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TECHNOLOGY AND APPLICATIONS OF LIGHT EMITTING DIODES

Head of the class

Lighting as a star pupil P. 26

ENDEAVOR BUSINESS MEDIA

QuarkStar

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Based in Las Vegas, QuarkStar technically may be considered a startup, but its employee roster reads like a list of lighting and technology industry superstars. Perhaps not surprisingly, the alma maters of the staff — led by CEO Louis Lerman, chief financial officer Sara Kuwabara, and chief operations officer Jacqueline Teng — rival any international ranking of higher-education institutions and include Stanford University; University of California, Berkeley; University of California, Los Angeles; Massachusetts Institute of Technology; Rice University; Tulane University; and several technical universities in Germany.

Early contributors to QuarkStar technologies included pioneers of solid-state lighting such as Roland Haitz of Haitz's Law; Bob Steele, Strategies in Light; and Peter Stormberg, former CTO of Philips Lighting. Along with their protégés from the field of SSL, they teamed with experts in controls; AI, robotics, and aerospace; building and land development; and medicine to create QuarkStar, a 2022 winner in the Department of Energy's L-Prize Phase 1 (see p. 15).

The firm shared with *LEDs Magazine* its ingredients for success and innovation.

Firm mission: Solid-state lighting faces significant obstacles to realizing its potential. As SSL's first deep-tech skunk works, QuarkStar seeks to develop real-world solutions that overcome current compromises on light quality, size, efficiency, and controls. Our mission: No more compromises, do more with less, and, above all, create light that people will love.

What we are known for: Edge-X, the first of QuarkStar's LED technologies to hit the market. Its modular optical system enables it to herd nearly every photon emitted from an LED and guide it to only where needed. With its compact footprint, meticulously mixed and conditioned light, and ability to switch distributions, Edge-X exemplifies doing more with less.

Roland Haitz, Peter Stormberg, and Bob Gardner bask in light from a QuarkStar troffer that uses Edge-X technology.

Photo courtesy of: Louis Lerman

What people don't know about us: Most, if not all, our team members are polymaths; we have several trained musicians and artists with published works in various mediums. Half of our executive team members are women and 60% of the inventors behind our IP portfolio (300 issued patents to date) are STEM minority members.

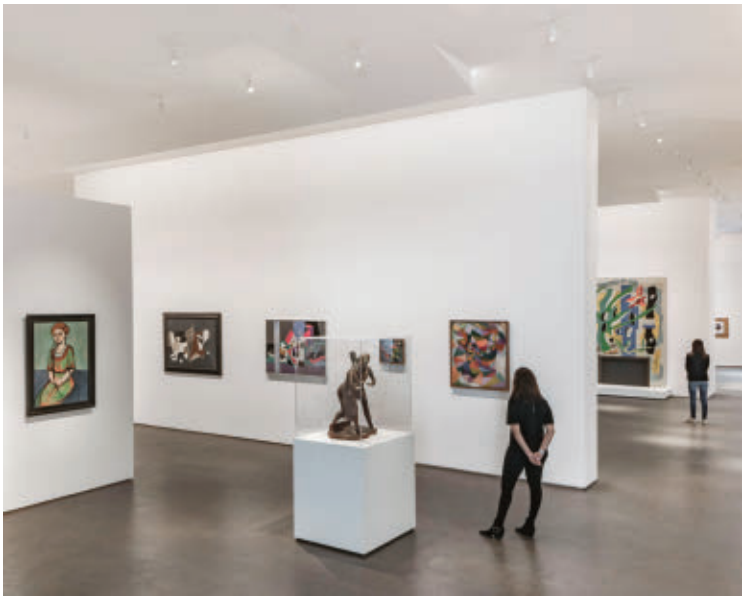
This mix of perspectives, knowledge bases, and real-world experience directly contributes to our creativity. In the past seven years, QuarkStar has averaged one new patent filing a week and received one newly issued or allowed patent every two weeks. All this from our 10-person technical team.

First commission (product or project): We provided the primary gallery lighting for

Above: A single row of QuarkStar Q-Wall fixtures uniformly illuminates the expansive walls of MFA Houston's Kinder Building. Right: Q-Wall uses beam-shaping optics less than 1 in. wide. Opposite: As the sun sets, QuarkStar's technology continues to provide consistent illumination on the far wall, turning it into a diffusive surface. Photos courtesy of: QuarkStar

the Museum of Fine Arts Houston's Kinder Building, the largest U.S. fine arts building development at the time (2020). Our Q-Wall asymmetric linear fixture, based on Edge-X technology, uniformly illuminates the Kinder Building's 16-ft-tall gallery walls with perfectly mixed light from a narrow optic; the museum even decided to redesign its coves to leverage this unexpected extra space. Edge-X creates an experience nearly indistinguishable from standing near a window or under a skylight.

Our favorite product: The DOE's L-Prize (Phase 1) challenge let us showcase an integrated solution for SSL technologies that encompasses multiple levels of luminaire systems. This was the culmination of technologies QuarkStar developed under a new division focused on creating the solutions of the future: Photon Works.



Q-Wall's diminutive size and light distribution allow curators to display art of multiple sizes and shapes without hot or dark spots. Photo courtesy of: QuarkStar

With our L-Prize partner Nichia, we met DOE's stretch goals for color and quality *and* for efficacy, color rendition, lighting distribution, and environmental considerations. All technologies can be manufactured with today's methods, with most having already demonstrated real-world success.

What are you currently working on? We're working on linear high-aspect-ratio sources, which have fantastic advantages in translating the "infinite" luminosity of pointlike LEDs to optimal real-world use.

Summarize your firm culture: QuarkStar brings together multidisciplinary experts to brainstorm how we can consistently break the mold in SSL. Even before COVID-19, we supported a flexible work style that welcomed inspiration from all areas of life — even, or especially, from our children and pets.

Lighting trend to leave behind: The focus on lm/W for rating fixtures and, by extension, the disregard for conservation of étendue. If a product has high lm/W, but only 50% of those lumens are hitting the target, then 50% of the lumens are being wasted. A more useful metric would be light-on-target.

Designer you admire: DaVinci, Turner, and Monet were each an explorer of light who invented a new way of capturing and recreating the luminosity of natural light, but also the beauty and emotion of the moment. This is QuarkStar's aspiration: to recreate nature's luminous best *and* the emotion that comes from experiencing it.