to add lighting controls, drivers, and sensor companies to their lineups. For example, Acuity Brands acquired eldoLED, an LED driver company in 2013 and Distech Controls in 2015.

Mergers and acquisitions have been a common theme over the course of the lighting industry's history. The ebb and flow of the business landscape is a complicated one, and it is guaranteed that as lighting technology and business condition continue to fluctuate, there will be other iterations of this complex business process in the years ahead. —E.D.



THE CHANGING BUSINESS LANDSCAPE



Josh McKenna

As the lighting industry has realigned itself to meet the new world order of solid-state lighting, the last thing anyone expected was for legacy companies such as Philips, Osram, and GE to reconsider their lighting businesses completely. Through the process of mergers and acquisitions, which had been rigorously playing out during the 2000s, it seemed as if the industry was heading toward a makeup of a few dominant publicly traded lighting conglomerates and a few independently owned, small and mid-sized lighting businesses. The surprise that caught many off guard was when Osram and Philips began divesting their lighting businesses in 2013. GE Lighting danced around the issue, stating it was "transforming" its lighting business, until it finally announced in fall 2015 that it was launching Current, powered by GE, an "energy company that integrates GE's LED, Solar, Energy Storage and Electric Vehicle businesses." For the lighting community as a whole, such a dramatic recasting of players once mainstays of the pre-LED era was difficult to imagine. —E.D.

LIGHTING TRADE SHOWS

Lighting trade shows provide that critical interface between manufacturers and designers that make possible the exchange of new product and technical information, and provide important networking opportunities. Over time, the lighting industry has developed various formats for these events, everything from week-long international expos to one-day local lighting representative showcases for a particular suite of brands.

In the early 1990s, there were two major national lighting trade shows trying to find their feet in the United States: Lighting World and Lightfair. The schedule in 1990—Lightfair in April in New York and two iterations of Lighting World, one in June in Chicago and one in October in Los Angeles —put a great deal of stress on the industry, as ARCHITECTURAL LIGHTING's editor at the time, Wanda Jankowski, noted in "Trade Show Trauma" (August 1990). She quoted lighting manufacturer Marvin Gelman, founder of Stony Point, N.Y.–based Lighting Services Inc: "The coasts have become prohibitive for manufacturers to participate in more than one trade show a year." Today, the issues of time and expense are still a critical factor, as exhibitors and attendees decide which trade shows are necessary to attend in order to deliver and to keep up with the latest product introductions.

Lightfair wound up being the victor of the North American market and, over the course of its 27-year history, has become the go-to event for lighting designers in the United States. All of which is not surprising when you realize that the show is co-owned by the International Association of Lighting Designers, the Illuminating Engineering Society, and AMC, the company that also produces and manages the event.

In the early days of Lightfair, the show rotated between New York, Chicago, and San Francisco. In 2003, the coast-to-coast rotation was limited to New York and Las Vegas. In 2011, because of the renovation at the Javitz Center in New York, Lightfair moved to Philadelphia. Last year, it was held in San Diego, where it drew 617 exhibitors and 27,628 registered attendees, a far cry from that first New York show which had 208 exhibitors and 7,500 registered attendees.

Outside of the U.S., Messe Frankfurt oversees a series of megascale trade shows around the world. For the lighting design community, the most notable is the biannual Light+Building. Held at the company's fairground in Frankfurt am Main, Germany, the complex includes 12 exhibition halls and a congress center and covers 6.2 million square feet. In 2016, Messe Frankfurt reported that the fair had received 216,000 trade visitors from 160 countries, and 2,589 exhibitors. Over the past decade, the international spectacle has drawn an even larger contingency of lighting designers and manufacturers from the United States, and that has started to impact how manufacturers choose to exhibit here. —E.D.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MEDIA FAÇADES

As LEDs first began to make their way into lighting in the early 2000s, their digital programming and color capabilities opened areas of investigation for those looking to use lighting in a new way, particularly when it came to the exteriors of buildings. Designers saw the digital aspect of LEDs as an opportunity to reimagine the building façade as more than just a structural component that separates interior from exterior and instead to use it as a large-scale pixel platform for conveying information and graphics. Building façade now became billboard. One of the first firms to explore "façade as communication medium" was Berlin-based studio Realities:United (RealU).

RealU was founded in 2000 by brothers and architects Tim and Jan Edler. The duo had been exploring digital technology and ways it could be integrated into buildings. Their first media façade in 2003 was a project called BIX, a communicative light display embedded into the plexiglass panels of the Kunsthaus in Graz, Austria, designed by British architects Peter Cook and Colin Fournier. BIX served as the foundation for RealU's next media façade in 2005, a display called "Spots" (shown) for a newly constructed office building at 10 Potsdamer Platz in Berlin. The client asked RealU to design an interactive façade that would serve as a marketing device to entice future tenants. To form the "giant, low-resolution, grayscale matrix," RealU used fluorescent light tubes as the pixels—1,104 ring-shaped tubes and 760 bars. The brightness of each lamp was controlled via a central computer. Over the course of the project's 18-month run, a combination of curated images—movies, graphics, and animation sequences—as well as artist-commissioned, site-specific works were on display. **—E.D.**


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“BRIDGE” TECHNOLOGIES

As lighting technology has evolved, not every new product introduction has had equal staying power. For example, incandescent lamp technology existed for well over 100 years before it was seriously challenged by the paradigm-changing LED. And some lighting technologies are more interesting for the bridge they provide between major developments. One example of this is the compact fluorescent (CFL) lamp.

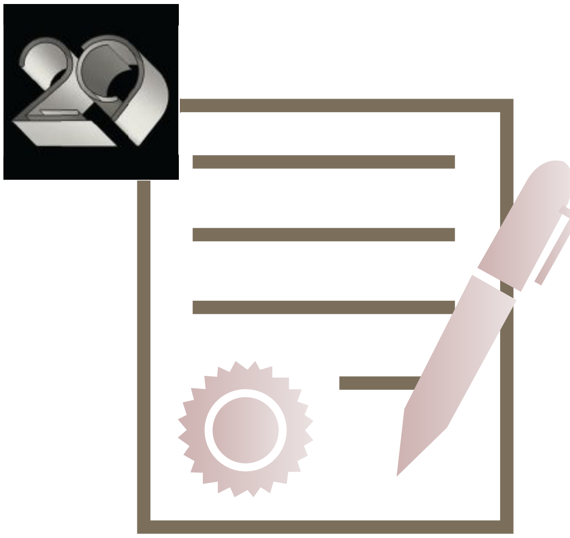
From a design standpoint, consumers have never been enamored with CFL’s harsh color temperature or lack of beam control and dimming capability. Furthermore, their mercury content is cause for environmental concern, a concern that is often viewed as bigger than any energy savings the source might offer.

The first spiral CFL was developed in 1976 by Edward E. Hammer, an engineer with General Electric in response to the 1973 energy crisis. The lamp was made by coiling a slender, 13mm-diameter, T4 glass tube. Existing lamp machinery could not consistently reproduce the delicate spiral, unfortunately, and GE decided the investment needed to retool factories was too great, so the lamp was not brought to market.

Later, in the 1980s, lamp manufacturers began to introduce CFLs that could be used with medium screw-based sockets as an alternative to the incandescent lamp. In 1980, Philips introduced its SL lamp, the first self-ballasted (magnetic) screw-in CFL which featured a double-folded T4 tube and color-stable phosphors. This was followed by Osram’s introduction, in 1985, of the Delux EL lamp, the first CFL to use an electronic ballast.

Wary of repeating the mistakes of the CFL introduction—premature to market, too expensive compared to the incumbent technology, and installation and performance issues—the lighting industry has been particularly strategic with the market introduction of LEDs. The U.S. Department of Energy even went so far as to issue a report in June 2006, *Compact Fluorescent Lighting in America: Lessons Learned on the Way to Market*, as a way to safe guard the introduction of solid-state lighting and ensure it would not become another bridge technology. **—E.D.**

Josh McKenna

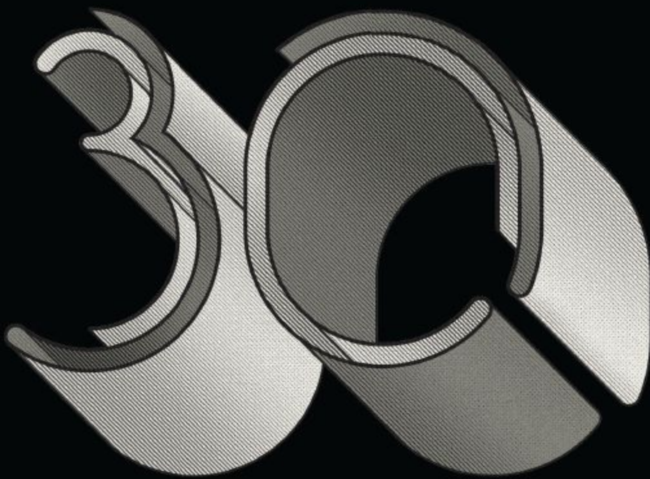


TEXAS HOUSE BILL 2649

In May 2009, the lighting community got a huge wake-up call: Texas House Bill 2649. The bill included an amendment that would have prevented lighting designers from practicing in the state of Texas, limiting the regulation and practice of lighting design only to licensed engineers, architects, landscape architects, and interior designers.

Upon learning about the measure on May 26, less than 24 hours before the vote was scheduled to take place, the International Association of Lighting Designers mobilized its membership in a rapid call to action. Over the next 24 hours, the lighting community rallied to resolve the issue before the Texas state legislative session ended.

Never before had lighting designers so swiftly mobilized on an issue, let alone one that put the issue of who can and cannot practice lighting design at center stage. The harsh realization of what might have been lost—the ability of established lighting practitioners to practice their craft in an entire U.S. state—served as a catalyst for revisiting discussions within the lighting community on the subject of qualifications and how that might lead to some type of licensure or credentialing system. The threat from the Texas House Bill was also a reminder about the need for greater and more frequent communication with design colleagues in other fields, as well as the need for a full-time monitoring system of the legislative issues that impact the lighting design community. —E.D.



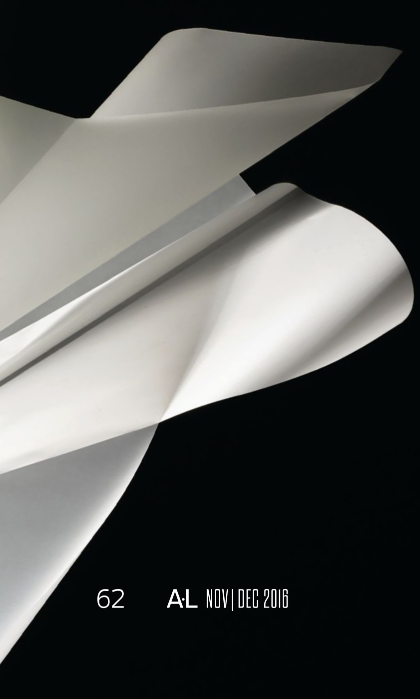
ESTABLISHMENT OF A CREDENTIALING SYSTEM

Although lighting design considers itself a profession, it does not have an education system or professional work path that leads to licensure, as does architecture or engineering. The issue of a recognizable qualification that speaks to what distinguishes a lighting practitioner is one that the lighting community has struggled with since the International Association of Lighting Designers (IALD) was first established in 1969.

In the late 1980s and early 1990s, the debate over this issue led to the creation of the National Council on Qualifications for the Lighting Professions (NCQLP) exam. Established in 1991 to create a testing format that would acknowledge an individual's baseline competency to practice lighting, successful completion of the exam leads to the title of Lighting Certified (LC) to be used after one's name. Although the exam was originally conceived with the intent to provide lighting designers with a way to distinguish themselves and their design skills, the program was not able to successfully monitor candidates and prevent those in the employ of lighting manufacturers from taking the exam. This has become a serious sticking point for the lighting design community, especially when it comes to the discussion around who can, and cannot, offer design services. As a result, lighting designers have questioned the meaningfulness of the designation. On average, about 300 people a year take the NCQLP exam and more than 2,500 people have passed it as of the end of 2015.

When the Texas House Bill 2649 incident occurred in May 2009 it was a harsh reminder that the lighting profession still had not successfully established a qualification system that could withstand the pressures of legislative embroilments. In 2010, under the organizational guidance of the IALD, with input from the Professional Lighting Designers' Association (which disbanded in 2014), a task force was formed to explore the issues surrounding the establishment of a credentialing system and the process that it would entail. Chaired by Australian lighting designer David Becker, the six-person task force engaged in a thorough and lengthy multi-year process which led to the establishment of the Certified Lighting Design (CLD) program, which debuted in 2015 (www.cld.global). Seeking the CLD credential does not require an exam but rather an evidence-based assessment process by which applicants, who must first have completed three years' professional work experience, must prove their competency in five of seven different areas, or "domains of practice." To date, 20 lighting designers have completed the program and received the CLD designation, while many more are currently going through the review process.

While many see the CLD credential as a step in the right direction, the lighting design community still struggles with a fundamental problem: design colleagues and clients do not equate "IALD" after one's name as meaning lighting designer and being a member of the International Association of Lighting Designers, the main professional body representing the lighting design community, the way that they recognize "AIA" and know that the individual is a member of the American Institute of Architects and working in the architecture profession. That is the issue lighting designers must overcome as the profession heads into the next decade. **—E.D.**

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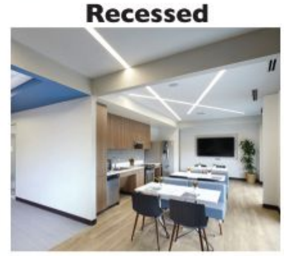

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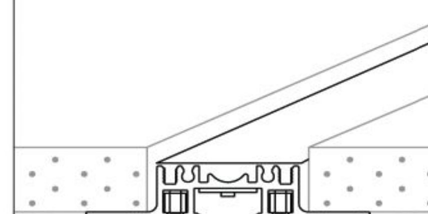

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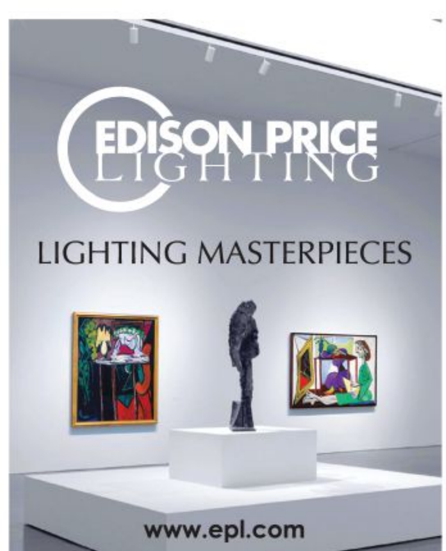

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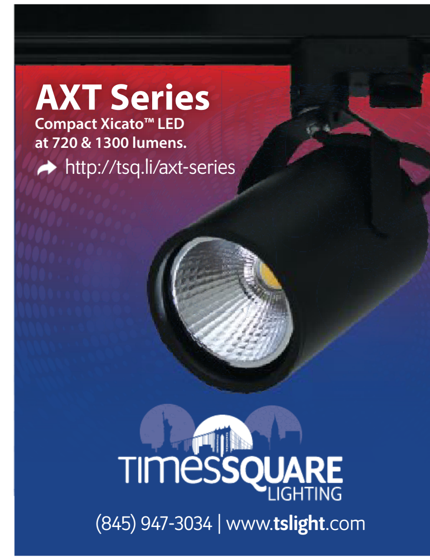

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(1) Outside County Paid/Requested Mail subscriptions stated on PS Form 3541.	29,292	29,880
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(1) Outside Country Nonrequested Copies Stated on PS Form 3541	1,091	490
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(e) Total Nonrequested Distribution (Sum of 15d (1), (2), (3), and (4)	1,425	590
(f) Total Distribution (Sum of 15c and 15e)	30,758	30,509
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(c) Total Requested Copy Distribution (Line 15F) + Requested/Paid Electronic Copies	36,016	36,095
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INDUSTRY VOICES

Since 2009, ARCHITECTURAL LIGHTING has conducted One-on-One interviews with thought leaders from across the lighting industry—a generous mix of designers, manufacturers, government and utility officials, educators, researchers, and next-generation voices—and we added video interviews to the series in 2014. Here's the list of participants through the years.

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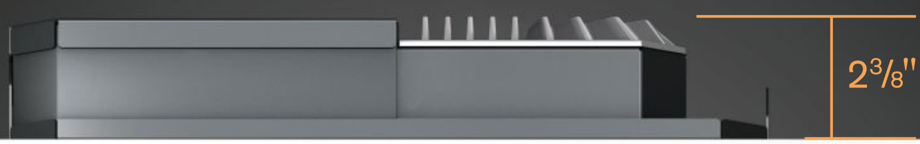

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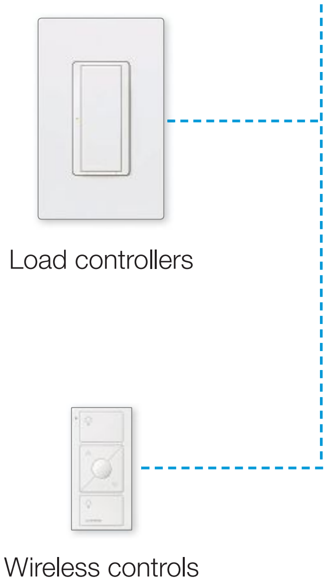

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