Accessibility:
Breaking New Ground
The best travelling exhibit on Leonardo in the world: the only one with new discoveries!

Flights Of Mind, Brought To Life

Some of the models have the convincing feel of old acquisitions: the seating, stream-lined like a flying machine, the armored revolving seat with camera protruding through its petals, the arched bridges, the water traffic. There would stage and display reproductions, along with photographs of surviving works and objects on loan plotted by models and drawings — who could resist the challenge meant by the artist, inventor and scientist for whom the current Renaissance man inspires custom-made valve?

These decorative merits of genius are all over the starting: challenging exhibition "Leonardo da Vinci's坊" which opens tonight at Discovery Times Square.

EXHIBITION REVIEWS

EDWARD BERTONELLI

"Leonardo's Axial Engine" is a flying machine powered by a giant spinning wheel. The machine, which was designed in the Renaissance, is brought to life in the new exhibit. The exhibit includes reproductions of Leonardo's designs and models of the actual machines, providing a fascinating glimpse into the artist's innovative thinking. Visitors can learn more about Leonardo's contributions to science and engineering through interactive displays and hands-on activities. The exhibit is open daily from 10 am to 9 pm, and admission is free for children under 12.

INFO & CONTACTS

www.leonardodavinciworkshop.com
dreyes@tsxnyc.com (North America)
ddonohue@imagineexhibitions.com (rest of the world)

PAST VENUES

Sforza Castle, Vigevano (Italy); Discovery TSX, New York (USA); Franklin Institute, Philadelphia (USA); Ontario Science Center, Toronto (Canada); Da Vinci Museum, Tokyo (Japan)

FLIGHTS OF MIND, BROUGHT TO LIFE

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At the Museum of Life and Science in Durham, North Carolina, the new Math Moves exhibition includes bilingual labels, audio description, and tactile elements. The exhibition was funded by the National Science Foundation and developed as part of a science center consortium led by the Science Museum of Minnesota in Saint Paul. Photo courtesy Museum of Life and Science.
Fostering Active Prolonged Engagement: The Art of Creating APE Exhibits

A must for exhibit developers, researchers, educators, and other museum professionals looking for ways to engage visitors more deeply with interactive science exhibits, this book documents the exploration and findings of the Exploratorium’s NSF-funded Active Prolonged Engagement (APE) project. Both a significant contribution to visitor research and a nuts-and-bolts guide to exhibit development, Fostering Active Prolonged Engagement includes 15 “APE Tales” (exhibit recipes with photos, drawings, and detailed construction specifications); discussions about setting explicit goals for visitors’ exhibit experiences; research and evaluation methods and results; and lessons learned for building constructivist-style exhibits.

#205
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Nonmembers: $23
Visit www.astc.org/pubs to order.
Let me forewarn readers that the next few paragraphs are about science—real science, as defined by such terms as inductive reasoning, hypothesis testing, statistical analyses, and probabilistic modeling. Some people call this child’s play, and, in fact, it is precisely about child’s play that I am referring.

I was struck by an article in a recent edition of Science magazine (September 28, 2012; p. 1623) that discussed new studies concerning scientific thinking in young children. The thrust of the article is that, when even very young children think and learn, they employ intuitive processes that are directly analogous to the fundamentals of scientific inquiry. Children make detailed observations of their worlds, systematically formulating hypotheses, experimenting, analyzing, revising, and making decisions in essentially the same rigorous fashion that defines good science.

While this notion may seem obvious and simple, it actually contradicts historical theories of cognitive development that depicted young children as irrational chance-takers whose observations and conclusions of the here and now required considerable external direction as part of cognitive growth. Yet, empirical evidence now clearly demonstrates that children are innately equipped with a considerable amount of basic intuitive capability that is continuously tested and validated in ways that parallel the logical processes of scientific thinking.

I drew several conclusions from this research that can have important implications for the ways in which science centers and museums everywhere characterize their impacts in the educational arena. The research suggests that young children have both the intuitive capacity and the preference to “think like scientists.” It is the way they naturally think. We speak so often about our role in helping children come to understand these processes and employ them when, in fact, our approach in science centers and museums is more to reinforce children’s cognitive predispositions and to help them validate their own approaches. Children enjoy the science center and museum experience because it allows them to do what they do best. And what greater satisfaction, confidence boost, and sheer enjoyment than to have one’s inherent skills so positively reinforced?

It may be a subtle point in this research, but as we introduce our young visitors to the vast world of science, connecting them with processes that they already feel within, we are helping them to trust those methods of thinking and learning, and we are using science to help them build self-assurance about ways to view so many other dimensions of their lives. As we focus on transforming minds with scientific inspiration, let’s be reminded as well that science is already at work in the poised and prepared minds that come to play.

Anthony (Bud) Rock (brock@astc.org) is ASTC’s CEO. Visit www.astc.org/blog/category-ceo to read more From the CEO editorials.
Thank you for producing Dimensions. It is on my short list of “go to” resources when I need inspiration, ideas, or advice. Back issues hold a prominent place on my bookshelf, and I find that I regularly grab them to hand to staff when we are discussing specific topics. Lately, we’ve been thinking about accessibility issues, and I have referenced or shared several related articles that have been quite helpful. At times, our staff holds brown-bag lunches to discuss the articles and ideas contained in Dimensions. It’s a fantastic professional development resource for our entire organization.

Denise Young, director of education and planning, Morehead Planetarium and Science Center, Chapel Hill, North Carolina

Send letters to the editor to dimensions@astc.org (subject line: Inbox). Include your name, title, and institution. We reserve the right to edit letters for publication.

SCIENCE CENTERS MULTIPLY IN INDIA

The numbers speak for themselves. In 2012, India added seven new science centers to its existing network of 40 centers. Three more science centers will be completed in 2013, and another nine by 2016. Proposals for 19 additional centers are pending with the National Council of Science Museums (NCSM), which is responsible for the planning and development of all new science centers.

“There has been a huge demand for science centers in various states of India as these centers have become popular and useful for society,” says K. G. Kumar, NCSM’s director. “NCSM made a conscious decision to set up new centers in states and regions where there are very few science centers—or none at all.” The goals of the new centers are to build science and technology literacy among the general public, enhance
understanding and appreciation of science, and motivate students to take up careers in science and technology.

The science centers cover a diversity of scientific topics ranging from astronomy and biodiversity to energy and emerging technologies. Exhibitions often focus on regional issues and characteristics. For example, the science center in Raipur (Chhattisgarh), an area well-known for its minerals, flora, and fauna, highlights these natural resources. Every center includes a gallery that features exhibits specifically designed to excite young visitors and show them how much fun science can be. Each center also features an exhibition on a contemporary topic and space for traveling exhibitions. Many of the centers also have buses that carry mobile exhibits to more remote locations.

Federal and state governments share equal funding responsibility for the new science centers, and NCSM trains staff. State governments provide the land for the centers and take over operation and management once they are completed. —Sharon Barry

Details: G. S. Rautela, Director General, National Council of Science Museums, India, dgo@ncsm.gov.in, www.ncsm.gov.in

Top left: Two parallel mirrors enable visitors to peer into what appears to be an infinitely deep well at the new Sub Regional Science Centre in Kalimpong, India.

Top right: Students view the inside of a magnified Integrated Circuit chip at the new science center in Kalimpong.

Left: An interactive outdoor exhibit at the new science center in Raipur demonstrates how an object’s perceived size varies with distance.

Below: At the Ranchi Science Centre, a Foucault’s Pendulum demonstrates that the Earth rotates on its own axis.

All photos courtesy National Council of Science Museums, India
If you want to do something big and bold at the SciWorks Science Center in Winston-Salem, North Carolina, all you have to do is step outside. Last May, after a year-and-a-half of development, the center opened its Outdoor Science Park, which gives visitors a chance to experience physics phenomena through large-scale activities that can’t easily be done inside. The 1 1/2-acre (0.6-hectare) site connects the main building with the center’s Environmental Park.

Fifteen interactive exhibits focusing on the scientific principles of light, sound, color, motion, and energy offer not just a hands-on experience, but a whole body experience. The first exhibit visitors encounter is a 5,000-pound (2,268-kilogram) granite ball that floats on a thin stream of water and demonstrates the amount of force water puts on a submerged object (hydrostatic principle). In the popular Tot Spot, young children can become human pendulums on a tire swing, or learn about levers by bouncing up and down on a stand-up tee-ter-totter. Elsewhere in the park, kids can become familiar with the structure and architecture of DNA as they climb a helix-shaped jungle gym. Whisper dishes enable youngsters to send whispered messages to friends and family 50 feet (15.2 meters) away. Other exhibits demonstrate how wind is converted into energy and introduce the concept of sustainability. To ensure that the new facility has room to grow, center staff left space for adding new exhibits in the future.

The Outdoor Science Park was made possible by a $150,000 grant from the federal Institute of Museum and Library Services, supplemented by $180,000 raised through a capital campaign. ~S.B.

Details: Tom Wilson, VP Exhibits, SciWorks, tom@sciworks.org, www.sciworks.org

Left: A visitor to SciWorks Outdoor Science Park turns a hand-cranked screw to draw water up from a tub. Photo courtesy SciWorks

Below: A climbing sculpture in the park highlights the coils and connecting proteins in DNA. Photo courtesy SciWorks
LIFTOFF IN MISSISSIPPI

“The goal for INFINITY is to engage and educate, to spur that sense of wonder and curiosity that took Christopher Columbus across the ocean and put me in a rocket to the moon!” says Fred Haise, former Apollo 13 astronaut and Enterprise Space Shuttle commander, now vice-chairman of INFINITY Science Center in Mississippi. The center, which opened on April 12, is affiliated with the John C. Stennis Space Center, the NASA facility where rocket engines for all manned Apollo and space station flights have been tested. INFINITY’s 30,000 square feet (2,787 square meters) of exhibitions highlight the role of science and math in exploration throughout history.

As visitors enter, they encounter a welcome video featuring Haise. The Great Nations Dare to Explore exhibition takes them on an interactive journey through the history of exploration, from early Egypt to future research stations on the Moon. Science Express demonstrates what the Stennis Space Center has contributed to scientific progress. Science on a Sphere, an animated globe 6 feet (1.8 meters) in diameter, uses multiple datasets to show dynamic images of the atmosphere and geography of the Earth, Moon, other planets, and Sun.

On the second floor, the Space Gallery traces the history and achievements of NASA’s space programs. Visitors can examine the spacesuit worn by Fred Haise, walk through a full-size mock-up of a scientific laboratory currently operating on the International Space Station, or experience the sights and sounds of a rocket engine test at Stennis. Outdoor exhibits offer opportunities to get close up to a tsunami buoy or the main engine of a space shuttle. Staff are currently planning a “kids’ zone” with interactive exhibits geared toward young children.

Funding for the $30 million facility came from a public/private initiative involving the State of Mississippi, federal agencies, and private businesses and corporations. —S.B.

Details: Linda McCarthy, general manager, Hancock Chamber, linda@hancockchamber.org, www.visitinfinity.com
WELCOME TO ASTC

The following new members were approved by the ASTC Board in March 2012. Contact information is available in the About ASTC section of the ASTC website, www.astc.org.

SCIENCE CENTER AND MUSEUM MEMBERS

• Burke Museum of Natural History and Culture, Seattle, Washington. First open to the public in 1899, the museum serves the University of Washington campus and the community with scientific and cultural exhibits, educational programs for all ages, nationally-ranked collections, and research.

• Flint Hills Discovery Center, Manhattan, Kansas. With over 10,000 square feet (929 square meters) of interactive exhibits and more, the Flint Hills Discovery Center explores the geology, biology, and cultural history of the Flint Hills of Kansas—the last remaining tallgrass prairie in North America. The center celebrated its grand opening on April 14, 2012.

• Grand Rapids Public Museum, Grand Rapids, Michigan. Founded by a group of civic leaders in 1854 as the Grand Rapids Lyceum of Natural History, the Public Museum now serves 230,000 visitors annually. The museum has been collecting artifacts for 150 years and also features traveling exhibits, such as Ontario Science Centre’s Facing Mars.

• Harbor Branch Ocean Institute’s Ocean Discovery Center, Fort Pierce, Florida. Open since 2007, this center features hands-on exhibits, a theater, and marine animal displays that provide visitors with insights into the ocean and coastal research conducted at Florida Atlantic University’s Harbor Branch Ocean Institute.

• Natural History Museum, London, England. The museum’s mission is to maintain and develop its collections, and use them to promote the discovery, understanding, responsible use and enjoyment of the natural world. Originally part of the British Museum, the museum debuted its own facility in 1881. It opened the Darwin Centre, where visitors can explore the collections and interact with scientists, in 2009.

• Neville Public Museum, Green Bay, Wisconsin. The Neville is a general museum of art, history, and science. It collects and preserves objects relevant to Northeast Wisconsin. The museum opened to the public in 1915. On the Edge of the Inland Sea is a permanent exhibition, a 12,000-year walk through time from the end of the Ice Age to the mid-20th century.

SUSTAINING MEMBERS

• Amusement Advantage, Arvada, Colorado. This company is dedicated to providing science centers and museums with the tools needed to measure guest experience, analyze results, and facilitate action to improve practices.

• Imagine Exhibitions, Atlanta, Georgia. From design and creation to placement and presentation, Imagine Exhibitions has the global resources for all things related to traveling exhibitions.
GIRLS RISENET RECEIVES SAVI SUPPLEMENT

The Girls RISEnet project, a U.S. National Science Foundation (NSF)-funded partnership between the Miami Science Museum in Florida, ASTC, and SECME, Inc., is strengthening the ability of informal science educators to motivate minority girls at the secondary grade level to explore and pursue science and engineering careers. In this way, the project addresses the need to cultivate diversity in preparing the next generation of female scientists and engineers. But the issues that Girls RISEnet addresses are not unique to the United States. They are global and persistent, and there is a clear need for more widespread research. To that end, NSF’s Science Across Virtual Institutes (SAVI) Program recently approved a supplement to support a one-year planning period that will culminate in a full SAVI proposal aimed at expanding the Girls RISEnet body of work into a multidisciplinary, multinational program of participatory research in gender equity and informal science education. The planning process will focus on developing strategies to establish an international community of practice in the United States, Latin America, and Europe. This network will be comprised of existing Girls RISEnet partners as well as the European Network of Science Centres and Museums (Ecsite) and member institutions from Latin America. For more information about Girls RISEnet and its programs, visit www.girlsrisenet.org.

BUILDING INFORMAL SCIENCE EDUCATION AND LITERACY PARTNERSHIPS

In mid-August, the National Writing Project (NWP) and ASTC received a four-year grant from the National Science Foundation (NSF) to support a full-scale development project designed to integrate science and literacy. NWP sites and ASTC member science centers and museums will form partnerships to develop, test, and refine innovative programs for educators and youth, resulting in the creation of a unique learning network. The project highlights the critical need for the integration of science and literacy and builds on recommendations in the Common Core State Standards and the National Research Council’s publication, “A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas.” The content will focus on current topics in science and technology such as environmental science, sustainability, synthetic biology, geoengineering, and other subjects that align with science center research and exhibitions.

This project will lead to the development of a robust learning community while contributing knowledge and lessons learned about networks and innovative partnerships. It is anticipated that formal and informal educators will increase their knowledge about science and literacy programs and develop skills to provide effective programs, while youth will expand their understanding of key science concepts and their ability to communicate science. Programs created by the local partnerships will serve approximately 650 educators (450 informal educators and 200 K-12 teachers) and 500 youth between the ages of 9 and 18. The project may result in the creation of new programs that merge science and writing, integrate writing into existing museum science programs, or integrate science activities into existing NWP programs.
CAISE NEWS: ACCESS THE WORLD OF INFORMAL SCIENCE EDUCATION ONLINE

The Center for Advancement of Informal Science Education (CAISE), in cooperation with the National Science Foundation, offers open sources of information that support the ISE field. Three of CAISE’s online initiatives—the ISE Evidence Wiki, the Principal Investigator’s Guide to Managing Evaluation of ISE Projects, and the Informal Commons—provide pathways for professionals from across the informal STEM learning landscape to access resources that can inform the development of their own projects and provide professionally vetted evidence to strengthen funding proposals.

ISE Evidence Wiki: This wiki provides the opportunity to join, use, and/or contribute to a growing body of evidence for informal STEM learning in a wide variety of settings. It is a first stop for those looking for specific citations on special topics in ISE, which can be useful for project and proposal development or in the formation of research questions. Evidence Wiki article titles represent topics relevant to current research and practice trends in ISE—for example, what is known about how mobile devices and apps have been used in informal learning environments (like science museums). After being seeded by a group of contributors with specific content expertise and interest, the wiki is now open to everyone. This resource recently made its debut in mobile format at ASTC’s Annual Conference in Columbus, Ohio. Explore and add your own evidence for ISE at www.iseevidencewiki.org.

Principal Investigator’s Guide to Managing Evaluation of ISE Projects: This recently launched guide is designed as a resource for active and potential Principal Investigators of informal STEM learning projects who want to integrate successful evaluation plans into their project designs. The guide was written by and for practitioners, and draws on the authors’ wide variety of experiences in making project evaluations useful—including finding the right evaluator, co-creating an evaluation plan, and producing and disseminating an evaluation report that meets the needs of the PI and the project stakeholders. Originally developed as a PDF document, the guide is now available in an interactive web-based format. Learn more at www.caise.insci.org.

Informal Commons: Have you ever found yourself searching the Internet for what has been done in the ISE field to introduce and sustain girls’ interests in STEM careers? Or what kinds of evaluation and research exist on integrating the arts and science? The Informal Commons website provides a one-stop engine that searches across a dozen sites containing research, project descriptions, activity designs, exhibits, evaluation reports and tools, and media related to informal STEM learning. Users can type in a search term or phrase—for example, “astronomy for children” or “family learning”—and narrow down results using an extensive tagging system to find the resources that best fit their needs. For those new to ISE, the Informal Commons provides a valuable introduction to the rich range of activities and resources in the field. For ISE veterans, the Informal Commons is a portal that interconnects a growing range of online resources and allows for streamlined access to timely information about the informal STEM field. Explore the Informal Commons at www.informalcommons.org.
MANY THANKS

ASTC extends its heartiest thanks and congratulations to COSI in Columbus, Ohio, for an exceptional job as host of ASTC’s 2012 Annual Conference in October. We extend our gratitude to COSI’s staff, board, volunteers, and partners, who invested significant time, effort, passion, and leadership on all aspects of the conference to provide a valuable and memorable experience for attendees from around the world. We applaud the Conference Program Planning Committee, session leaders, and presenters for their tireless work and willingness to share their expertise and contribute to the conference’s tremendous success.

We salute outgoing committee co-chair Sharon Ament, formerly of the Natural History Museum, London, as well as outgoing members Julie Bowen, TELUS Spark, the New Science Centre, Calgary, Alberta, Canada; Martin Fisher, Science Central, Fort Wayne, Indiana; Kathy Gustafson-Hilton, Hands On! Inc., St. Petersburg, Florida; Bev Sanford, formerly of SciWorks, The Science Center and Environmental Park of Forsyth County, Winston-Salem, North Carolina; and Steve Snyder, The Franklin Institute, Philadelphia, Pennsylvania. We are grateful for your leadership in shaping the content and scope of ASTC’s Annual Conference. We also express our appreciation to Angela Wenger of the New Jersey Academy for Aquatic Sciences, Camden, and Guy Labine of Science North, Sudbury, Ontario, Canada, who will serve as committee chair and vice chair respectively for the 2013 conference.

Finally, we would especially like to thank the following annual conference sponsors (as of September 20, 2012) for their support of ASTC and their commitment to science centers and museums worldwide.

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Look for a full report on ASTC’s 2012 Annual Conference in the January/February 2013 issue of Dimensions.

Share your knowledge by presenting a session at the 2013 ASTC Annual Conference in Albuquerque, New Mexico, to be hosted by Explora, the National Museum of Nuclear Science and History, and the New Mexico Museum of Natural History and Science, October 19–22. Visit conference.astc.org for the new online proposal submission form and instructions. The submission deadline is December 31.
My ideal museum experience requires **one cool exhibit experience where I spend significant time**, engaged in a way that taps into my interests and expands my thinking. It allows me to explore an idea viscerally, using my hands—even my whole body. Connecting with others around the phenomenon is important, too, as it shapes my perspective. Yet I have to own the activity, by directing next steps and reflecting on what I learned. Ideally, I’ve embodied a concept, had my interest piqued, and am primed to explore further. My ideal museum experience is more than memorable. I’ve come to care.

**Tracey Wright**, senior researcher and developer, TERC, Cambridge, Massachusetts

The Smithsonian’s National Museum of Natural History is developing a 10,000-square-foot (929-square-meter) education space that is equal parts collections vault, lab, field station, and town square where visitors will build their own ideal museum experiences. With Slover-Linett Strategies, we asked our visitors what that meant to them. They told us that their ideal museum experiences are **dynamic, immersive, personalized, relevant, one-of-a-kind, and surprising**. We’ve built a process to develop experiences that deliver on these expectations and will constantly test them in the education space, learning with our visitors about ideal museum experiences and when we know we’re achieving them.

**Shari Werb**, director of education and outreach, Smithsonian’s National Museum of Natural History
Tell us: What are the best ways to integrate evaluation into science center and museum practice?
Email dimensions@astc.org (subject line: Viewpoints), or post on our Facebook page (www.facebook.com/ScienceCenters). Include your name, title, and institution. Responses may be printed in a future issue or on our website. We reserve the right to edit responses for publication.

Affordable parking. Bathrooms that are easy to find. And plenty of floor staff who are knowledgeable and excited about the content while being committed to making the visitors comfortable in the museum.

Erika Kiessner, senior exhibit developer, Aesthetic Studios, Toronto, Ontario

The key may be not to focus on federal mandates or broadly defined needs but rather to find out who your visitors are and what they say they want, and add your expertise and experience to interpret those needs. This may require the critical skill of being able to step out of our “professional” shoes and think about what we would want from a museum through the lens of our own consumer/learner experiences. We are not very different from our visitors. Just pay attention to what drives your unique visitors in your unique institution. It doesn’t need to be complicated.

Hever Velázquez, research and evaluation associate, Oregon Museum of Science and Industry, Portland

Visit www.astc.org/blog/category/astc-dimensions/viewpoints for an extended discussion of this question.

The above statements represent the opinions of the individual contributors and not necessarily the views of their institutions or of ASTC.
PGAV Destinations commissioned primary research on the subject of the family vacation, looking at what motivates their choices and how they make decisions.

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To receive a free copy of PGAV Destinations’ complete monograph, “The Art of the Family Vacation,” contact Marie Shellenberg at marie.shellenberg@pgav.com. To learn more about PGAV Destinations, our visitor research projects, and our planning and design work, visit www.pgavdestinations.com/insights.
Kirk Johnson became director of the Smithsonian Institution’s National Museum of Natural History (NMNH) in Washington, D.C., on October 29. He was formerly the chief curator and vice president of research and collections at the Denver Museum of Nature and Science (DMNS) in Colorado, where he helped manage a $40 million annual budget and oversaw a 70-person research and collections division. Johnson started out at DMNS as the lead scientist of the Prehistoric Journey exhibition in 1981. As director, he led a nine-month excavation in Snowmass Village, Colorado, in 2010 that uncovered thousands of bones from the Ice Age. Johnson replaced Cristian Samper, who left NMNH on July 31 to become president and chief executive at the Wildlife Conservation Society in New York.

Betsy Bennett announced that she will retire from the North Carolina Museum of Natural Sciences (NCMNS) in Raleigh. She attended Hollins University and the University of Virginia, and then became a science and math teacher. Bennett also worked at Discovery Place, Inc. in Charlotte, North Carolina, where she demonstrated physics experiments to the public. She joined NCMNS in 1990, where she began raising private money and seeking appropriations for a $71 million building. In addition, she was able to obtain a large Acrocanthosaurus fossil to display at the museum. The remodeled museum opened in 2000. She also contributed to the opening of the Nature Research Center in April of this year. This $56 million addition to NCMNS allows visitors to watch and interact with scientists as they work, and has already attracted 300,000 visitors in its first two months. Bennett will retire at the end of the year.

Lara Litchfield-Kimber steps up as executive director of the Mid-Hudson Children’s Museum in Poughkeepsie, New York. She comes to the museum from Ithaca, New York, where she served as deputy director of Sciencenter and played an active role in both science and children’s museums through conferences, presentations, collaborative partnerships, and mentorship programs. She will be responsible for leading the development and implementation of a new strategic plan for the museum and for evaluating existing exhibits and educational programs, current community needs, and the potential for developing collaborative partnerships with other organizations. In the role of executive director, Litchfield-Kimber will also have financial oversight of museum operations; be responsible for growing museum resources through earned, contributed, and grant income; and oversee all museum programs, staff, and volunteers.

Steve Langsdorf recently accepted the position of vice president of engineering and production for Roto, a museum planning and exhibit design-build company based in Dublin, Ohio. Formerly the vice president of experience at COSI, Langsdorf is a graduate of DeVry Institute of Technology and has spent over 17 years in the science museum field spanning a myriad of disciplines. Throughout his tenure at COSI, Langsdorf led virtually all front-line operating departments, from admissions and exhibit maintenance to food service and retail, and spearheaded the creative vision and implementation strategy for several significant exhibition and facility upgrades and additions. Langsdorf is taking over an expanded Roto engineering and production operation from Randy Hinderer, who is retiring after a nearly 20-year association with the Roto organization and its forerunners.
Blue Telescope uses technology, storytelling, and design to create engaging interactive exhibits and experiences. From multi-touch and mobile apps to games, quizzes, and social interactives, our innovative solutions use the latest technology to educate, communicate, and connect with your visitors.
what we learned

Reversing the STEM Summer Slide

By Robert Corbin

Some students do not have access to enrichment over the summer. In particular, several independent researchers have lamented the lack of substantive out-of-school STEM (Science, Technology, Engineering, and Mathematics) enrichment for underserved children throughout the United States. At Discovery Place, Inc. in Charlotte, North Carolina, we created an innovative partnership to address the negative trends in STEM achievement resulting from this “summer slide.” Beginning in 2009, we teamed up with MAT and MAED graduate students from Wingate University and with three local Title I elementary schools and their teachers to provide a summer enrichment program entitled Protovation (Prototype + Innovation) Camp.

In Protovation Camp, the focus is on collaboration. We rely upon elementary school teachers to identify and share student achievement deficits, and graduate students to design curriculum. Staff from Discovery Place model engaging teaching techniques and ensure that all experiences are wonder-filled, inquiry-based, and full of free choice. The resulting program is delivered to students both in their schools and at Discovery Place over the summer. Teachers also present the experiences to guests on the floor of Discovery Place, with exhibits frequently serving as the centerpieces of those experiences. Over the past three years, we have learned a number of important lessons.

1. Teachers are willing to change. External evaluation of Protovation Camp shows significant improvement in STEM-related attitudes and achievement among students, as well as enhanced STEM teaching skills among teachers and graduate students. We attribute these results to the willingness of educators to alter tightly held beliefs about their teaching practices based on their direct observation of students and guests.

2. Real-time feedback is key. If experiences in informal science centers are not engaging, you see the backs of guests’ heads. They simply walk away. Students in formal classrooms don’t have this option. By delivering lessons within the informal learning environment at Discovery Place, educators learned that some of their lessons were not engaging to students and needed to be changed. Teachers adapted the style, pace, and complexity of both teaching techniques and content to match the immediate, specific needs of learners.

3. Science centers are excellent training environments. Many educators assume the best place to train teachers in STEM pedagogy is the university classroom. Discovery Place and its partners have learned that piloting inquiry-based lessons for underserved elementary students within free choice science center environments deeply transforms teacher and student attitudes toward, and knowledge of, STEM subjects.

Protovation Camp provides an inspirational model for teaching and learning science methods—a model that is vital as we advocate for the role informal science education (ISE) plays in the STEM conversation. Protovation Camp affirms what the ISE field has always known: Engaging people through wonder is the steadfast precursor to learning for teachers and learners of all ages.

If you would like to write about what your institution has learned from a project in exhibit development, education, finance, and/or operations, contact us at dimensions@astc.org (subject line: What We Learned).

Robert Corbin (RobertC@discoveryplace.org) is vice president of learning experiences at Discovery Place, Inc., Charlotte, North Carolina.
How Can We Be More Inclusive?

In recent decades science museums have made significant progress in meeting the needs of visitors with a range of disabilities—physical, cognitive, and behavioral. But much more remains to be done for the inclusion of people with disabilities to become the norm. In this issue, we explore what it means to be inclusive and how science museums can adopt universal design practices to make accessibility part of their institutional culture. The articles include personal perspectives from two authors with disabilities as well as guidelines, resources, and specific suggestions that any institution can use to provide a successful experience for every visitor.

At the Museum of Life and Science in Durham, North Carolina, the new Math Moves exhibition includes bilingual labels, audio description, and tactile elements. The exhibition was funded by the National Science Foundation and developed as part of a science center consortium led by the Science Museum of Minnesota in Saint Paul. Photo courtesy Museum of Life and Science.
Scaling Shapes
Practice doubling the size of objects in three dimensions—height, length and width.

Haciendo figuras a escala
Practica doblar el tamaño de los objetos en tres dimensiones: alto, largo y ancho.
Changing Practices: Inclusion of People with Disabilities in Science Museums

By Christine Reich

Science museums hold great promise for engaging learners of a broad range of abilities and disabilities in informal science learning. As institutions known for their interactive and self-directed activities, science museums already exhibit many of the principles of universal design for learning that foster equitable learning environments for all (see the Center for Applied Special Technology, www.cast.org/udl). Science museums have the ability to present information and content in a variety of ways, they can offer visitors multiple ways to express themselves, and they are designed to foster interest and curiosity. In fact, these very characteristics of science learning experiences in museums have been found to eliminate the performance differences that can exist in the classroom between students with disabilities and those without disabilities.

While science museums hold great potential for being welcoming and inclusive of visitors with a broad range of abilities and disabilities, the question remains: Do we live up to that potential? Looking back, I see evidence that science museums have become more inclusive of people with disabilities over time. Looking ahead, however, I believe much more work remains. Fortunately, new insights on ways to create lasting change toward greater inclusion of people with disabilities make me feel that change is possible and feasible in the years ahead.
The field has also begun to think more broadly about what it means to be inclusive. When I look at the content on the ASTC Accessible Practices website (www.astc.org/resource/access), which is still a phenomenal resource, I’m reminded that much of our thinking in the late 1990s focused on physical aspects of inclusion, such as height and reach of exhibits and accessibility of the physical museum building. Only a few individuals at the time (such as my mentor and close friend Betty Davidson, now retired from the Museum of Science, Boston) were thinking more broadly about inclusion.

Today, the term inclusion has a more multidimensional meaning. As outlined in the 2010 Center for the Advancement of Informal Science Education (CAISE) Inquiry Group Report titled Inclusion, Disabilities, and Informal Science Learning (http://caise.insci.org/uploads/docs/InclusionDisabilities_ISE.pdf), inclusion extends beyond physical access. Inclusion now also encompasses ways to cognitively engage all visitors in learning about science and ways to enable all visitors to interact socially with others in their visiting group. The report found many examples of science museums taking actions to create a learning environment that is both physically and cognitively inclusive. Unfortunately, only a few museums explicitly address issues of social inclusion.

Inclusion now also encompasses ways to cognitively engage all visitors in learning about science and ways to enable all visitors to interact socially with others in their visiting group.
Fifteen years ago, few science museums addressed issues of inclusion in a meaningful way. Today, science museums around the world take intentional, meaningful, and repeated actions to be more inclusive of visitors with a broad range of abilities and disabilities. Even those museums that took actions to be more inclusive years ago have since expanded how they think about inclusion.

When I first started working at the Museum of Science, Boston, the inclusion of people with disabilities was largely addressed within exhibitions and through special programming. Today, we have an official accessibility initiative aimed at improving access for people with disabilities across the entire museum. We consider the inclusion of people with disabilities in exhibition design, facilities management, visitor services, programming, human resource policies, professional development offerings, and information technology development. These efforts are funded through a variety of sources, including the Institute for Museum and Library Services (IMLS), the National Science Foundation, non-governmental foundations, endowments, and our general operating budget.

The great progress we have made as a field over the past 15 years is certainly worth celebrating. However, the unfortunate reality we found while researching current practices to develop the CAISE report is that true commitment to the inclusion of people with disabilities remains an exceptional practice—not the norm. What can we do to move this effort forward? One route is to seek change within our own institutions.
We consider the inclusion of people with disabilities in exhibition design, facilities management, visitor services, programming, human resource policies, professional development offerings, and information technology development.

Above: Visitors can touch this 3D scale model of the Pavilion of Knowledge (Ciência Viva) in Lisbon, Portugal, to receive auditory directions on how to navigate the museum. Photo courtesy Anna Lindgren-Streicher

Below: Sounds and tactile elements enhance access to traditional object-based exhibits for a broad range of users. Photo courtesy Eric Workman, Museum of Science, Boston

CHANGING OUR INSTITUTIONAL PRACTICES

How do we change institutional practices so that our museums become more inclusive of people with disabilities? I have sought to answer this question through a multi-year, two-phase research study funded through the IMLS National Leadership Grants program.

Phase one consists of an extensive literature review to examine 25 empirical studies of organizational change toward the inclusion of people with disabilities in a broad range of institutions (schools, museums, other non-profit organizations, and businesses) around the globe (e.g., the United States, the United Kingdom, Finland, Spain, Canada, and India). Phase two features an in-depth study of three science museums that have taken substantial actions to be more inclusive of people with disabilities. Although the phase two findings are not ready for publication, lessons from phase one, combined with information from the CAISE report, sketch a pathway for facilitating change toward inclusive practices within science museums.

After reviewing 25 empirical studies on organizational change and inclusion, I found that seven important factors facilitate a change toward the inclusion of people with disabilities:

1. **Shared inclusive cultures, values, and beliefs** facilitate change when present in an organization, and impede change when absent.

2. **Distributed knowledge and expertise** can facilitate change, and conversely, an overreliance on the knowledge of any one individual (whether an internal or external expert) impedes change.

3. **Distributed leadership** is an important component of successful change, particularly when the formal leader is knowledgeable of inclusive practices and fosters further leadership within a group of individuals.

4. **Collaboration** is a key element of change when carried out in multiple dimensions (between internal and external stakeholders, among staff members, across hierarchical levels, and with institutions of similar types).

5. **Involvement of people with disabilities** is critical, as such individuals play a role in advocating for change and challenging traditional assumptions about the limitations of disability.

We consider the inclusion of people with disabilities in exhibition design, facilities management, visitor services, programming, human resource policies, professional development offerings, and information technology development.
An on-going learning process that may include elements of inquiry and reflection appears to facilitate change, while an overemphasis on one-time events poses significant barriers.

The perception of available funding can facilitate change when staff members believe funding sources exist, and can serve as a barrier when they believe funding to be unavailable.

My findings from this literature review resonate with information we gathered when writing the CAISE report about the practices of seven science museums that demonstrate a commitment to the inclusion of people with disabilities. Shared inclusive values and beliefs were evident in several of these institutions’ official position statements about disabilities. Two noteworthy examples were from the Pavilion of Knowledge (Ciência Viva) in Lisbon, Portugal, and the Chicago Children’s Museum. The latter states on its website that, “access and inclusion practices are intended to open doors and are recognized as critical components of the museum’s planning and development.”

Most of the seven institutions distributed knowledge of inclusive practices (and perhaps distributed leadership, as well) through internal professional development experiences that were offered to a broad range of individuals. For example, the Education Inclusion Initiative program at Lincoln Park Zoo, Chicago, extended across a broad range of educators at the zoo, including those who facilitate interpretation carts, organize lectures, and coordinate internships.

Change was also an on-going process at most of these institutions. We saw evidence that many of these museums were building upon their prior work, as well as the work of others in the field. Some of them, such as the Science Museum of Minnesota, Saint Paul; the Museum of Science, Boston; and the New York Hall of Science, integrated evaluation (a form of inquiry and reflection) into their ongoing change process.

Perhaps most importantly, these museums all shared a common practice of involving people with disabilities. For example, at the Science Museum of Minnesota and the New York Hall of Science, people with disabilities work as staff members or volunteers, serve as advisors and consultants, and provide feedback through regular testing of exhibits and/or programs.

LOOKING AHEAD TO THE NEXT 15 YEARS
Reviewing the changes over the past 15 years makes me hopeful about changes we will see in the next 15. As more and more science museums adopt inclusive practices, I can imagine a time when it is commonplace to present information in multiple formats (not just with text labels, but also with audio, images, and video), to offer multisensory interactives, and to provide scaffolding and supports that aid all visitors in learning about science, technology, engineering, and mathematics. I can also envision a greater emphasis on the social inclusion of people with disabilities, making sure they can learn alongside, not segregated from, their friends and family.

While some may see this vision as rosy-eyed and unrealistic, I see it as a necessity. Only through such changes can science museums begin to live up to their potential as places that engage all visitors in informal science learning and help all individuals feel that learning about science, technology, engineering, and mathematics is for them.

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ACCESSIBILITY INFORMATION AND OTHER RESOURCES

ORGANIZATIONS AND ONLINE RESOURCES

1. Leadership Exchange in Arts and Disability (LEAD), www.kennedy-center.org/accessibility/education/lead
   The LEAD network is dedicated to investigating practical methods for improving accessibility in cultural institutions, sharing information about arts and accessibility, and distributing resources and knowledge among professionals in the field of accessibility. A LEAD-related listserv is at http://groups.yahoo.com/group/culturalartsaccess.

2. National Center for Accessible Media (NCAM), http://ncam.wgbh.org
   NCAM is dedicated to achieving media access equality for people with disabilities. In a museum setting, media access can include video captions, audio descriptions, and improved website accessibility.

3. Center for Applied Special Technology (CAST), www.cast.org
   CAST strives to expand learning opportunities for individuals with and without disabilities through universal design for learning.

4. Job Accommodation Network (JAN), www.askjan.org
   Access is not only about visitors. Staff and volunteers have disabilities, too. A free service of the U.S. Department of Labor’s Office of Disability Employment Policy, JAN provides guidance on workplace accommodations and disability issues to both employers and employees.

5. ADA National Network, www.adata.org
   The ADA National Network and its 10 regional U.S. centers provide information, assistance, and training on all aspects of the Americans with Disabilities Act (ADA).

   MAC has representatives from about 100 cultural institutions in the metropolitan New York City area, as well as members and representatives of the disabilities community. The website has podcasts of their workshops.

7. Access Center, www.k8accesscenter.org
   The Access Center blog provides guidance on teaching kindergarten to grade 8 students with a wide range of abilities. Their STEM training resources are at www.k8accesscenter.org/training_resources/science.asp.

   This site provides classroom and laboratory solutions for students with visual impairments.

   Produced by the National Technical Institute for the Deaf, this video dictionary contains math and science terms.

10. LinkedIn, www.linkedin.com/search-fe/group_search
    Two groups on this professional networking site discuss accessibility and inclusion issues and can be joined by professionals in the museum field: Library and Museum Accessibility Forum; and Museum Education Roundtable.

BOOKS AND PUBLICATIONS


Nora Nagle (nnagle@mos.org) is ADA and 504 accessibility coordinator at the Museum of Science, Boston.
An Institutional Culture of Inclusion
By Elizabeth Fleming

As an interactive science center situated on an 84-acre (34-hectare) campus with over a mile (2.2 kilometers) of walking trails, the Museum of Life and Science, Durham, North Carolina, faces unique challenges in incorporating accessible practices throughout its indoor and outdoor exhibit environments. How did we apply a consistent practice of accessibility in displays ranging from an interactive mathematics exhibit to a natural bear overlook and everywhere in between? We started by making inclusion a value and priority throughout our institutional culture.

OUR HISTORY OF ACCESSIBILITY
We have a strong history of designing exhibits that incorporate features such as audio description labels and tactile elements. For example, Explore the Wild has zoom cameras and touchable skull, fur, and scat specimens, while our newest indoor exhibition, Math Moves (a National Science Foundation-funded project developed as part of a science center consortium led by the Science Museum of Minnesota, Saint Paul) uses audio descriptions and bilingual labels (English and Spanish).

Designing multi-sensory, multi-level interactives is common practice for us. An essential part of this practice is engaging local disabilities communities to help us evaluate our exhibit development projects on an ongoing basis. For instance, the Comparing Forms exhibit in Math Moves invites visitors to compare a set of three chairs of different sizes. The exhibit was enhanced when we added a touchable small-scale model of the three chairs so visitors could experience them in another dimension. This design decision was substantiated by one of our accessibility advisors—a person with low vision—during the exhibit prototyping phase.

We have also been actively involved in learning about and studying accessibility practices for more than a decade. For example, we hosted an ASTC Accessible Practices workshop in 2000 and an ASTC Roundtable for Advancing the Professions session titled Designing Accessible Exhibits in 2007. Currently, we are participating in a study called Taking Action Toward Inclusion, which is led by the Museum of Science, Boston, and funded by the Institute of Museum and Library Services (IMLS). Through our participation in the NISE Network, we have also worked on efforts to create and apply universal design guidelines to our public programs (http://nisenet.org/catalog/tools_guides/universal_design_guidelines_programs).

Moving beyond accessibility as an integral part of our exhibit development philosophy, and taking steps to make our whole site and our staff reflect the inclusive elements portrayed in our exhibits, have been our focus over the past few years.

AN INSTITUTIONAL VALUE
Being inclusive means more to us than just meeting

Outdoor exhibitions like Into the Mist are available to everyone at the Museum of Life and Science as a result of wide, mulched pathways. Photo courtesy Museum of Life and Science.
the standard measurements to comply with the Americans with Disabilities Act (ADA), more than just designing for people with disabilities. Being inclusive means that we try to make the visitor experience as open, inviting, and user-friendly as possible for people of all abilities.

More times than not, the experience becomes better for everyone. For instance, wide, automated doorways are appreciated by wheelchair users and also by visitors with strollers. Exhibits with audio presented through headphones assist visitors with low vision and can help any visitor focus on the exhibit content and block out surrounding noise.

Accessibility as an institutional value has become pervasive throughout our museum’s culture thanks to regular staff training about safety and customer service, as well as through facility improvements in several recent construction projects.

**STAFF TRAINING**
We conduct frequent staff-wide safety training about emergency and evacuation procedures and always discuss and simulate working with people with disabilities. Our evacuation training includes information about using sign language to communicate about fires and other potential hazards.

Staff members receive thorough training about the services available to our visitors, such as wheelchairs and strollers. Since our museum campus stretches across 84 acres (34 hectares), we offer golf cart rides to visitors needing assistance to travel to the far reaches of the campus. Above all, staff members are always willing to lend a helping hand. Because we discuss accessible practices frequently, safety, service, and inclusion have become shared values at our museum.

**SITE IMPROVEMENT**
A series of recent construction projects gave us the time and space to think about some key barriers and improve certain accessibility features across the museum’s campus. For example, we built a set of outdoor classrooms and were careful to re-grade the access path. Restroom renovations allowed us to include low sinks. With any door repair or replacement, we added an automatic-open button.

When we designed *Into the Mist*, a new outdoor exhibition area that opened in June 2012, the area was intended to be a wide-open playscape filled with changing terrain and natural elements for visitors to explore. This design intent didn’t mesh with the use of asphalt pathways, but we wanted to make this...
Elizabeth Fleming (elizabeth.fleming@nclms.org) is exhibits development manager at the Museum of Life and Science, Durham, North Carolina.

ONGOING WORK

While we’ve come a long way at Museum of Life and Science, we know we still have room for improvement. We need to communicate more to potential visitors about our accessibility features. For example, we will specify on our site maps which exhibit areas include various features, such as audio descriptions. We plan to modify some exhibit galleries that still have suboptimal sound or lighting. We also plan to better address the needs of our visitors with autism.

Because our whole organization values inclusion, we are continuously searching for ways to make the museum as accessible as possible. Like all new efforts, it’s only a matter of time and money before we can implement all the desired improvements.

WHERE TO BEGIN

Drawing on our experiences, I recommend that institutions seeking to make inclusion a priority start by taking these actions:

- Include people with disabilities in exhibition projects, especially during prototyping.
- Include accessibility consultants in major capital construction projects.
- Work from the standpoint that accessible solutions improve everybody’s experience.
- Work toward inclusive and equal solutions, not separate solutions.
- Become familiar with available resources (see list on page 27).
- Designate advocate(s) within the organization.
- Develop 5- and 10-year objectives.
- Celebrate small accomplishments along the way.

At the Museum of Life and Science, we believe that creating an institutional culture of inclusion has been valuable not only for our visitors but also for our staff and volunteers. Ultimately, our culture is much stronger for having made inclusion an institution-wide priority.
Universal Design: Inclusive and Accessible Museum Experiences

By Sina Bahram

My first memory of visiting a museum is from elementary school. I remember trooping onto a bus full of children and the two-hour ride to the museum. When we arrived, I was split off from the rest of the children and placed in the charge of an older gentleman. He gave me a pair of headphones and a cassette player with an audio tour of the museum. The reason for this singular treatment was because I am blind. Though I have some usable vision, it is not enough to appreciate museum exhibits from a purely optical point of view. The kind gentleman spent several hours walking me through the museum, letting me touch things that most visitors weren’t allowed to touch. He found me exhibits with audio, olfactory, or tactile components, and he answered, or tried to answer, every single one of the unending questions that were a hallmark of my childhood. It was one of the few school trips that I’ll never forget.
That trip came sharply to my mind again in May 2012, when I had the pleasure of working with the talented individuals at the Museum of Science, Boston, to create universally designed exhibits. Accessibility experts, computer scientists, informal learning spaces researchers, and others gathered for a highly productive one-week workshop entitled Creating Museum Media for Everyone (CMME). I was invited due to my doctoral research, which facilitates eyes-free exploration of highly graphical data. In this article, I describe universal design partially from conversations I had at the CMME workshop and afterwards, and partially from my own experiences as a blind museum visitor.

PRINCIPLES OF UNIVERSAL DESIGN
In 1997, the Center for Universal Design at North Carolina State University, Raleigh (www.ncsu.edu/www/ncsu/design/sod5/cud), published seven principles of universal design for buildings, outdoor environments, and products. Each principle inspires me to ask a question that should be considered at the design phase of any digital or physical object with which museum visitors might interact. The seven principles and museum-related questions are:

1. **Equitable use:** Can visitors with different functional limitations get a similar, or equitable, experience?

2. **Flexibility in use:** Can visitors interact with the information in a variety of different ways?

3. **Simple and intuitive use:** Can visitors with different experience or knowledge benefit from the information being presented?

4. **Perceptible information:** Can visitors access and interact with the information being presented, independent of a sensory disability and disturbances in the environment?

5. **Tolerance for error:** Can visitors always return to a consistent, known starting point so that, for example, they don’t cause systems to crash or behave unexpectedly, regardless of the actions they take?

6. **Low physical effort:** Can visitors fully appreciate the given information without needing much physical effort or dexterity?

7. **Size and space for approach and use:** Can visitors get close to the exhibit; have enough space in which to move around, even with a wheelchair, walker, or crutches; and manipulate it, independent of posture or other physical limitations?

Social inclusion and interaction are among the many benefits of following universal design. While I greatly enjoyed my first museum experience as a child, I wished that I could have interacted more with my classmates, felt part of the group, and been able to participate in the same activities. This element of inclusion should be a central motivating factor when designing an exhibit. Universal design facilitates this social inclusion and interaction among visitors. Additionally, museum visitors today carry their own mobile phones, tablets, and other gadgets. If information is available in open and standard formats, then visitors can use their familiar devices to enrich their experience. An important added benefit is being able to deliver content and multimedia via the web, in portable apps, and in a variety of other forms.

A SUCCESSFUL PROTOTYPE
Modern computers are inexpensive, and interactive software is widely available. It is now easier than ever to create inclusive and accessible museum experiences for all visitors. Many successful examples of inclusive and accessible designs were embodied in the working prototypes resulting from the CMME workshop.

One of the prototypes was for an exhibit that allowed users to explore data about themselves. For example, various sensors measured body temperature, pupil response, and foot arch index of the person using the prototype exhibit. The prototype
had visual, auditory, and tactile components. It presented the data visually on a variety of graphs and had levers for the user to easily manipulate the view of the data. It also employed sonification and speech components so that blind or low vision users could hear the data through different sounds and speech.

The tactile components included a physical grid that allowed the user to feel the spacing of data points on some of the graphs. The levers for manipulating the graphical view had rods coming out from them, and their intersection reflected the X and Y coordinates of a particular data point. Embossed print and raised Braille characters on the levers indicated which lever controlled which axis. The prototype itself was contained within a wooden construct that could be mounted on a height-adjustable table for flexible physical access. Links to videos and additional photos of the prototype are on www.SinaBahram.com.

This prototype is only one example of the myriad ways to create an exhibit following the principles of universal design using readily available materials. It could be easily assembled and professionally produced. I believe that the secret for successfully creating efficient, economical, and accessible museum exhibits lies in considering the principles of universal design from the start. I encourage museum professionals to adopt this powerful approach.

Reflecting upon my museum experience as a young child, I am reminded of the words of American author and poet Maya Angelou: “I’ve learned that people will forget what you said, people will forget what you did, but people will never forget how you made them feel.” Exhibits following universal design principles will facilitate a powerful feeling of inspiration, awe, wonder, and excitement for all visitors, not just those with functional limitations.

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Above: The author tests a prototype exhibit that provides tactile, audio, and visual feedback for the user. Right: Tactile elements in the exhibit, such as this eyeball, help convey scale. Both photos courtesy Keith Simmons, Museum of Science, Boston.
The Adaptive Mindset: Reflections on Accessibility

By Gabrielle Trépanier

When thinking about access, a hugely complex issue for museums and science centers, I often go back to one of Albert Einstein’s quotes: “Everything should be made as simple as possible, but not one bit simpler.” One of the trickiest aspects of working toward accessibility in any context is the attempt to take something as wildly variable as human abilities and issue practical guidelines that work for everyone. I’m not sure this can be done without over-simplifying, or more importantly to me, without reducing people to what they can and cannot do.

This article is a personal reflection on museums and access, based on who I am: a person with a disability; a museum evaluator at the Canada Science and Technology Museums in Ottawa, Ontario; an accessibility advocate; a PhD student researching learning in informal contexts; and both a “regular” and an adaptive athlete.
PERSONAL VIEWS OF A SOCIAL PHENOMENON

My point of view on accessibility is, of course, grounded in my life experiences. My disability is neurological. It affects certain fine hand movements (typing is fine, but handwriting hurts) and the movements of my legs and feet. In my work as an advocate, it’s a challenge to balance a visceral understanding of how it feels to be unable to use a cool-looking interactive with a first-hand appreciation of the work my colleagues already put into developing strong and coherent exhibits.

My lived experiences and academic training have led me to think of disability primarily as a social phenomenon, grounded in the attitudes and expectations of people and organizations. I have, and know of, many stories with which to illustrate that position. My symptoms are variable, sometimes obvious and other times invisible. New acquaintances are often surprised when I self-identify as disabled, especially in athletic contexts. More than once I’ve heard, “You’re not disabled; you just have some problems walking,” or—a personal favorite—“You’re not disabled; you biked to get here!”

According to researchers who study access issues, this confusion stems from the tendency to see people with disabilities as afflicted with a problem that keeps them from being able to fully participate in life (see Kahn, 2011, for an interesting overview). From there, it’s easy to misinterpret coping skills and alternate strategies as “overcoming” disability.

I find it frustrating to have physical limitations that will never lift, but I cope better with them than with unnecessary barriers—like stairs without a ramp.

ADVOCACY, ATTITUDES, AND EXPECTATIONS

Acknowledging disability affects how we look at the physical infrastructure of our buildings. For science centers it also requires careful thought about the hands-on, minds-on, and full-body experiences at the heart of our work. If we accept a social definition of disability, then access issues don’t derive only from what individuals can and can’t do, but also from what museums think visitors ought to do. I approach advocating for accessibility from the belief that I, and everyone who negotiates life with disabilities, have the same rights as anyone else to experience the opportunities offered by museums and science centers and to meet these opportunities on our own terms.

The tools for allowing everyone to take part in their own way are already in place. Museums currently provide multiple and varied opportunities to their visitors: chances to learn and play; to debate and argue; to see, hear, and feel things; and to deepen and extend their knowledge. Moreover, even “average” visitors come in with different intentions: visiting with a toddler is nothing like visiting with grown-ups. We already expect staff to adjust their interactions accordingly.

Access adds a layer of complexity to museum work. I am currently working on the third iteration of my museums’ accessibility guidelines for exhibitions. A significant roadblock in the past was the incredibly broad range of issues that fit under the “disability” heading. For exhibit developers and front-line staff, the scope was too unwieldy, as in, “So many issues, how can we address them all?” In the current version, I use two lenses—physical and sensory impairments; and cognitive and learning impairments—in the hope of focusing attention on areas for action, rather than on a long list of medical conditions.

Physical and sensory impairments include vision, hearing, mobility, and motor control issues. Cognitive and learning impairments refer to differences in concentration, language comprehension, and information processing. I adapted the physical and sensory guidelines mostly from official sources (like the Canadian Standards Association,
THE RIGHT TO OPPORTUNITY

I’m not sure what to do with these issues, except to suggest that a fresh perspective might be useful. Therefore, I’m concluding this reflection with experiences from the adaptive sports movement.

The goal of this movement is to provide people with disabilities with the same opportunities and potential benefits as anyone else interested in sports. These include fitness, new friends, mental and physical discipline, and self-confidence. (Organizations with information about the adaptive sports movement include Rowing Canada, www.rowingcanada.org/domestic_rowing/adaptive, and the Whistler Adaptive Sports Program, www.whistleradaptive.com).

As someone who practices both mainstream and adaptive sports, I notice, counterintuitively, that in the adaptive world I focus more on the sport and less on my impairments. It’s not that my symptoms go away; it’s that they don’t make everyone else uncomfortable and tongue-tied. Because the starting point is everyone adapts (coaches, volunteers, athletes), it’s easier to assume the challenge of a new sport on my own terms.

The core principles of adaptive programs, all of which are relevant to how museums and science centers could approach visitors, are the following:

- Have highly variable expectations about the outcomes.
- Work with individuals, not their disabilities.
- Ask questions; the individuals are your best source of information.

The fact that accessibility is very complex keeps me from suggesting that applying these principles to exhibit design or staff training is simple. Adaptability can’t replace the ongoing work of removing unnecessary barriers, like missing ramps and poorly designed controls. However, my experience so far is that the adaptive mindset creates trust in the way people with differing abilities deal with one another. As a person with a disability, I don’t expect museums to compensate for all of my impairments, but I do expect to feel as valued and as welcome as anyone else. If everyone—staff, volunteers, and visitors—can comfortably express their needs and interests, it may become easier, and way more fun, to meet that expectation.

REFERENCE

Engaging Students with Disabilities in Accessibility Reviews

By Sheryl Burgstahler and Lyla Crawford

Here is a fun way for students to make some money and win prizes: Ask them to review the accessibility of informal science education facilities and programs.

Since 2010, the DO-IT (Disabilities, Opportunities, Internetworking, and Technology) Center at the University of Washington, Seattle, has offered high school and college students with disabilities the opportunity to conduct accessibility reviews. They earn a $100 stipend plus the cost of the visit for themselves and up to two guests. Participants who submit the best reports also receive prizes.

This work began as part of an AccessSTEM project funded by the National Science Foundation. The project’s objectives were to increase awareness of access issues and solutions among students with disabilities and to enhance their ability to advocate for STEM learning environments that are welcoming and accessible to a diverse audience.

Working together on a botany project at the University of Washington, students learn how to identify and overcome disability-related barriers. Photo courtesy DO-IT, University of Washington
PROJECT PARTICIPATION
We recruit students through online e-mentoring communities that the DO-IT Center supports for students with disabilities. During the project’s first two years, 32 students from 10 high schools and 15 postsecondary institutions contributed reviews. Of these participants, 15 were female and 17 male, and they disclosed a range of disabilities, including Asperger’s syndrome, visual impairments, learning disabilities, mobility impairments, health impairments, and traumatic brain injuries.

The 32 participants conducted 60 accessibility reviews of a range of facilities and programs in Washington state, including the Seattle Aquarium, the Pacific Science Center, the Museum of Flight, and Woodland Park Zoo (all in Seattle), and the Port Townsend Marine Science Center.

As we’re writing this article, in August 2012, more students are conducting accessibility reviews.

GUIDELINES AND WORKSHEETS
Participants interested in completing a review receive guidance in selecting a facility or program, background reading, and instructions for submitting their report. Sample guidelines are available at www.washington.edu/doit/Stem/accessibility-review.html.

A worksheet (www.washington.edu/doit/Stem/accessibility-review-report.html) guides participants in evaluating how welcoming and accessible the facility or program is for people with disabilities. The worksheet asks participants to consider accessibility issues related not just to their own disability but also to other disabilities as they review components such as the website, publications, physical environments, exhibits, activities, and staff knowledge.

For example, some of the items on the worksheet are as follows:

- Does the website say how to request disability-related accommodations?
- Are brochures available in any alternative formats such as large print, Braille, or electronic file?
- Are all levels of the facility connected via a wheelchair accessible route of travel?
- Are equipment/exhibit labels in large print with high contrast?
- Can buttons and other controls be reached by individuals who stand at a wide range of heights or by those who use wheelchairs?
- Are videos captioned?
- Are audio directions and content transcribed?
- Are staff members familiar with how a
Clockwise from left: Using multiple methods to learn a concept, two DO-IT Center participants explore a greenhouse to view living plants they’ve previously seen only in textbooks.

A DO-IT Center participant views small brain samples in a large mold that is easier for people with mobility impairments to handle.

Participants in the University of Washington’s DO-IT Center program sort through lab supplies on an adjustable height table. All photos courtesy DO-IT Center, University of Washington

person with a disability can request an accommodation?

Participants also share recommendations for improving the facility’s or program’s accessibility. Once they submit an acceptable review, they can request to do another.

ACCOMMODATIONS AND UNIVERSAL DESIGN

As part of the activity, participants are asked to read the publication Universal Design: Process, Principles, and Applications (www.uw.edu/doit/Brochures/Programs/ud.html) to learn about two approaches to making informal science education offerings accessible to people with disabilities—accommodations and universal design.

• An accommodation is an alternate format, assistive technology, or other adjustment that helps a person with a disability use an existing product or environment.

• The goal of universal design is to create products and environments that are usable by everyone, regardless of ability or disability, to the greatest extent possible.

Universal design minimizes the need to make future accommodations. For example, if a science facility contains a height-adjustable work surface or surfaces of different heights, then an accommodation will not be needed for a visitor whose wheelchair is too high for standard-height workstations. This workstation will also be comfortable for a visitor who needs to remain seated in a chair or for a very tall or short individual. Making accommodations is reactive, whereas universal design is proactive (see the article on page 32 for more about universal design).

PARTICIPANTS’ OBSERVATIONS

Participants reacted positively to their experiences conducting accessibility reviews, with overall comments such as: “I learned a lot about how to look at a
program and figure out if other people with disabilities can fully participate,” and “This was a lot of fun because we got to go to a cool place and contribute to making it better.”

Participants gave a wide range of observations and suggestions about the accessibility of the facilities and programs they visited. Some of the suggested improvements were to:

- Provide alternative formats (Braille, large print, audio) for brochures and exhibits.
- Caption videos.
- Provide multiple-height vantage points for exhibits.
- Ensure that steps or benches for children to view an exhibit can be moved or are positioned to allow a wheelchair user to get close to the exhibit.
- Clearly indicate on the website, in brochures, and at the site how to request disability-related accommodations.
- Include more images of individuals with disabilities in materials.
- Train staff about the types of accommodations available and how to offer assistance.

PROJECT OUTCOMES

We found that inviting students to conduct reviews had several beneficial outcomes. Participants developed disability/accessibility awareness and advocacy skills as they explored issues related to their own disabilities as well as those of others. We expect that, through their continued engagement in programs and activities, the participants will have a positive impact on accessibility throughout their lives. Additionally, we provide informal feedback to staff at the reviewed facilities and programs as we engage with them through other DO-IT Center programs, such as field trips for students with disabilities.

Suggested improvements take time to implement, so evidence of impacts on the accessibility of local informal science education facilities and programs is limited. However, we had previously collected accessibility feedback more informally from participants with disabilities in other DO-IT Center activities. This feedback contributed to building a new theater where wheelchair users don’t have to sit separately from their visitor group. They can sit in the front, the back, next to other wheelchair users, and next to individuals using regular seating.

In another related effort, DO-IT Center participants with a variety of disabilities provided input to architects developing a facility for the Center for Sensorimotor Neural Engineering at the University of Washington. Many of their suggestions were incorporated into the final design of the facility, resulting in restrooms, door openers, floor surfaces, and room layouts that are more accessible to visitors with disabilities.

A PERMANENT ACTIVITY

The success of our AccessSTEM project, in terms of participants’ enthusiasm, their increased knowledge of accessible design, and their advocacy skills, has led the DO-IT Center to offer this activity on an annual basis with funding from the State of Washington. We’re also encouraging others to replicate the practice. Organizations that are interested in evaluating and improving the accessibility of their local informal science education programs can use the model developed by the DO-IT Center, as well as the guidelines and worksheet on our website (www.washington.edu/doit).

Activities like the one we’ve described can ultimately contribute to the increased participation of students with disabilities in STEM and improve these academic fields with the perspectives and talents of this underrepresented population.

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From Access to Inclusion: Welcoming the Autism Community

By Paula Rais

In March 2011, the Children’s Museum of New Hampshire (CMNH) in Dover hosted an ASTC Roundtable for Advancing the Professions (RAP) titled From Access to Inclusion: Welcoming the Autism Community. Following an online discussion of the same topic, hosted by ASTC Connect (connect.astc.org) in January 2011, participants came to CMNH to witness Exploring Our Way, CMNH’s Autism Partnership Program.

Autism spectrum disorder, or autism, includes a range of neurobiological conditions. Autism is not mental retardation or mental illness, and although effective treatments exist for autism, there is no cure. Interactive museums—like science centers and children’s museums—are in many ways ideal environments for children with autism, but they can also be uncomfortable and scary. Children with autism can easily be overwhelmed by noise, bright lights, and other people’s activities. Therefore, implementing even small changes can make the difference between a disastrous visit and a successful one for visitors with autism and their families.

Two boys learn to operate an interactive fish ladder in the Exploring Our Way program at the Children’s Museum of New Hampshire.
EXPLORING OUR WAY
In response to requests from parents raising children with autism, we launched Exploring Our Way in March 2010. This program has a very simple but profound goal: to be a place in the community where the entire family can enjoy time together in a welcoming environment, learning skills that can open new possibilities in the world.

Exploring Our Way is structured as a low-risk entry point to the museum that gives families a successful shared experience on which to build the confidence to visit during regular opening hours. Temple Grandin, an American professor, writer, and speaker who has autism, recently said to me, “People need a transition so they can eventually come to the museum when it is crowded. You don’t want [kids with autism] to be in a parallel universe forever. [Exploring Our Way] is a good idea!”

Six months before starting the program, we began collaborating with Easter Seals New Hampshire, giving us access to medical experts, parents with first-hand experience, service providers, and young adults with autism. CMNH assembled a committed team of advisors including educators, university professors, parents, advocates, therapists, and physicians who help guide the program. The generosity of our partners in making Exploring Our World a success cannot be understated. They have helped us understand what autism is—and isn’t—and how we can have the greatest impact.

PROGRAM DESIGN
We decided to design Exploring Our Way especially for families that have a child with autism. The program runs once a month for two hours before CMNH opens for general admission. Children with autism and their families can visit without a reservation and are welcome to stay as long as they like.

Anxiety plays a huge role in autism. Temple Grandin says that “fear is the main emotion with autism. My amygdala (fear center of the brain) is three times larger than typical.” Therefore, anything that reduces anxiety—for children and parents—is going to help families get through the door. Children with autism thrive on consistency and routines, so parents often find it helpful to have tools available to plan their visit in advance.

We created a welcoming environment with a combination of:

- Resources, including social stories called Museum Advanced Planning Picture Stories (MAPPS), other visual supports, and Frequently Asked Questions, available on our website (www.childrensmuseum.org/cmnh2010/programs) and in the museum;
- A map room to serve as a transition to the museum. Families and children can plan their visit before going to the exhibits and can return to the room as often as needed;
- A friendly and trained corps of staff and volunteers;
- Minor physical adjustments, such as slightly dimmed room lights and lower volume on exhibits with sound.

We don’t charge admission for Exploring Our Way, so there is no added financial anxiety for parents if their child isn’t comfortable enough to stay and play. Visitors can attend the program as often as they like. They also receive free admission passes to encourage them to return during regular hours.

Professionals in the autism field have commended our efforts with Exploring Our Way. For example, Viki Gayhardt, autism family support specialist with Easter Seals New Hampshire, said the program “is exceptional in that it recognizes that our children with autism are more like their peers than they are different; it’s just that they need more time and some environmental modifications in order to play and learn amongst others.”

THE RAP EVENT
Participants in the From Access to Inclusion RAP arrived with questions about programming for the autism community, and together we determined some answers.

1. How do we get institutional buy-in and support from museum staff?
If part of an organization’s mission is to be inclusive, it should be easy to get buy-in for a program that helps a condition that affects one in 88 children. Most of us probably have a connection to someone with a child, neighbor, or relative with autism. It can be very compelling to hear a personal story from someone you know.

2. How do we find partners?
Contact the educators you already know in your community. Organizations like Easter Seals (www.easterseals.com) and Autism Speaks (www.autismspeaks.org) have regional chapters throughout the
United States and can put you in touch with local contacts. Speak to the families you know who have a child with autism. They will be thrilled to hear you are considering a program, and chances are they will be very willing to help.

3. How do we market the program?
Marketing an autism program can be done very efficiently through social media, your partner organizations’ networks, and online calendars for children’s and family activities. Word spreads quickly about organizations and programs that provide a welcoming and supportive environment for children with autism.

Other models include holding occasional events, specifically designed camps and workshops, and ongoing programs. Starting with a pilot program affords a low-risk way to determine the best fit for your organization.

4. What program models work well? How can we start a program if we have no extra space?
The exclusive program model that we use in Exploring Our Way is ideal because it addresses the unique needs of children with autism. But if you can’t find dedicated time or space, select a time when your museum is typically less busy, such as during members-only times. This scenario provides the opportunity to promote awareness about autism among your members and other visitors.

Other models include holding occasional events, specifically designed camps and workshops, and ongoing programs. Starting with a pilot program affords a low-risk way to determine the best fit for your organization.

5. How do we fund the program?
Hard costs can be kept low by establishing mutually beneficial relationships with partners who can provide free staff training, resource development (e.g., social stories), program design, staffing, evaluation, and marketing. In addition, adaptations to existing programs with minor changes in curriculum, process, or teaching methods can result in a more inclusive environment. Your partners can help guide this process by identifying elements of a program that could be difficult for children with autism and suggesting simple alternatives that can be accomplished for little or no cost.

6. How should we begin?
• Partner with your local autism community.
• Conduct training for museum staff and volunteers.
• Promote your accessibility and resources on your website.
• Offer special autism programs and events.

Among the museum’s trip planning resources are Museum Advanced Planning Picture Stories (MAPPS). The three illustrations here are tools that help children understand they will be going to the Children’s Museum, checking in at the front desk, and then hanging up their coats. Photos and images courtesy Children’s Museum of New Hampshire.
SUCCESES WITH EXPLORING OUR WAY

RAP participants observed that neurotypical siblings at Exploring Our Way modeled behavior for their siblings with autism. They also noticed a high level of parent-child engagement, parents networking and sharing tips, and the presence of many fathers.

We’ve also received many positive responses from parents, such as this one from a mother: “Just seeing my son happy, comfortable, and engaged in so many new things was absolutely astonishing. Your exhibits were designed in such a way that he and his sister knew exactly how to jump in and learn. I’ve never had a happier Mothers Day in 10 years!”

The success of Exploring Our Way also presents a big challenge: As children become more comfortable in the museum, they begin to visit more often during regular hours rather than attend Exploring Our Way. Therefore, to sustain visitation, we must keep contact lists current, stay in touch with early intervention therapists and special educators, and continue reaching out to families with a newly diagnosed child and to those unfamiliar with Exploring Our Way.

We believe that the relatively simple practices we’ve implemented with this program are attainable for many museums and can make a significant difference for families and children with autism.

Paula Rais (paula@childrensmuseum.org) is director of community engagement at the Children’s Museum of New Hampshire in Dover.
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Candy maker Mars Inc. is donating $5 million to the Smithsonian Institution’s National Museum of American History, Washington, D.C., to create a new gallery focused on business and innovation in the United States dating back to the 1700s. The company will be the lead sponsor of a planned American Enterprise exhibition. The 8,000-square-foot (743.2-square-meter) multimedia gallery will trace the nation’s development from a small agricultural country to one of the world’s largest economies. This will enable the museum to expand beyond technology, cultural, and political history to address business-related issues. The gallery will include John Deere’s plow, Eli Whitney’s cotton gin, and other objects that show the development of U.S. agriculture, as well as Alexander Graham Bell’s first telephones, Alfred Bloomingdale’s personal credit cards, and Michael Dell’s early computers.

The Miami Science Museum, Florida, was awarded a $300,000 grant through AT&T’s ASPIRE program, one of the largest corporate commitments to address high school success and workforce readiness. The grant will support the development of the Museum’s Upward Bound Math and Science college readiness program from October 2012 through September 2014. The program is for low-income, first-generation, college-bound students in grades 9–12. The program features college counseling services, a week-long college tour, entrance exam preparation, and support. During the school year, students will participate in Saturday sessions at the museum, including a wide variety of workshops with hands-on science activities, tutoring and homework help, college preparation, computer lab access, and internship experiences.

The Reuben H. Fleet Science Center, San Diego, announced that The Ackerman Foundation has awarded full funding of $10,000 for a new program, Art Integrated with Math and Science (AIMS), developed by Fleet Inquiry Institute (FII) Director Cristina Trecha. AIMS is an opportunity to add to the core workshops offered through FII for teacher professional development, as well as to partner with other museums to enhance park-wide collaborations. AIMS will bring 20 elementary school teachers from Title I-underserved San Diego schools into the science and art museums of Balboa Park to learn innovative ways of cultivating classroom creativity and innovation by incorporating the visual arts and arts-based learning strategies into the daily math and science curriculum.

Two grants were recently awarded to The Franklin Institute, Philadelphia:

- $5,882,653 from NSF as lead partner in a four-city program for urban climate change education in the community. This grant covers a five-year period under the Climate and Urban Systems Partnership and will be shared with the Columbia University Center for Climate Systems Research, the University of Pittsburgh Learning Research and Development Center, the Carnegie Museum of Natural History, the New York Hall of Science, and the Marian Koshland Science Museum. The project brings together more than 20 organizations committed to climate change and climate science programming for residents of Philadelphia. Urban Learning Networks in participating cities will share information developed under this program on the best way to provide and improve education concerning climate change.

- $2.5 million in July from Teva Pharmaceuticals to develop Your Brain, a signature innovative exhibition at the museum exploring neuroscience and the human brain. This 8,500-square-foot (789.7-square-meter) exhibition will be housed in the Frank Baldino, Jr. Gallery and will show how this evolving science is having a profound impact on our personal and societal decisions. The Frank Baldino, Jr. Gallery will be located inside the new 53,000-square-foot (4,924-square-meter) addition, the Nicholas and Athena Karabots Pavilion, adjacent to the Benjamin Franklin National Memorial. Slated to open in 2014, the Karabots Pavilion will enable the Institute to expand its education programs by adding 10,000 square feet (929 square meters) of multi-purpose and classroom space.
Laddie and Jim Elwell

Interviewed by Joelle Seligson

Laddie and Jim Elwell grew up in the East with ready access to museums. When they noticed a lack of such resources near Bemidji, the small Minnesota town they now call home, the couple took action. This year Laddie and Jim are retiring as executive director and financial officer, respectively, of Headwaters Science Center (HSC), which they opened 18 years ago. They spoke with Dimensions about their grassroots effort and how ASTC has helped them along the way.

Tell me about establishing HSC. How did it come together?
L: I was working at the Science Museum of Minnesota, about 225 miles from here. I would see school groups from Bemidji or one of the hundreds of small towns throughout Minnesota. Some of these kids were spending six hours on a bus to get to the museum. Jim and I started thinking, “Why couldn’t we have a science museum up north?”

J: We had a meeting for anyone interested in having a science center. About 30 people showed up. [They] organized a spaghetti dinner, and that was our first fundraiser. First of many, I’m sure. How have you kept everything going?
L: With difficulty. But with the cooperation of a wonderful bunch of people who helped in so many different ways.

How have you seen the center evolve?
L: When we opened our doors we had three exhibits. We had an 8-foot (2.4-meter) python snake that belonged to a high school teacher whose wife wouldn’t let him keep it in the garage. We had a Double Yellow-headed Amazon parrot by the name of Humphrey and a bicycle gyroscope that Chuck Deeter, our first employee, built. It’s still a popular exhibit.

J: We were helped considerably by ASTC’s new centers’ meeting in Boston in 1992.

L: I owe our being to ASTC. It’s just been so darn helpful. One of the great presenters at that session told us that the Pacific Science Center had gotten a National Science Foundation grant designed to help start new science centers [an initiative called the Science Carnival Consortium]. However, the closure date was the next day. So I flew from Boston to D.C., and wrote a very quick application with help from the ASTC office—and by golly, we got it! Chuck Deeter and I got a week out in Seattle for training, and we got 11 big, professional exhibits in 1994.

Where are you leaving the center today?
L: Bemidji is a town of about 13,000. We had 30,000 visitors last year and the year before, and that’s pretty good. But it has been hard. We’ve really bumped along.

What stories will stick with you the most?
L: The library asked if it could have a used book sale in our building. I came in one morning and noticed a lady in our shop looking at a book on snakes. I said, “Have you seen our snake?” And she said, “He’s not in his cage.” Sure enough, the cage was open. This meant we had an 8-foot (2.4-meter) python loose in a room full of boxes, books, tables, and people. We found him a couple of hours later; he had slithered into the basement. It didn’t amount to anything, but it was funny because all of us were walking around with our hands folded behind our backs, trying to look innocent as we looked.

Any advice for others wanting to start a science center?
J: I guess we just say, “Dream big, and it will happen.”

For a podcast and full transcript of this interview, visit www.astc.org/blog/category/astc-dimensions/q-and-a/.
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