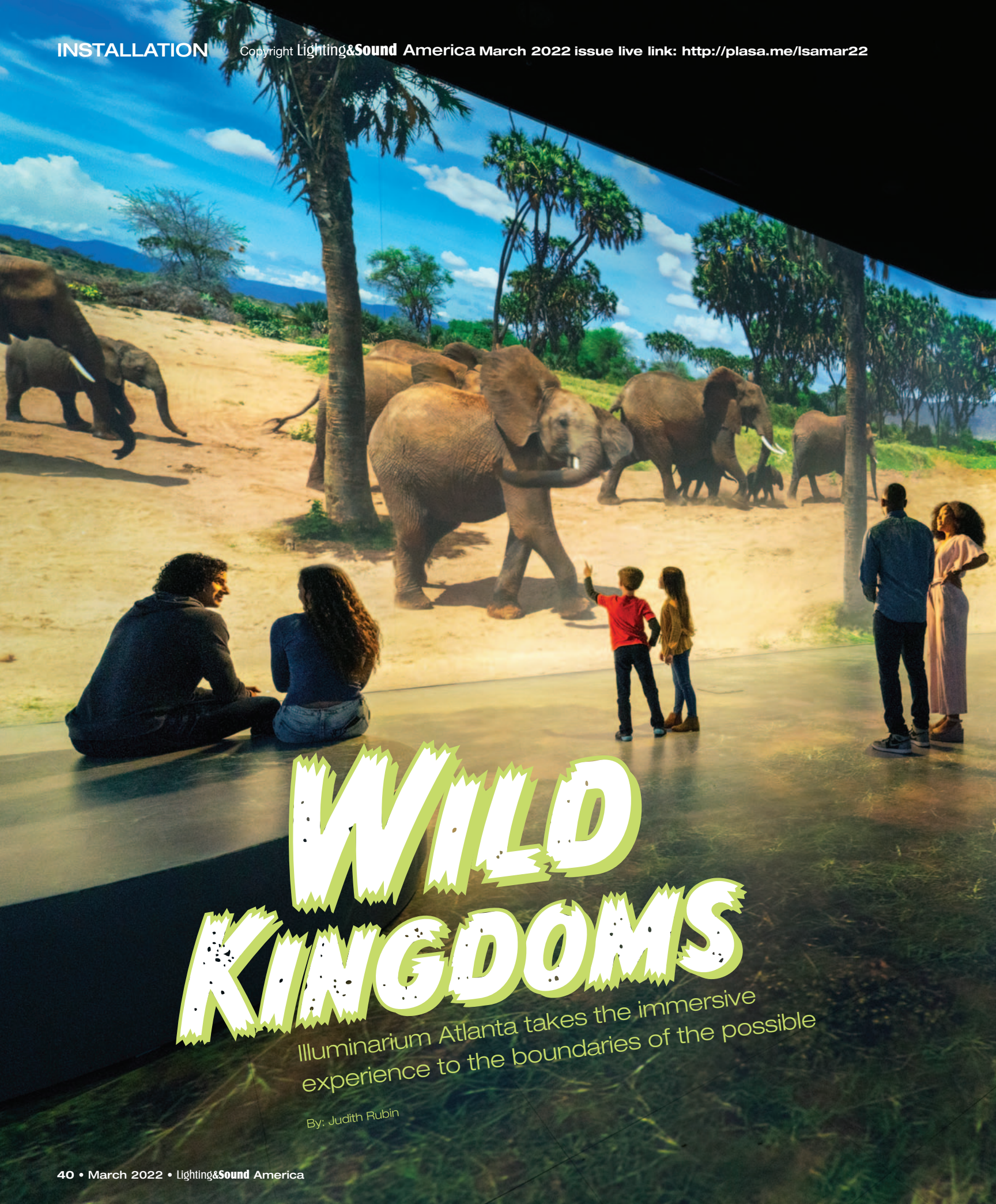


WILD KINGDOMS

Illuminarium Atlanta takes the immersive experience to the boundaries of the possible

By: Judith Rubin

In July 2021, Illuminarium Experiences launched a new storytelling platform in the form of Illuminarium Atlanta, the first of a planned network of repeatable, immersive visitor experiences. Its inaugural show, *WILD: A Safari Experience*, is a 360°, multisensory showcase of exotic animals in their natural habitats, produced by RadicalMedia using custom camera arrays capturing a 240°-degree native field of view. *WILD* is now showing in the 26,000-sq.-ft. flagship venue on the Atlanta BeltLine. RadicalMedia is currently at work on two additional shows, *O'KEEFFE: One Hundred Flowers* (an immersive art exhibit) and *SPACE* (a journey to the moon and beyond).

Illuminarium Experiences is headed by CEO Alan Greenberg, who co-founded the company with RadicalMedia and Rockwell Group. The next three locations are Las Vegas, Miami, and Chicago, with the vision extending worldwide to more cities and tourism destinations. "What Illuminarium is offering to the content world is a series of exhibition spaces, and to visitors a high-end immersive experience with all the amenities," says Phil Lindsey, attractions lead designer and senior project manager of Legends, which was retained as owner's rep for the building development and has the operations contract as well as handling food and beverage, ticketing, and merchandising.

The primary experience unfolds in two spaces, beginning in a smaller preshow theatre and continuing in a larger main theatre, both of which double as events spaces. After hours, they morph into a themed nightclub with ever-changing projected environments and unique mobile bar units.

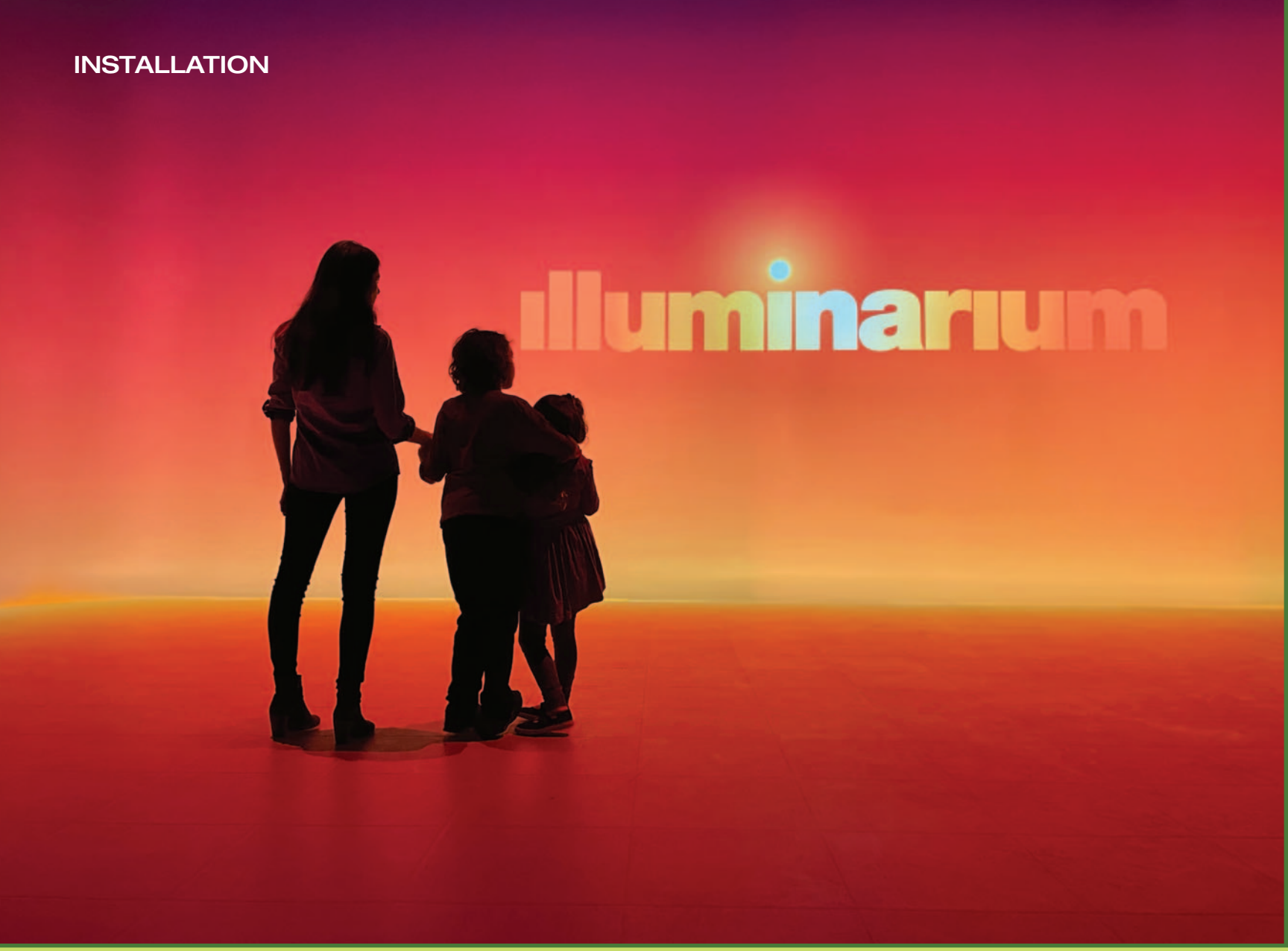
Within the growing sector of immersive attractions, Illuminarium stands out for the extent to which each aspect of the technology is being driven. "We really felt the appetite to push as far as technically possible—to the boundaries of possible," says Peter Kirkup, global technical solutions manager at disguise, one of several Illuminarium technology partners.

"With our history on big theme park projects, large museums, and experiential spaces, we've seen the biggest of the big. But on this project, we pretty much have consensus that nobody has seen some of this stuff on this scale," says Christopher Cooper, senior project manager of Electrosonic, also an Illuminarium technology partner.

"There are no rules, there is no box," says Brian Allen, Illuminarium executive vice president of technology and content. "Immersive storytelling has changed the narrators/storytellers. There is no frame; that doesn't matter anymore. What you can do with video is whatever you want; what you can do with audio is whatever you want, and you layer on top of that."

The technology is evolutionary, but the operating model

Photo: Courtesy of Illuminarium Experiences



The retrofit of the Atlanta location included raising the ceiling 13' over the show areas to provide a 22'-high by 330'-long projection surface with an 8'-high equipment storage area above.

is mature with a view to being sustainable—including retail, dining, special events, nighttime experiences, school groups, incentives for return visits, and a format that is repeatable while it continues to evolve.

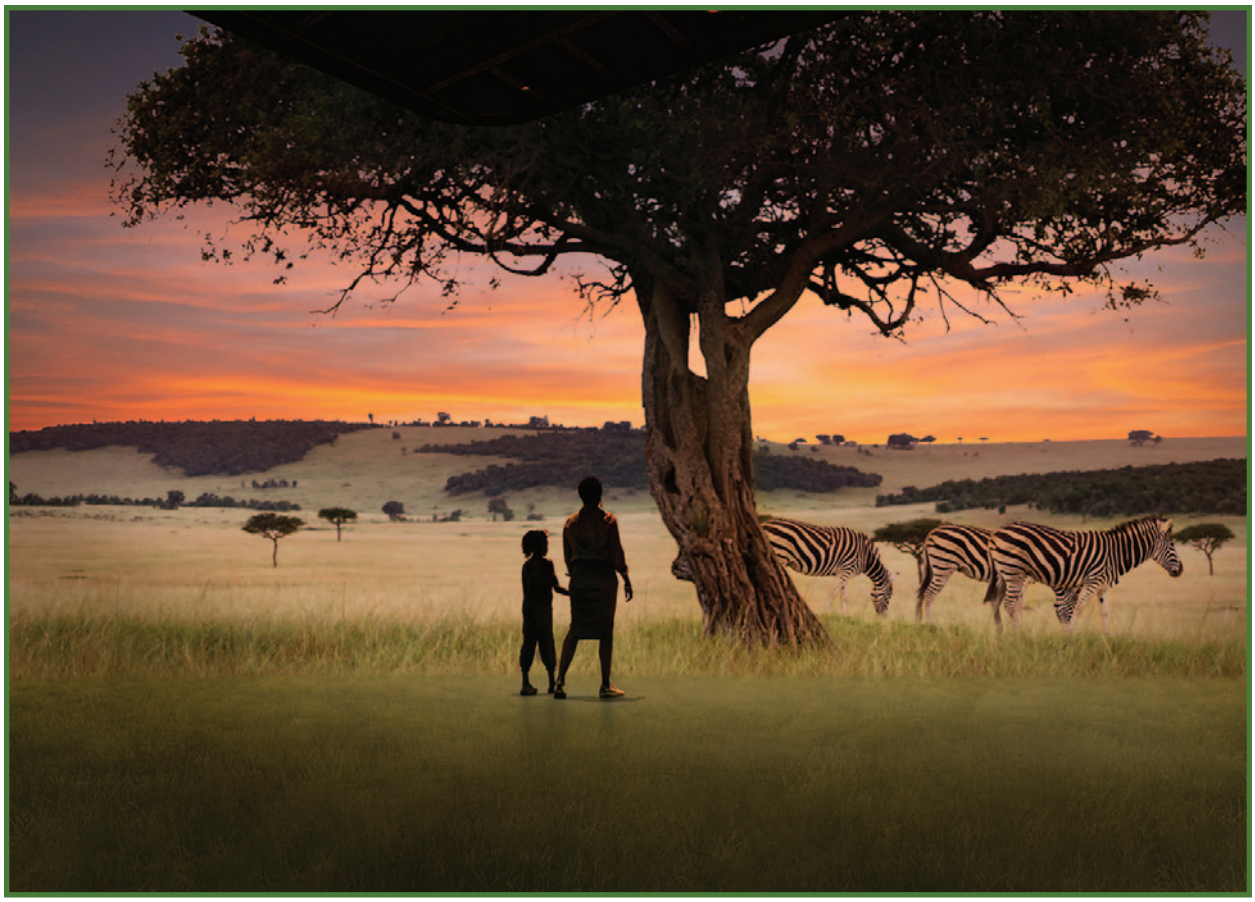
Partners and projection

Illuminarium Atlanta is a custom retrofit of an existing building. The design architect is Rockwell Group, with Niels Guldager as lead creative architect. The architect of record is Stevens & Wilkinson. The retrofit included raising the ceiling 13' over the show areas to provide a 22'-high by 330'-long projection surface with an 8'-high equipment storage area above.

The official technology partners are Panasonic, Strong/MDI, Holoplot, disguise, Electrosonic, Powersoft, Lightware, Ouster, and SensoryCo. Suppliers of additional services and products include Focus Lighting, Visible Sound LLC, EXP, InterAmerica Stage, Dante, Q-Sys, Medialon, Smart Monkeys (ISAAC), and Nanolumens.

As lead technical director for Illuminarium, Lindsey's role included working closely with Allen as the team of external suppliers and partners was formed. "Because Illuminarium is so highly show-system driven, I came in as owner's rep on that side," says Lindsey, who joined the Legends team four years ago to help develop the project with project director Saga Patel.

Electrosonic's scope included engineering, fabrication, project management, programming, commissioning, testing, training, and on-site support. "The people we need to really work on these systems are gaming-level programmers, to get to that level of seamlessness," says Electrosonic's Cooper, whose team included Elliot Nyfield, Jim Funke (AV programming and engineering), and John Notarnicola (visualization engineer and projection specialist).



The star projector is the Panasonic PT-RQ50KU, offering 50,000lm brightness and native 4K resolution (4096 x 2160). Panasonic created a unique, short-throw lens designed for zero offset and minimal loss of light

Panasonic is the exclusive visual solution provider of native 4K projectors, 4K professional displays, and 4K professional camera solutions for Illuminarium. The star projector is the Panasonic PT-RQ50KU, touted for 50,000lm brightness, native 4K resolution (4096 x 2160), and vivid color images. Utilizing a laser engine that combines one red laser and two blue lasers operating at different wavelengths, light output is doubled from the same footprint as the previous PT-RQ32KU 4K projector, according to Panasonic.

To help fulfill Illuminarium's vision for an enhanced immersive experience, Panasonic created a unique, short-throw lens designed for zero offset and minimal loss of light to allow guests to approach the visuals within about 5.9'. "Together, the short throw-ratio and zero screen offset help to immerse Illuminarium's audience more deeply in the content designer's world," says Joseph Conover, strategic manager, themed entertainment solutions, Panasonic North America. "This is a zoom-capable, native 4K lens with a throw-ratio of 0.55–0.65:1 that rotates and may be adjusted at 90° intervals, 12 o'clock, three, six, and nine. We have seen great success in short-throw lens development across our product line of projectors and this new lens is the pinnacle of our factories' incredible craftsmanship. Our team in Japan, known as 'Takumi,' live by a philosophy of 'Kaizen'—to constantly improve development. We are also providing show-quality support and services, including remote support for all locations, through our early warning and control software. This collaboration also enables Panasonic to introduce emerging technologies the public doesn't usually get to see, and puts these technologies in front of creatives."

Cynthia Pawlowski, visual systems marketing manager, Panasonic North America, notes that the PT-RQ50KU native 4K projector was first installed by Princess Cruises and is popular for projection mapping at such events as the downtown LA Luminex Arts Festival, and the Luma Festival in Binghamton, New York. "Everybody wants to get their hands on it and use it," she says. "Its compact body brings significant workflow advantages, which is especially important when working under time constraints. And it has software capabilities embedded for precise alignment, seamless edge-blending, and powerful color reproduction."

While the Atlanta venue is a hybrid install integrating 19 PT-RQ50KUs (50,000 lumens) and 25 PT-RQ32KUs (30,000 Lumens), the Illuminarium projection systems in Las Vegas,

Photos: Courtesy of Illuminarium Experiences

Miami, and Chicago utilize (or will utilize) only PT-RQ50KUs and the ET-D3QW200 lens.

To support all this innovation and help fast-track it, Illuminarium maintains a lab in Atlanta for testing and mockups. Conover says, "The lab is about a 1/8 scale test environment where all this tech was vetted, including ours. We worked a very long time to test all these items out as content was being developed." (RadicalMedia shot *WILD* on a five-camera array on location for four months.) "The lab was critical to that and will continue to be as things continue to evolve."

Supporting the high-res projection and content delivery while providing redundancy and failover systems is Lightware video transport technology, designed to transport uncompressed imagery over dedicated fiber. Lightware's UBEX AV-over-IP solution supports uncompressed, high-fidelity signal extension at 4K UHD at 60Hz (4:4:4) using packet-based transmission. "The Lightware transmitters, receivers, and UBEX [ultra-bandwidth extender] devices are a big part of the system," Nyfield says. "Ubex/JUNIPER connections create matrix routing capabilities for understudy server failover. The system uses the Junipers to send video signals from any transmitter to any receiver connected if necessary. This really adds flexibility."

"Ubex enabled us to push the boundaries of technology and innovation by delivering truly uncompressed content without any degradation in our signal from camera, playback, and projector," Allen says. "It delivered on the promise of eliminating signal loss and has let us create a flexible, future-proofed system."

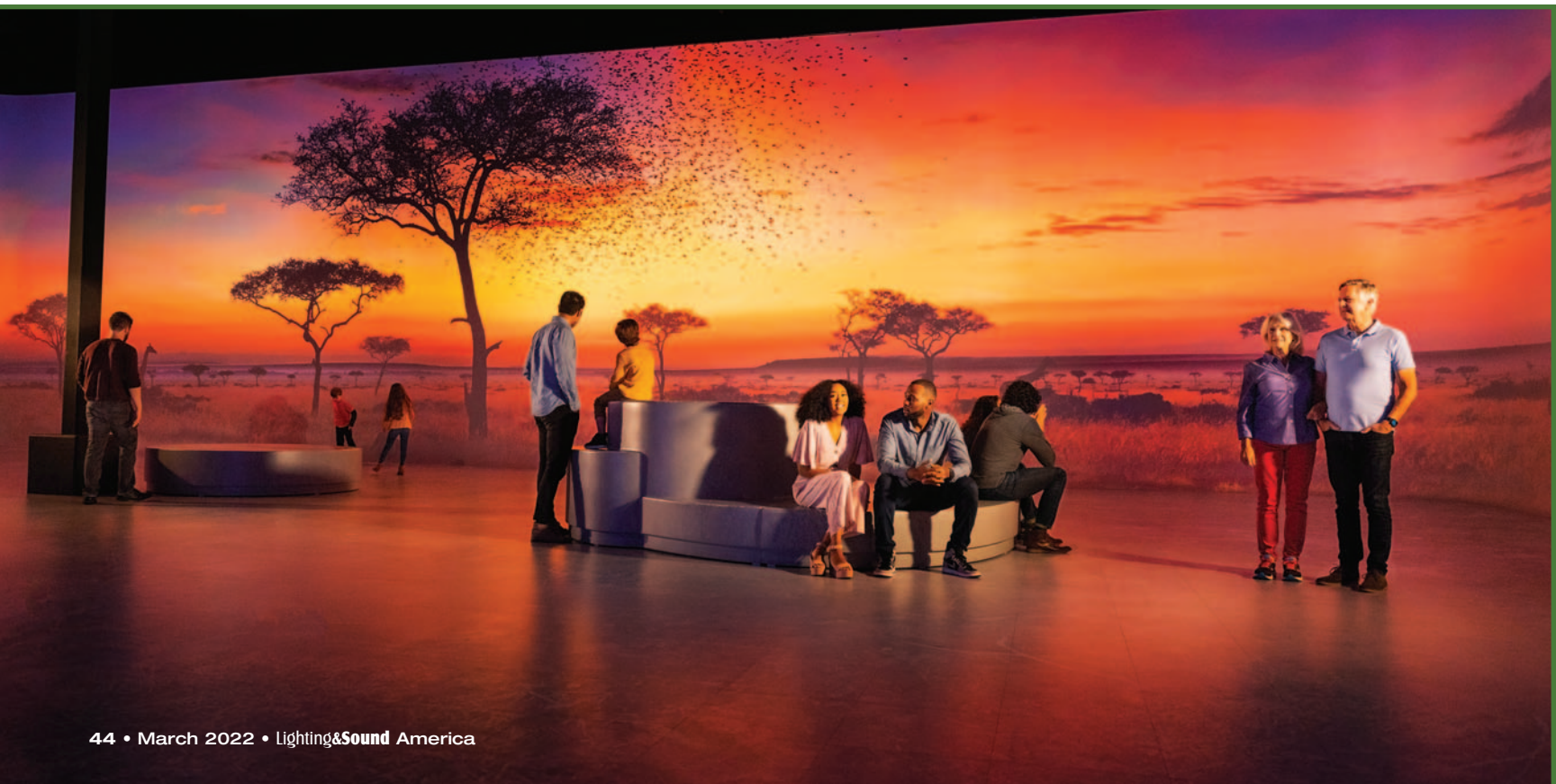
Sensory environment

In late 2019, Electrosonic reached out to Dustin Small, director of specialty projects at Strong/MDI, for solutions to help transform Illuminarium into a seamless sound and projection environment, making the most of Panasonic laser projectors, Holoplot speakers, and other elements. Two essential, proprietary items from Strong/MDI were implemented: Orion high-contrast gray optical coating, and the patented Eclipse sound panels.

The Orion brought the drywall to life as a level-five projection surface. "It had to be level-five, completely flat and viable without the slightest bit of ripple," says Electrosonic's Cooper. Applying it was one of the final steps in finishing out the space, a two-and-a-half-week process requiring tenting and MDI's trained, eight-person team.

The speaker panels, made of aerospace-grade carbon fiber and manufactured in the company's Quebec facility, allow sound to penetrate solid surfaces without visible evidence. They are positioned in front of the Holoplot speakers. Depending on the space, each Illuminarium venue will have 25 – 50 such panels embedded in the walls. "There are speakers and subwoofers placed throughout chapters one and two, including 25 locations with floor-mounted Holoplots on stands made by Metal Masters and hung on trusses from InterAmerica Stage. Holoplot units are all self-powered; the audio files live on Q-SYS and are distributed via Dante," Cooper says.

"It's time to make screen and sound technology equal to the improvements in projection and media, and it was great to see things come together in this way for



Complementing the state-of-the-art projection and audio to surround and engage visitors are a haptic infrasound floor provided by Powersoft, based on a patented moving-magnet direct-drive transducer and driven by matched amplifiers.

Illuminarium," Small says. "I feel that this is ten times better than what the industry has been using for decades. There are no seams or butted edges to collect dust, and no perforations to lose light and pixels. Now there's a different option and we are working to build awareness."

The Illuminarium technology partners consistently praise the Holoplot speakers. The company's new X1 product line is featured in Illuminarium, with 52 units of the X1 Modul 96, a full-range two-way matrix loudspeaker, and seven of the X1 Modul 80-S, a full-range three-way matrix loudspeaker, installed in the walls and ceiling. The speakers weigh 200lb each. Holoplot head of business development Francois Villaret and acoustics/sound system design engineer Natalia Szczepanczyk played key roles on this project. The Berlin-based audio technology manufacturer was founded in 2011 and the initial application of its speakers was in train stations.

Holoplot's key technology is "3D audio-beamforming," which enables precisely shaped and steered acoustic beams to create sound fields in a range of forms and sizes to support multiple sound zones across a space. In the case of *WILD*, it allows sound content delivery to specific zones that may be directly next to each other, such as a roaring lion in one area and a thunderstorm in another. "It allows you to steer that audio and stereo image wherever you want it," Cooper says. "It's quite unique and quite impressive." The speakers come fully integrated with software and IoT capabilities.

Small calls the technology "phenomenal," saying, "It brings a different dimension to the immersive environment, nothing like you've ever heard before. It makes elements on-screen feel like they are sitting on your shoulder."

"The magic of Holoplot is its ability to control how the sound propagates in space," says Illuminarium sound designer Peter Lehman, of Visible Sound LLC. "With Holoplot's control software, we can create wavefronts where audio remains very, very consistent over long distances, or focused beams where the audio travels more like a focused laser to a specific targeted area. Most people haven't heard speakers do these things yet. An array of Holoplot X1 modules is more like an incredibly versatile musical instrument than a traditional sound system."

"The integration of Holoplot technology also allows us to continue to democratize these extraordinary experiences," Allen says.

"Calling the product a speaker doesn't do it justice," says Lindsey.

Complementing the state-of-the-art projection and audio to surround and engage visitors are a haptic infrasound floor provided by Powersoft, based on a patented moving-magnet direct-drive transducer and driven by matched amplifiers. The ability to accurately reproduce audible and inaudible frequencies adds new layers of experience, for example, tactile sensations that correspond to the movement of elephants, the roar of a lion, or the thunderstorm sequence in *WILD*. "These are super

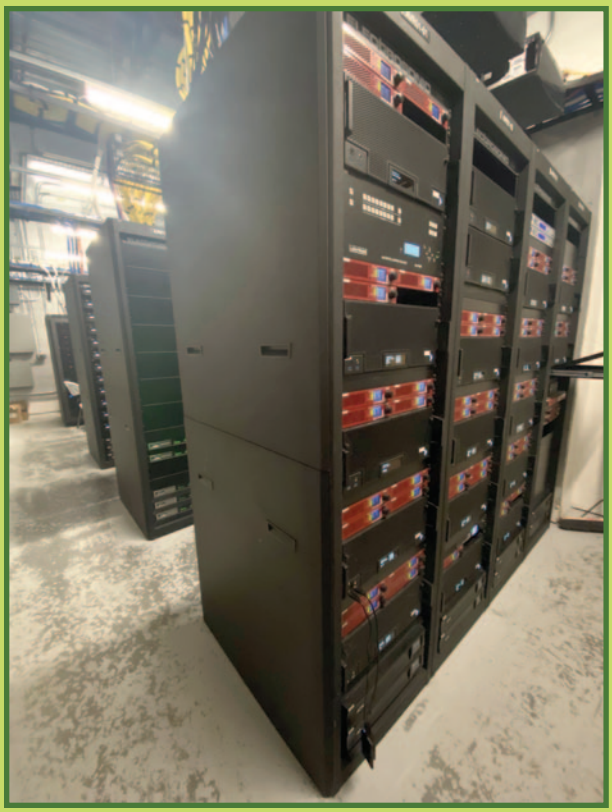
Left photo: Courtesy of Illuminarium Experiences; Right photo: Jordan Vision for Rockwell Group

transducers used for vibration rather than sound," Cooper says.

"Those drivers are so powerful they actually broke the first brackets we put in, and we had to reengineer the brackets," Lindsey says.

The floors have real-time, interactive visual content as well, utilizing the OS0 ultra-wide view LiDAR [light detection and ranging technology] provided by Ouster. LiDAR monitors the situational awareness of guests and triggers a response to certain movements. "LiDAR is how we get 'glob' data to a location for a render stream," Cooper says. "If you are walking across the floor and there's a puddle or pond or something like that projected, the LiDAR is getting that data from the human form being there and giving it to a PC that interprets it and sends it to one of the disguise rx units that triggers video to match."

"We were pushing the limits of what's possible even in terms of creating the generative content on the floors," Nyfield says. "Guests come through in clusters or clumps, the system recognizes that and transmits data to a whole render farm of computers generating content on the spot to the actual group moving through the space." The render farm lives on racks in the EER and was designed as a scalable system with room for future expansion. Strong/MDI is now working with Illuminarium on an upgrade to the flooring system that will enhance the media display and add a few axes of motion.



Inside the server room.

Further rounding out the multisensory environment are authentic scents, provided by SensoryCo and customized for each spectacle.

Workflow

Sound designer and composer Lehman specializes in immersive, high-channel-count audio. His team was brought on while *WILD* was in production to handle all the sound design, effects, soundscape, and the final audio experience mix in the space.

"The mix for *WILD* ended up being 112 channels wide; the source sessions were over 1,000 tracks," Lehman says. "There are 51 Holoplot speaker cabinets that each take their own discrete mix channel. There are also five LFE channels and 32 audio channels to drive the haptic system in the floor, which consists of 141 Powersoft movers. There are also several other mix channels that feed the specially programmed beams that are produced by the Holoplot system."

The team created new tools to deal with unique workflow challenges dictated by the nature of the show. "A 112-channel mix on a 40-minute show is a lot to wrap your arms around," Lehman says. "I had never done a mix with that many channels in the final mix. And there is so much happening in *WILD*. You can be in one part of this big space, watching, hippos, or in another spot, watching lions or elephants—all in the same piece of the show. Traditionally, you are mixing for the sweet spot, but this is completely different—a room where you wander around. We had to create a new workflow to be able to handle all of the challenges. Through scripting and heavy customization of REAPER, we created tools to deal with quickly assigning sounds, or groups of sounds, to any group of mix outputs; automated haptics mixing from any audio source; and on-the-fly, customizable spatial panning to move audio objects through the space." The team, which included Lehman's son Alex and nephew Cory, spent a couple of months in the studio, pre-mixing and creating the unique mix architecture, and two weeks on-site, mixing.

The workflow entailed doing much of the work offsite, trading files back and forth. "We needed to be ready when they had the media loaded," Lehman says. "We were able to get picture and speaker location indicators and assign channels to speakers ahead of time." The audio mixing platform was Reaper "because it is so highly configurable. Each scene and transition has a separate mix. After mixing, we would piece the show together, put it all in a master timeline in Reaper and render the whole show, then push 112 .wav files to the Q-SYS platform."

Lehman notes that having the audio designer onboard early is advantageous for developing immersive spaces. "If audio is important, make it part of creative development," he says. "Instead of contracting for the bare minimum,

The ticketing area.

back-time it a few months and you can open up a partnership between audio and visuals and creative producers." Key interactions for Lehman's team included Illuminarium Experiences (including Brian Allen and visual effects specialists Boaz Livny and Melissa Graff) and RadicalMedia (including owner and founder John Kamen, Jeffrey Wolfe, and Felix Cabrera).

For disguise, the project was also characterized by scale and complexity and the need to customize workflow. "The video server technology of disguise media playback systems pushes the 4K content to the projector space, and Illuminarium Atlanta was one of the largest examples of real-time rendered content at this scale," Kirkup says. The system originally included 18 disguise vx 4 media playback servers and 12 rx rendering nodes able to power real-time generated cinematic scenes at the 240° native field of view captured by the media producer. Illuminarium subsequently upgraded to 45 rx render nodes to generate content in real time on all 18,000 sq. ft. of its Atlanta venue.

Conversations began at the concept stage. "We were involved in workflow conversations all the way through," Kirkup says. "We were on-site for multiple parts of deployment during projector studies, looking at light levels and coverage, gauging the number of servers and outputs, and doing mockups. My role included advising on workflow and resolutions to render content and naming convention files so servers could ID them."

The scale of things pushed the number of servers to 18. "We regularly run multi-server shows, but not 18 servers, more like six," Kirkup says. "There are 13.8 B pixels per second being played out from the servers. That's an awful lot of pixels, way beyond a movie in a theatre in 4K—this is 4K every few meters and in high color fidelity, using the best-looking video codex and real-time content. It all becomes very rich. Illuminarium had the appetite to push the envelope, and we really felt the appetite to push as far as technically possible. That's where my team comes in and shines."

The team made use of Notch LC video codec, a generative content creation platform that integrates with disguise software. "It enables you to embed content greater than eight-bit and is designed to allow more granularity of the video signal, so you don't have steppy colors while still retaining the ability to retain these crazy resolutions," Kirkup says. The Illuminarium system color gamut is Rec. 709. "The team at RadicalMedia did a whole set of color treatments, adjusting to make the color work on those specific projectors and in that setting."

Kirkup emphasizes that what disguise provided extends significantly beyond simple media delivery. "We offered Illuminarium some of our first hard drive upgrade kits to 60TB storage, and every server has upgraded storage to a larger capacity," he says. "We also upgraded the networking capability of the vx machines to support real-time content. The key thing is that disguise enables that end-to-end process, an integral part of the entire creation of the space with previz and workflow tools that enable delivery—but, also, it runs the show. It's all about collaboration."

Lighting and special events

The scope for Focus Lighting ran from schematic design to completion of construction for the exterior façade, ticketing, café, retail, outside patio, and the main experience space, including illuminated ceiling panels and mobile bars. Key members of the team, headed by principal Brett Andersen and senior lighting designer Justin Keenan Miller, were associate designer Asier Mateo, project manager Lauren Lanzotti, and assistant project manager Nic Christopher.

Installation was handled by general contractor Turner Construction and electrical contractor Inglett & Stubbs. Focus Lighting also did the Las Vegas Illuminarium and is working on upcoming locations.

"While our scope of work was primarily within the project's front-of-house areas, we also designed the lighting for the mobile bars and the illuminated ceiling within the Illuminarium experience rooms," Andersen says. "These elements, along with their required power and data infrastructure, help to enhance the environment when the experience rooms are rented out for special events."

Focus collaborated with Rockwell to create hanging ceiling panels with integrated lighting to help conceal the projectors and other equipment above, and to make the ceiling come alive as part of the experience. "We needed these backlit panels to be made of a material that would allow light through, but we also needed them to completely disappear when the backlighting was off—a simple layer of white diffusion wasn't going to work," Andersen says. The Focus team partnered with SEG Systems to manufacture these custom units. "SEG has lots of great products to create backlit boxes, but we still needed the right material to go in front of the lighting. After considerable experimentation, we discovered the perfect combination was a sandwich of three different fabrics from SEG and Rose

Photos: Courtesy of Illuminarium Experiences

Brand. The layer closest to the lighting is a white diffuser. The middle layer is a black RP screen. The third outer layer is a black sharkstooth scrim. With the three fabrics layered together, we get the diffusion we need to avoid seeing the LED pixels when they're on, and the RP screen and the scrim give us the inky darkness and lack of reflection when the LEDs are off." The lighting behind the diffusers is provided by a series of DMX-controlled, RGBW light strips supplied by SEG. "They are configured with an inner square and an outer ring that are controlled separately, allowing us to mix any color in each," Andersen says. An eight-channel DMX driver is mounted to the back of each panel, with DMX lines running to each.

All the panels are controlled by an ETC Mosaic system, one of two on the project. "One handles front-of-house guest lighting and another, separately linked with the disguise video system, controls the ceiling panels, mobile bars, and anything else that gets added," Andersen says. "Our project managers designed, built, and programmed the front-end lighting interface for operations. The Mosaic touch panel gives them control to trigger scenes and pick custom colors for all the different RGBW fixtures, including lights on the exterior of the building. Even the illuminated signage outside the building [consists of] pixel-mapped LEDs that can be animated. A wonderful thing about the Mosaic is that it has a ton of flexibility—it allows us to do custom coding, which opens up a whole new way of thinking about lighting control."

For special events, there is a manual option for staff to control lighting on the fly. The manual controls are superseded by the disguise system when the main show is running. Additional infrastructure in the ceiling space can support a working theatre rig and enable future upgrades. Miller says, "There are about 89 data and power points distributed across that ceiling. A designer can take control of those ports through the Mosaic or an outside theatrical console and bring in moving lights or strobes. We were tasked early in the course of the project with creating this flexibility."

The mobile bars are a key element in the nighttime aspect of Illuminarium and are brought to life with lighting to tie in with events' colors or to the video experience. "We designed them to use RGBW LED light panels on the front of the bars behind frosted acrylic," Miller says. "To make them more flexible, we are now working with City Theatrical to integrate them wirelessly, so that in future they can be used in other areas of the space as well as outside while still controlled by Mosaic and disguise."

"The bars were a first-of-kind challenge," Andersen says, "and a test bed for a lot of ideas still being developed."

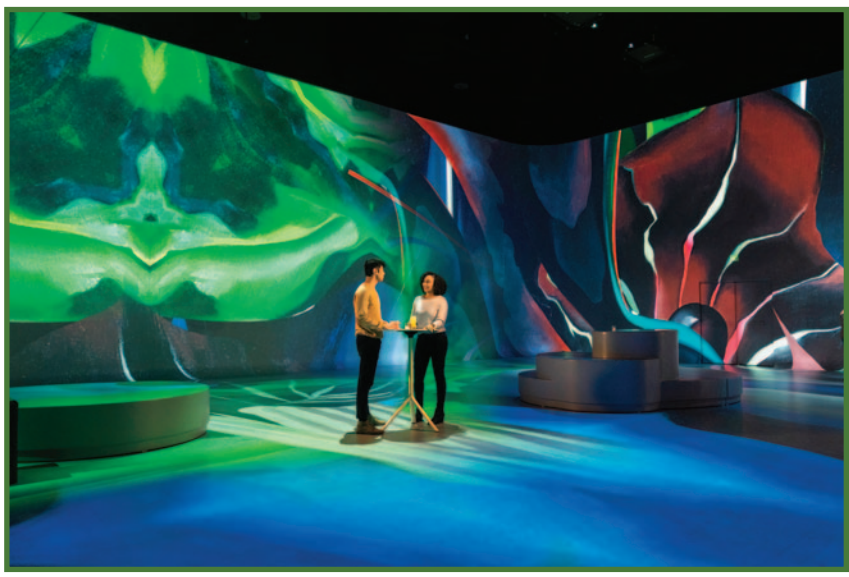
Lighting for the front-of-house areas and outside patio was designed to encourage longer stays and to attract passersby. Andersen says, "We thought about those spaces like any hospitality project—we used light to help make them both inviting and comfortable—brighter and crisper during daytime, warmer and more dramatic at night."

Collaboration and MEP

EXP was engineer of record for the mechanical, electrical, plumbing, fire-protection, and technology design systems, contracted to Legends. The EXP team was overseen by vice-president Dan Christman and project manager Jonathan Turner. Their quality-control team included Brandon Lemonier, Mike Culver, Damon Lynn, Eric Knauth, Aaron Borges, and Kasey Carey. Their design team included Sarah Manley, Spencer Combs, Kaitlyn Gardner, Eduardo Casas, Greg Unger, Chris Zwicky, and Stefani Petreski.

"We spent about 18 months on the attraction as a whole," Turner says. "Probably the most challenging aspect was coordinating support of the chapter room projection systems." The 8'-high ceiling space above the show wall had to accommodate projector locations, trusses and their mounting points, HVAC, data cabling, power distribution, fire-protection piping, and more. "All these vendors needed a piece of that ceiling pie," Turner says. "The initial plan had to adjust to in-field changes, with the projectors at the top of the hierarchy. We designed a sheet metal plenum box behind each projector for the HVAC to keep them cool, and some of those boxes had to be shifted or resized as the projectors were adjusted."

There is a considerable degree of sound and vibration produced by the speakers and haptics, and a lot of air movement through very large ducts. "The team brought in an acoustician, Akustiks," Turner says. "We coordinated with them to get a certain noise rating from the rooftop air-handling units and to create a vibration and sound-damp-



After hours, the space morphs into a themed nightclub with ever-changing projected environments and mobile bar units.

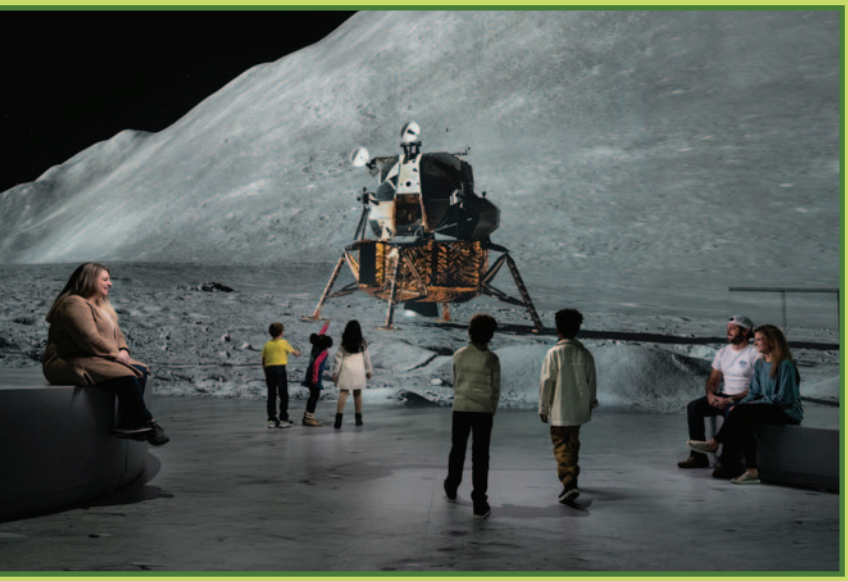
ening system to reduce transmission from the roof to the chapter spaces. The projection system is extremely sensitive to any vibrations, so it was imperative to reduce or eliminate all vibration from the mechanical equipment. For the sound transmission, we used specific turn vanes in the ductwork bends to dampen the sound of the air movement. They smooth out the air pattern but don't impede airflow. Rooftop units and other mechanical equipment were placed away from chapter rooms, and the chapter area itself is isolated with a full-height acoustical wall."

The number of show-related data racks required grew substantially over the course of the project. "The sheer amount of space needed to push content to the projectors was pretty impressive," Turner says. "Design started with ten racks, which grew to 14, which then grew to 36. I'm so proud of our team to be able to absorb that and to come up with an air-cooling solution for the rack room that is effective but also very economical and space-conscious."

Turner's team also worked to reduce fifth-wave harmonics on the electrical distribution system, which, in turn, reduces energy usage. "Switchboard metering lets us view harmonics, enabling us to consider solutions to mitigate undesirable impacts in the electrical wave form. We can smooth out the sine wave curve to make the system more efficient."

Scratching the surface

Looking ahead, another way Illuminarium will continue to evolve its model while maintaining repeatability is in the scope of its control platform. Electrosonic put into place an ISAAC platform, running Medialon as the overall control system, with a view to expanding Isaacs's role in future. "We are not really utilizing Isaac yet to its potential, but it will eventually provide full control, tied into each Illuminarium venue," Nyfield says. "It's there, waiting. We have two on-site service techs tasked with maintaining the health of the system and starting it every day. There are touch screens tied in with Medialon and several pre-set modes for daytime, nighttime, and special events."



Future attractions include SPACE, which takes guests on a journey to the moon and beyond.

Looking back at the critical period leading up to opening the flagship Illuminarium in Atlanta, the central EER on the second floor of the building, where the disguise units and Powersoft amps are housed, was the site of much activity. "In the final months there were 20 – 25 people on laptops in that room," Lindsey says.

"The foresight to try to account for everybody to have their own workstation made a lot of sense and is something I feel good about putting into the system," Nyfield says.

"It seemed best to have dedicated stations to give all programmers space to do their work, anticipating that we would be working with all these partners during crunch time," Nyfield continues. To accommodate the collaboration, it was laid out with three dedicated workstations (media players, audio, and interactivity) in KVM pullout drawers, each with its own monitor and window to the system, plus additional ports to allow more users to connect their laptops and dial in. "There was such a level of experimentation between trades, we knew we were going to have the experts in the room to talk to one another. It was not a mad scramble but a lot of activity and a lot of collaboration that needed to happen."

The story of Illuminarium is a dream tale of vision and innovation in a supportive and fertile atmosphere of creative experimentation, with cutting-edge tools and top-level participants. We look forward to its next chapters.

"Brian Allen is very technical, very aware of what the industry is capable of," Nyfield says. "That knowledge, along with the creativity he brings to the table, opens a world of possibilities in regard to what AV can do. It is really fun working with him, taking what is rattling around in his head and turning it into reality. He is always brainstorming what's next."

Kirkup says, "Illuminarium has created the best-looking, most immersive projection experience ever, integrating other systems and real-time content in a way not previously done to this scale, creating an aesthetic and experience that are next-level."

"There is a magic that this surround format contains in terms of story structure and narrative; that's where the creatives can start having the most fun," Lindsey says.

"As of today—and you know how fast things change—this is the bleeding edge technology in terms of display," Cooper says. "The arms race will continue—there are a lot of plans in place and lot of power to help make that happen."

Allen says, "We are taking things out of the passive world and putting them in an interactive world and you're tying those to emotions. It has unlocked creative storytellers and what we're doing now only scratches the surface of what we can actually do."