www.lightingandsoundamerica.com

PLASA February 2009

Lighting&Sound America

0.00

Entertainment, Presentation, Communication

California Academy of Sciences

A greener approach to museums

Concerts:

AC/DC's *Black Ice* world tour

Circus:

Cirque du Soleil's *ZED*

ALSO:

The sound of *Shrek*

City Theatrical's SHoW DMX

A new performing arts center at John Cooper School

Riedel's Artist digital matrix

Lighting for a museum gala

In style and content, the California Academy of Sciences points the way to a greener future

By: Judith Rubin

Last year marked the second time the California Academy of Sciences in San Francisco rebuilt itself after an earthquake.

In 1906, the buildings—and most of the exhibits and collections of this venerable educational institution, formed in 1853—were wiped out. In 1916, it was re-established in Golden Gate Park, some distance from its original downtown location. When that building was damaged in the 1989 Loma Prieta quake, the Academy set out to remake itself, with more square footage (410,000, of which 100,000 are reserved for the public), but a smaller footprint and environment impact. The $488-million price tag, funded through a public-private partnership, includes the new five-level facility, which opened last September, as well as the costs associated with the temporary home maintained on Howard Street for several years. The three components—the Kimball Natural History Museum, the Steinhart Aquarium, and the Morrison Planetarium—are housed in architect Renzo Piano's celebrated LEED Platinum-certified structure, with its 2.5-acre, native-plant roof garden.

California Academy of Sciences was the North American winner of the Silver Holcim Award for Sustainable Construction, in recognition of its innovative "green" design. Piano calls the vast, open, high-ceilinged, slab-construction space "very organic," and, indeed, some very big design challenges arose in making this energy-frugal, natural-ventilation, sunlight-filled building compatible with any number of agenda items –including supporting the latest interactive and display technologies,

Photo: Thinc Design, New York

housing live animals, nurturing a rain forest, and protecting fragile specimen collections. However, the Academy sought to create a model of green building both inside and out–and that is pretty much it has done.

"The client stuck to their guns completely," says Blair Parkin, managing director of Visual Acuity, lead media and technology consultant to the project from 2002 until its opening. Parkin's team wrote most of the overall technical specs for the building. "Technologists were part of the early master planning," he says. "We began by working with Renzo Piano Building Workshop of Genoa, Italy, Stantec Architecture, and engineers from Ove Arup [other base building contractors include SWA Group, Webcor Builders, and DRY and Associates], then started with the technology supply community. Then we moved on to interfacing with Academy research and production staff and the third-party companies charged with producing systems and content."

The building contains a great many digital media systems. According to Parkin, the use of digital DVI inputs for video projection, along with fiber-optic IP networks for computer, audio, and video data, created an infrastructure with less need for cabling. Frugal heat and power budgets were the rule, and gear was sourced and specified accordingly. The many ingenious solutions that designers applied inside this environment should help set the tone for future projects of this type.

Top: An architectural drawing shows the roof garden. Bottom: Looking into the Kimball.

Cinnabar's kit of parts

"I feel like our next company ad should read, 'No black box? No infrastructure? No problem!'" says executive producer Jonathan Katz. His company, Cinnabar, produced 35,000 sq. ft. of exhibits for the Academy, primarily those for the Kimball Natural History Museum. Katz, who produced several exhibits for the Academy's temporary facility, met regularly with Piano and his team (represented in San Francisco by Brett Terpeluk) to shape a mutually agreeable vision for the exhibits under his direction. From this dialogue came the concept of the "kit of parts"—free-standing exhibit modules, designed with a set-builder's sensibilities. (Cinnabar has a background in building sets and props for television and film).

The modules are made of plywood and metal—with evenly spaced holes to hang lights and AV gear—and plenty of electrical outlets. The basic materials, finishes, and exposed fasteners complement the architectural aesthetics, and provide an economical, durable, flexible system. "These were built with the idea that they will be repurposed at a later date," says Cinnabar's project manager, Jeannie Lomma. "They are very hardy, made primarily out of metal channels designed to fit together. You can build off the main chassis any number of ways, and put runs of them together. The anchors, which function as tie-down points, occur every 8', and are designed to carry quite a bit of load. Each kit of parts anchors to the facility at strategic points in the floor, where there are power and AV connections, and to tie-points in the ceiling."

A greenscreen [a wire mesh product that architects use for vines] hangs over each module, helping to define a human scale within the 34'-high ceilings. The space above the modules was used to dramatically suspend large items, such as a T.rex skeleton that hovers in foreboding beauty over the Extinction exhibits, and a blue whale skeleton in the Oceans area.

The kit of parts fulfills another need—providing the archival climate-control and life-support systems essential to the presentation of the Kimball's specimen collection and the display of live animals. The latter are juxtaposed with multimedia, light-

"Piano calls the vast, open, high-ceilinged, slab-construction space 'very organic,' and, indeed, some very big design challenges arose in making this energy-frugal, natural-ventilation, sunlight-filled building compatible with any number of agenda items—including supporting the latest interactive and display technologies, housing live animals, nurturing a rain forest, and protecting fragile specimen collections."

Renzo Piano's design is meant to be organic and to blend into the landscape.

Photo left: Courtesy of California Academy of Sciences. Photo right: Joe Fletcher

Photos: Tim Griffith

boxes, images, and graphics throughout the exhibits. The building infrastructure didn't supply them, so Cinnabar integrated these systems within the modules themselves. "We had to put a lot of advance thought into where the exhibits would go," remarks Cinnabar's AV consultant, Tom Mulally, of Numagic Consulting Los Angeles. "Because of the radiant heat floors, you couldn't do normal cable runs. Cinnabar's Gus Marino handled all our electrical needs." Each module has multiple outlets, providing additional circuits to plug in lighting and AV, or appliances, such as vacuum cleaners or external media players, so that additional power is available without disrupting the exhibit systems.

Each module also houses its own gear, independent of the rack room in the basement. "We decided to keep everything local, since these were to be flexible exhibits," says Mulally. "That way, if one or two get moved, you don't have to change things in the control room."

There are dozens of media systems—video players, interactives, and kiosks—and most of them incorporate Mac Mini desktop computers, donated by Apple. The system design/integrator BBI Engineering Inc., the AV supplier for most of Cinnabar's exhibits, wrote custom control programs that turn Mac Minis into professional video servers, allowing for real-time captioning and synched video playback. Mindi Lipschultz, the media producer, created 31 digital video pieces, including interactive games, kiosks, and mini-documentaries for these exhibits, heavily utilizing material from the Academy's archives. "Mindi might not know what format her source material would come in, so there was sort of a loose design approach," says Mulally. "I was apprehensive about using consumer equipment, but it worked really well. We were able to play the Mac Minis all exactly the way we wanted—and, if necessary, they're easy to replace."

"We developed a proprietary product for the purpose of doing these controls out on the floor—the microMSC, or multifunction show controller," says Mark Roos, a principal of BBI. "It combines an Ethernet switch, audio signal processor, and serial connection in a very small box; all you have to do to put a Mac Mini on the floor is add one of these boxes." It was a useful approach because, even well into production, things got moved around. "We were making equipment changes on the spot," adds Mulally.

Some acoustical treatments, provided by Ove Arup, were suspended from the ceiling, but there are none on the concrete floors, and the open space, filled with hard surfaces, is fairly live. "We were very conscious of trying to achieve the best acoustic isolation with everything in one big

room," says Roos, whose team included Sasha Harris-Cronin, Lisa Dunmeyer, David Kaufman, John Ross, and Richard Shields. To confine audio, BBI provided phased line-array speakers for various media installations, such as a Dakota FA-501 array (a 36" flat panel suspended overhead) for the popular Insect Collecting Game, in which users manipulate an infrared wand to simulate the experience of capturing insects in Madagascar. Zeek Productions created the media using Macromedia Director, and Chuck Boucher of Craniac devised the IR control system. The 40" LCD display uses a Samsung 400PX and two infrared cameras. For other kiosks, BBI installed line array loudspeakers using either eight 2" drivers or eight 3.5" drivers, which were made for BBI by Innovox. The arrays are all driven by BBI proprietary eight-channel DSP amps.

The video mini-documentaries, run automatically when visitors are nearby, are triggered by Visonic Klip 4N motion sensors. Synchronized captions are triggered by pressing a button. The vast majority of the media displays are seen on 40" Samsung 400 PX flat panels, mixed in with a number of 23" Apple Cinema displays. (There are also some higher-end flat panels, 52" NEC 5220-AVs, used for digital signage and for the Science In Action updatable media exhibit.) For a mini-documentary exploring Galapagos undersea wildlife and using a round screen, Edwards Technologies Inc. (ETI) supplied an NEC WT-610 rear-projection system, with a pair of Tannoy DI-5 speakers, a Stewart processor/amp, and Mac Mini server, built into an enclosure to help localize the sound.

Snibbe Interactive provided three custom interactive media experiences. The Arctic Ice, located on the west side of the museum, exhibit focuses on climate change. Visitors enter a room filled with a projection provided by a NEC NP4000, and use their bodies to block sunlight from melting polar ice floes, helping a baby polar bear reach its mother. A Sanyo PLC-XF70 unit provides the infrared sensing. On the east side of the museum, Bug Rug, part of the Madagascar exhibit in the Islands of Evolution gallery, is an insect-themed interactive floor. This infrared sensing system uses another NEC NP4000 video projector, a pair of Tannoy DI-5 speakers with a Stewart PA-70-2 amp, and four Clover IR 030 infrared illuminators. The video plays on a 32" Samsung 320PX monitor fed by a Snibbe custom server with a BBI microMSC controller. The Island Colonization interactive table in the Galapagos exhibit uses a pair of NEC LT380 projectors, a pair of Snibbe-customized PCs, four Tannoy DI-5 speakers, a Stewart processor/amp, and a BBI microMSC control interface.

Each area of the museum has a separate control system, but each must speak the language of the custom-built AMX-based master controller provided by BBI. "We can control each component, be it audio or video, to minute levels," explains Roos. Staff members can rely on presets or make manual changes from the control room. The web-based interface also facilitates remote control and remote support, which BBI is providing.

First Circle was contracted by Cinnabar to provide the lighting design for the Kimball Natural History Museum and other areas. "The guiding light for the kit of parts was to keep it simple," says First Circle's founding principal, Peter Maradudin. "It has a sort of tinker-toy quality, with everything exposed, including the lighting. Our design had three basic elements: Provide a broad wash of light for the large panels [Vode linear fluorescents], accent small graphics or displays

Cinnabar's "kit of parts" exhibits are designed to be used in various ways.

Photos: Joe Fletcher

[Vode MR-16 spotlights], and have something inside the displays that wouldn't generate any heat or UV [LED striplights by Hera]." The custom-made Vode floods and spots "have a very clean, almost unassuming, aesthetic to their fluorescent light fixtures, appropriate to what Renzo Piano was doing in the rest of the building and to what Cinnabar was doing with modular construction," says Maradudin. "Vode's president, Tom Warton, would talk about how he went to the old Academy as a boy. It was partly a labor of love for them."

Some of the floods attach to the modules with custom 16" extension arms made by Cinnabar, and others join directly to the grid openings at 8" intervals. "Part of the brief with Cinnabar is that these are movable over time," notes First Circle founding principal Matt Levesque, "so we made them easy to move. They are bolted to the steel structure by a long tube with a slide mounting armature."

Others associated with this part of the Academy were the environmental design firm Volume, environmental designer Tim Martin Design, exhibit designer Craig Hodgetts, installer Laser Exhibitor Service, exhibit writer Carolyn Collins Petersen, general contractor CCI, construction project manager Don Young, base building contractor Webcor, director of visitor interpretive programs Carol Tang, and director of project management Scott Moran.

Tusher Hall features 16 dioramas depicting the terrain and wildlife of Africa.

Photo: Peter Maradudin

Antelopes in the footlights

Cinnabar also applied its set-building skills to production of Tusher African Center, an enhanced recreation of the old Academy's African Hall. This vaulted space features 16 dioramas depicting the terrain and wildlife of various regions of Africa visited by Academy scientists. All the original's painted backdrops were authentically recreated and the specimen animals touched up. Four interactive kiosks were added, for which Lipschultz produced a series of safari videos exploring the various regions. Dakota MA-4 line arrays provide focused sound at the kiosks that share the room, with its popular live penguin program.

"The guiding light for the kit of parts was to keep it simple. It has a sort of tinker-toy quality, with everything exposed, including the lighting."

For the largest diorama, Lipschultz produced an animated sequence, a herd of elephants slowly traveling across the plains in the distance. Video was painstakingly edge-blended into the painted background. The system, provided by ETI, consists of a Mac Mini with custom video player software provided by BBI, a Panasonic PT-D4000 projector with four JBL Control 25AV speakers, and a Crown CTs 4200 amp providing the soundscape, as well as BBI's microMSC for control.

First Circle lit the dioramas with a combination of fluorescents above and LED accents below. "It was a simple, low-voltage system that didn't produce any heat, and the LEDs allowed us to install very small luminaires to put light into the animals' faces, giving their eyes sparkle and their faces more punch," says Maradudin. "The fixtures are tiny—smaller than your fist, and we located them on the floor, protected and hidden from view by the frame around the glass barrier, like little footlights."

"It's like vaudeville uplighting," notes Levesque, "and some of these specimens are more than 100 years old, so they were around during the age of vaudeville. It's an unconventional application, using LEDs as a fill. They're actually a model designed for wet applications, but we selected them because the way they're constructed allowed us to slide in a gel. I've seen gels used with LEDs in theatre, but they were just taped over, not permanent."

The outer two limestone walls of African Hall, which first opened in 1934, were conserved for aesthetic and historical value, and are the only structures from the old Academy present in the new building. Both

Above and pages 56-57: The Water Planet exhibit.

African Hall and the Foucault pendulum, installed in 1951, were beloved attractions that returned with updated designs and technology in the new building.

Even the labels are digital

Thinc Design was lead exhibition designer for the new Steinhart Aquarium, in addition to other "living exhibits," including the 212,000-gallon Philippine Coral Reef tank, the Rain Forest, the 100,000-gallon California Coast exhibit, the penguins in African Hall, and the albino alligators in the Swamp. Thinc brought in the architectural firm Urban A&O to help realize its vision for integrating the Aquarium's fish tanks into a heavily themed environment, with multiple audiovisuals and elaborately shaped, blue fiberglass wall surfaces that evoke the feeling of water. "Thinc has the experience with aquariums and Urban A&O has the form-making," explained Thinc principal Tom Hennes. Mike Shakespeare, also of Thinc, was the lead project manager and project designer, working closely with Joe MacDonald of Urban A&O. The director of Steinhart Aquarium and chief of public programs for the Academy is Chris Andrews.

Urban A&O used CATIA software to plot the forms for the walls and exhibit islands. The files were sent to Wild Factory, an automotive supplier, where they were translated into full-scale high-density molds. The molds, in turn, were shipped to Prototype Sources, laid out with fiberglass, finished, and painted. "Of course, the walls were so huge they had to be subdivided," notes MacDonald. "We developed a joint detail, similar to that of an automobile door or trunk joint. Forming the islands posed additional challenges, because they needed to house technology, life support, and plumbing. The shapes also accommodate public circulation: "Sometimes they swoop out to make a bench." The manufacturing tolerances were precise. "Because the walls had to be so precise, we cut out templates that were placed on the floor, so the contractors would build up to them and have a perfect match. Our high-tech walls went over their walls."

The aquarium's showpiece is Water Planet, a room that is flanked by the California Coast and the Coral Reef exhibits. Once an hour, the lights go down inside the room, transforming it into a 360° projection theatre for a five-minute video about the importance of water on Earth. The display uses 10 projectiondesign F20 sx+ units, which project onto the top 6' of the room's sculptured walls. AV and control systems were provided and installed by BBI. The media, produced by UV PHactory, plays off five Delta media servers supplied by 7th Sense. The LED lighting design was by Ove Arup. Visual Acuity was the lead media and technology consultant on the project. Meyer Sound supplied the eight-channel sound system. "Having done a lot of theatre and projection work in the past, I was convinced we could project onto these surfaces and still have the video work," says Hennes. "We did a lot of testing of different degrees of gloss and luster of finish and found something that did what we hoped it would do—a wonderful, tactile blending of imagery and surface. It was ultimately an automotive finish with a relatively matte gloss coat."

The aquarium also features a digital signage system for the exhibit labels. Each fish tank has an 8.4" LCD panel by Apollo Displays. Apollo's ArtistaNET and ArtistaMedia boards allow for multiple images and text to be displayed and managed from one server. "It was cheaper to do it digitally than print it," said Hennes. "We were originally not going to network these, but the cost continued down, and then we wanted to network them so they could dim down during the Water Planet the show."

Thinc designed, and BBI created, eight interactive exhibits inside the aquarium. Four "wet interactives," where exhibits, interactive projected touch-sensitive images, and running water are combined. The projections are thrown straight down to a horizontal surface and are provided by three projectiondesign F10 sx+ units. The Dive Station interactive encourages the personal exploration of specimen objects, using a table that is a sloped, rear-projection surface and reacts to RFID chips in the object being handled. The projectors are Toshiba short-throw widescreen

Photos: Thinc Design, New York

models, and the projection surfaces were supplied by Stewart Filmscreen; also used are BBI customized circuit boards, and AMX controllers. Control software and video playback runs on Mac Minis.

Inside the four-story glass Rain Forest dome, part of the Aquarium, visitors enjoy an environmental soundscape provided by Wild Sanctuary Communications. The speakers are 5" Tannoy DI-5Ts, with Crown CTS 8200 amps and playback off BBI proprietary show controller/audio units.

Hennes cites Parkin and David Person, from Teecom Design Group, in addition to Bob Haroutunian, as all playing roles coordinating the digital infrastructure of the building. "We wanted to centralize the servers as much as possible. Before we were able to know just where we would need them, we laid out a series of connection ports so we'd be able to plug in. As things solidified, we placed protectors."

Hennes praised the lighting design by Jason Edling of Arup. "Joe wanted to light the edges of the fiberglass panels where they flare out, at the vertical transitions. The walls don't touch and there's a reveal behind each corner. To create detail there, an LED strip goes in, concealed so that the light is caught by a piece of curved Centra material, and creates a diffuse glow. Pairs of green and blue strip lights mounted above at different angles create shadows and rhythms of color on the undulating surfaces." In the course of installation, the team ran into a setback. "There were these weird shadows," says Hennes. "They were a result of putting linear lights on curved diffusers. The baffles were causing shadows on the concavities. We had to add an eggcrate diffuser to eliminate them." There were also challenges balancing the needs of the animals with the show lighting. "Jellies and reptiles and certain other creatures need certain spectra of light to be healthy," explains Hennes. "In some cases, as with desert lizards, you need the equivalent of daylight. And some animals, such as leafy sea dragons, really hate to have the lights turned on and off."

"We were looking for someone to integrate everything into the islands," notes MacDonald, "and in the end we never found that integrator, apparently because this kind of project was such new territory. So the fiberglasser took it upon himself to play the role, because he was so invested in the forms he had just fabricated. He had to invent a tool that would screw the walls together."

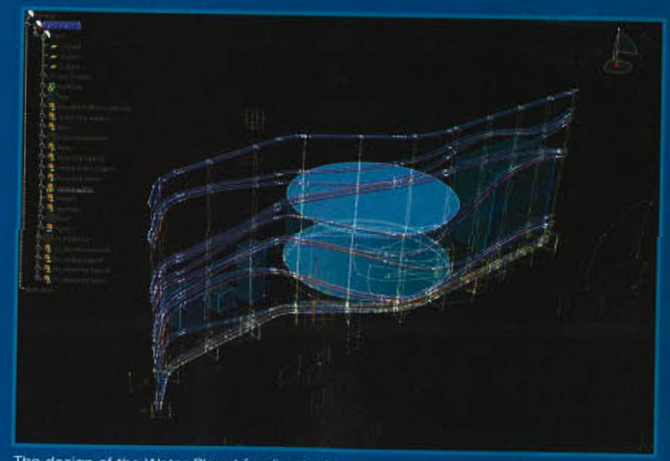
"This was new territory," remarks Hennes. "We were dependent on the kindness of strangers."

Some exhibits' project management was provided by Rhodes Dahl, here as well as in the Kimball Natural History Museum.

One big digital multimedia venue

"Murphy's Law gets up two hours before everyone else," quips James Sweitzer, Ph.D., project manager for the new Morrison Planetarium. Sweitzer, of Science Communications Consultants, joined the team six months prior to opening and played a critical role in its consummation. "We had to make quick decisions," he says. As a doctor of astrophysics who can talk to digital media producers, general contractors, and museum curators as well as his fellow scientists, Sweitzer, who also teaches at Columbia College Chicago, admits to an "unusual" resume "in museums and planetariums, my whole professional career—except when I helped build an observatory at the South Pole."

Inside the Morrison dome is a 290-seat, state-of-the-art digital dome theatre featuring what's known as a "fulldome" system. Fulldome is an emerging technology that has become a popular replacement for optical star projectors, and is now being adopted for some entertainment applications. The 75' diameter dome in the Morrison is about as large as they come. The seating is steeply raked, at 30°, and the dome screen is tilted to the same degree, encouraging visitors to feel that they are sitting in the midst of space. Mimicking the tilt of planet Earth, the dome is cantilevered out over the museum's 212,000-gallon Philippine Coral Reef tank. The tilted frame, composed of 100% recycled steel, provides attachment points for the plaster and fiberglass panels that form its exterior surface.



The design of the Water Planet feeding tanks.

USEUM

Fulldome systems combine real-time systems with the ability to navigate digital databases in real time for star shows and tours of the Universe, with playback systems that deliver "pre-rendered" shows. The Morrison has additional capabilities for remote networking, and for displaying and streaming material from a variety of sources. For example, it has the capability to broadcast live NASA feeds related to current missions and connect visitors to Academy research expeditions around the world.

Several leading manufacturers cooperated in providing and installing the components of the fulldome theatre. Global Immersion (GI) engineered and fitted the planetarium display system, part of the theatre control and management system, and one of the three back-end server clusters. "For the display hardware, we installed what we call 'Fidelity Bright,' says GI chief executive Martin Howe. "We integrated six projection-design F30 sxga+ DLP projectors into the theatre, each projecting a resolution of 1,400 x 1,050 and with fully configurable brightness up to 6,500 ANSI lumens. They are ideal for projecting the night sky and other scientific content onto the dome. We custom-designed and fitted our optical blending technology so that the audience views one large, uniform image." The GI media server streams uncompressed, high-resolution content straight into the dome.

Sky-Skan Inc. installed a six-channel output definiti graphics cluster that feeds one source of content into the Fidelity Bright display system. SCISS AB of Sweden provided its Uniview software for a separate real-time computer cluster. Both work alongside the GI server rack as data visualization platforms that can "fly" the audience through the Universe. Spitz Inc. supplied its NanoSeam projection screen. Although the screen is constructed of separate aluminum panels, the seams between the panels

The exterior of the Morrison Planetarium.

Photo: Tim Griffith

are designed to disappear with proper lighting. Tiny perforations across the screen enable audio speakers and other equipment to be located above and around the outside of the screen. Sky-Skan also installed the Meyer Sound audio system which consists of three CQ-1 loudspeakers (left, center, right), nine UPJ-1Ps as side and rear surrounds, one UPJ-1P at the zenith of the dome, eight X-800 extended range subwoofers, a pair of Matrix3 audio matrix/processing frames, and a Wild Tracks 24-track audio playback system. BBI was contracted to GI to provide some infrastructure in the form of fiber optics, Cat 6 cable, and projector mounts. Visual Acuity was the technical visualization design consultant.

Mindful of the half-life of technology, there are plans to keep the Morrison on the cutting edge. "Technology plays a central role in modern planetariums, with relationships that last long past the delivery date of computers and projectors," says Ryan Wyatt, director of Morrison Planetarium and science visualization. "We look forward to working closely with the talented people in the companies we have selected, and our efforts will redefine how science visualization integrates into planetarium programming." The Morrison is currently screening its first in-house fulldome show, "Fragile Planet."

As the director of visualization, Wyatt's digital territory encompasses not just the planetarium dome but also the four big Science in Action plasmas and a stereoscopic 3-D digital cinema on the second floor. "It's DCI-compliant but we also have a way to get into the system to allow us to do other formats," says Wyatt. The 3-D projection system uses Dolby playback and Barco's DP-2000 digital cinema projector, with Dolby's specially-designed reusable goggles. Stewart Filmscreen provided three projection screens for the 3-D theater, which also are used to display 2-D content, projected by Digital Projection International Titan projectors. The audio processor is a Media Matrix

Nion. Installers were BBI and Bay Area Cinema Products. The Meyer audio system is a surround cinema setup, using UPQ-1P (left/right), UPJ-1P (center), 12 UP-Jr (surrounds), and 2 750P subwoofers.

Also part of the new Academy is the custom digital production studio, built specifically to serve these multiple digital displays, which will help keep the intended continuity of look and message between one space and another, and support the Academy's goal to be a content distributor to other facilities. The facility includes six 3-D and two 2-D workstations, two Avid video production workstations, and a 112-node render farm; BBI provided fiber-optic interconnects and Think Logical switching equipment. With a production timeline of seven months for the Morrison Planetarium's debut production, "Fragile Planet," developing a speedy production pipeline took top priority. "We worked closely with SCISS to create a completely Maya and Uniview production environment," notes Wyatt. BBI provided fiber-optic interconnects and Think Logical switching equipment.

BBI also worked with designer John Cavala and Academy Studios on the in-house research lab, where visitors can watch a scientist performing research and ask questions via a Meyer PA system. The scientists' activity is projected onto rear screens provided by 3M Vikuity. The system uses F20 series projectiondesign projectors and Geffen DVI extenders to transport the high-resolution video signals over Cat5 and Cat6 cables. PA systems on the east and west side of the building, also installed by BBI, use Meyer MVC-5s in the large spaces and Tannoy Di6 DCTs elsewhere.

BBI's master control system has a number of layers. "The supervisory system consists of AMX Netlinx controllers," says Roos, "and we are in the process of delivering a monitoring system that communicates with AMX's RMS monitoring system. This system provides a graphical interface for AV in the museum, logs errors, and looks at all the AV systems in the building." The remote support network provided by BBI is based on using VPN connections to either the AMX equipment, or the specific exhibit PCs or Macs or the Nion audio processor, according to Roos. "We do things like global volume control, and control by gallery. A docent can carry a PDA-type device and control the volume of exhibit with that. It's programmed to allow handheld devices to control audio, and works with any browser-based PDA and a password."

Controls at the lower level are implemented on BBI show controllers. "The big controller, MSC-4MP3, is being used for most show control, and anything that requires precise timing is on a BBI box," says Roos. "In this green building, the computers go to sleep and wake up over the LAN. It conserves energy for the life support systems."

On the roof observation area, BBI installed a 60" custom line array from Innovox, consisting of sixteen 3.5" loudspeakers for announcements.

Sticking together

Another Academy goal: thematic cohesiveness throughout the facility. "Utilizing the latest technologies, Steinhart Aquarium, Morrison Planetarium, and the Kimball Natural History Museum have been combined into one guest experience with a central theme of 'life and its sustainability,'" reads a statement issued by Andrews, Tang, and Wyatt.

"We decided we wanted an integrated guest experience," explains Andrews. "We have tried to integrate the museum and the aquarium more, and although the planetarium is stand-alone, its programming is integrated with the rest of the Academy. Philosophically, we have tried to come up with themes and messages that are integrated. We didn't want the guests to have a number of very disconnected experiences, nor did we want them to have a single, monotonous experience. So there are common stories and common messages, but the various halls and areas feel different from one another, and stimulate the senses in a variety of ways. That and things like the roof deck and outdoor garden help combat exhibit fatigue and provide a more invigorating experience. We're already beginning to plan the first major new exhibition for spring 2010, and also asking ourselves, what would an expansion or whole new wing look like? Any facility of ours has to have three elements: 1) freshness, via a steady flow of new things onto the public floor, 2) an annual change large enough to be promotable, and 3) a major change or renovation within about a decade."

"Philosophically, we have tried to come up with themes and messages that are integrated. We didn't want the guests to have a number of very disconnected experiences, nor did we want them to have a single, monotonous experience. So there are common stories and common messages, but the various halls and areas feel different from one another, and stimulate the senses in a variety of ways."