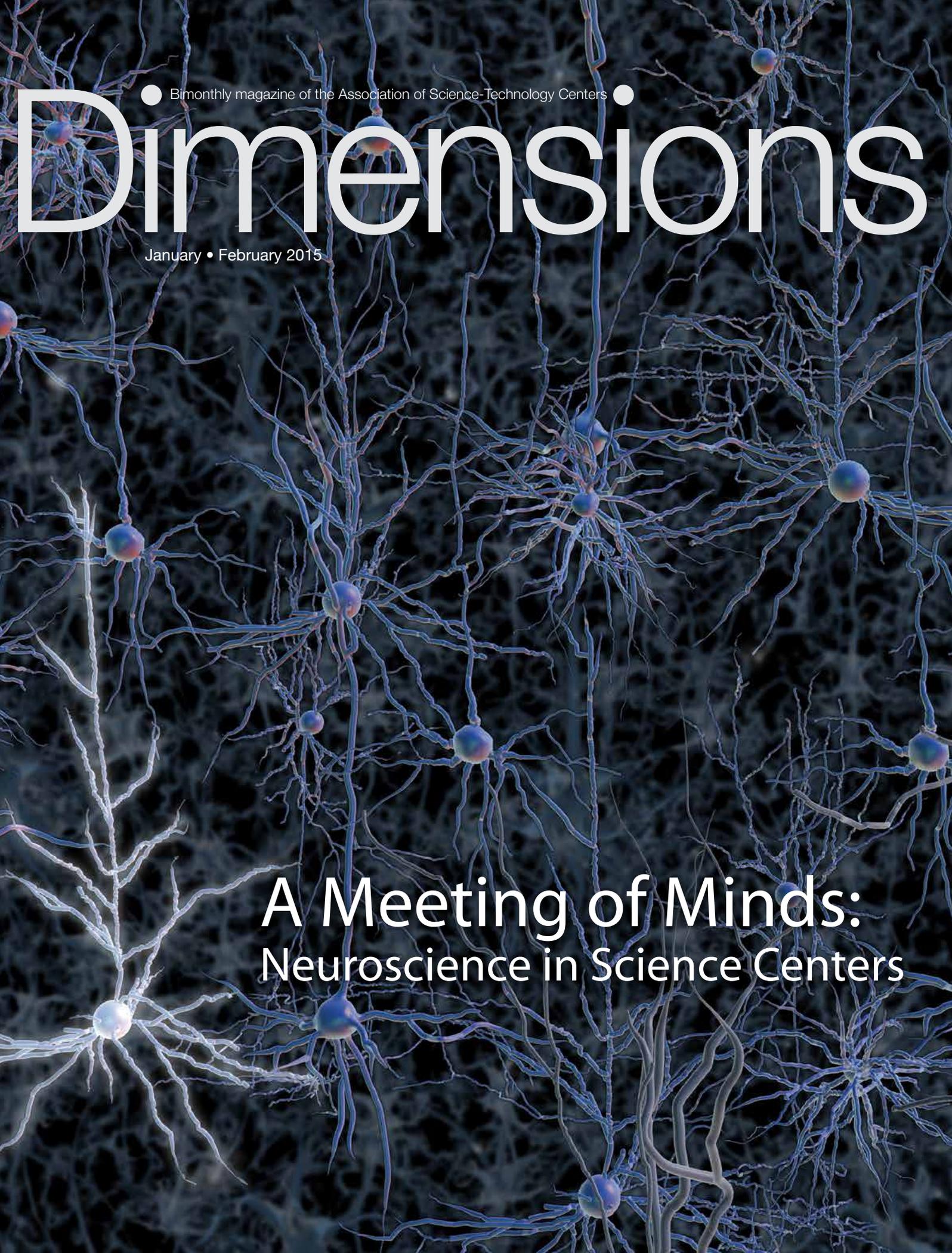


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January • February 2015

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In the *Your Brain* exhibition at Philadelphia's Franklin Institute, the Neural Climb simulates the dynamic, complex signaling environment of the brain. Photo by Colin M. Lenton

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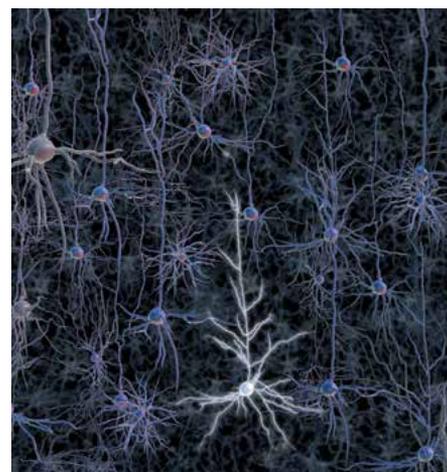
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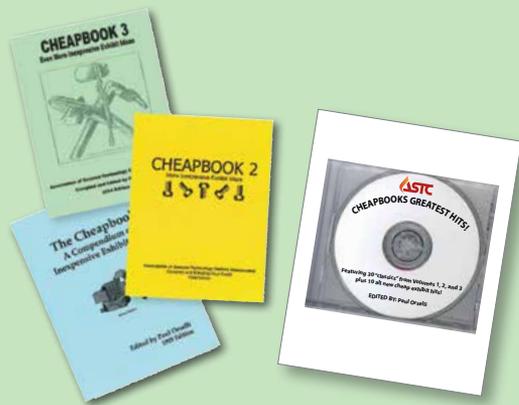
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Introducing ASTC's New Website

I hope *Dimensions* readers around the world have already had the chance to visit ASTC's new website (www.astc.org). We are extremely pleased with the new design and functionality of the site. It is organized to provide easy access to information, news, resource materials, and professional development opportunities.

I encourage you to explore all the new website has to offer, including the following useful resources:

- Visit the **ASTC Community** to join one or more of the nearly 350 conversations currently underway among more than 2,300 museum professionals from around the world in the General Forum, or discuss the latest issues in one of ASTC's 20 Communities of Practice (community.astc.org).
- Jump over to **myASTC** to read the latest issue of *Dimensions*, access the directory, or update your subscriptions (members.astc.org).
- Find out what ASTC is up to on our **blog** (www.astc.org/blog).
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- Check out all of ASTC's **publications**, including *Dimensions* (www.astc.org/publications).
- Find an ASTC-member science center with our **science center search** (www.astc.org/about-astc/about-science-centers/find-a-science-center).
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- Take advantage of ASTC's diverse **professional development** resources and opportunities (www.astc.org/professional-development).
- Access ASTC's 2014 **Annual Conference** presentations and get information on ASTC 2015, to be held October 17–20 in Montreal (www.astc.org/conference).
- Learn about ASTC's **advocacy and public policy** efforts (www.astc.org/advocacy) and take action using the **Legislative Action Center** (www.congressweb.com/sciencetechnologycenters).
- Explore **InformalScience.org**, an online collection of informal science education resources from the Center for Advancement of Informal Science Education (CAISE).



Photo by Christopher Anderson



These and so many more resources are yours through the new ASTC website. We are grateful to the many members, staff, and designers, notably Wood Street, Inc., who have helped to create such a valuable addition to the resources available to the ASTC community.

Anthony (Bud) Rock (brock@astc.org) is ASTC's president and CEO. Visit www.astc.org/category/ceo to read more From the CEO editorials.

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“A Terrific ASTC Annual Conference”

Congratulations on a terrific ASTC Annual Conference! Thank you for all of the planning, communication, and on-site management from the ASTC team to make it a success. It seemed to run very smoothly and [North Carolina Museum of Natural Sciences President and CEO] Emlyn Koster and his staff were very happy hosts. I appreciate the special touches, like the ability to print our name badges at a kiosk, the daily blogs, the Communities of Practice meetings, and the layout and activities in the Exhibit Hall that truly made it a hub of the conference. I talked to many happy exhibitors, including my own staff, and I expect you will easily sell out next year’s booths. There was a buzz from Board members about [ASTC President and CEO] Bud Rock’s progress report at the Board meeting and the exciting projects ahead. Please extend my appreciation to all of the ASTC staff. You are a small but exceptionally powerful team!

Nancy Stueber, *president and CEO, Oregon Museum of Science and Industry, Portland*

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A visitor learns about bats inside a walk-in model of a Puerto Rican cave. Photo courtesy C3Tec

PUERTO RICAN PREMIERE

Puerto Rico's first science and technology center—the **Centro Criollo de Ciencia y Tecnología del Caribe** (C3Tec) in Caguas—opened its permanent exhibition last August. *Our Bodies, Our Island, Our Planet* was designed to awaken curiosity and spark interest in science, technology, engineering, and math. The exhibition features 32 displays aligned to Puerto Rico's science and math curriculum and designed with 9- to 14-year-olds in mind.

The 6,764-square-foot (628-square-meter) exhibition is divided into four thematic zones that all share a focus on systems and sustainability. Zone 1, Sustaining Puerto Rico, features a Powers of Ten Theater highlighting relationships among systems of different magnitudes, and interactive kiosks that survey visitor attitudes and behaviors concerning sustainable living. Zone 2, Physical Systems: My Body, My Island, My Planet, explores the systems supporting living organisms and Earth itself. It includes a hurricane simulator, a walk-in model of an island cave, and a series of interactive stations on human body systems.

In Zone 3, Energy Systems in Nature and Human Invention, visitors can roll coins down a gravity well and discover ways to make their homes environmentally sustainable. Zone 4, Living Systems: Human Body and Health, invites visitors to manipulate a DNA model and select different traits, and to pedal bicycles to observe how long it takes to burn off calories.

In addition to the permanent exhibition, which occupies much of the center's first floor, the three-story building includes a space for traveling exhibitions, a Physics Laboratory and Biology Laboratory where families and school groups can participate in experiments and games, a 3D movie theater, and a Green Roof with an observatory and ecological garden. The project was spearheaded by the late ex-mayor of Caguas, William Miranda Marín, and made possible by \$25 million in municipal funds. The center expects to receive 50,000 visitors a year.

—Sharon Barry

Contact: Tasha Endara, executive director, tendara@c3tec.org, www.c3tec.org

TINKERERS WELCOME

In 2014 the **New York Hall of Science** (NYSCI), Queens, celebrated its 50th anniversary. The museum kicked off the celebration in June by opening *Design Lab*, a 7,000-square-foot (650-square-meter) permanent exhibition that invites visitors to use their innate inventiveness to find solutions to design and engineering challenges. The overall goal is to engage all types of science learners in solving personally motivating problems via a creative design process. “With *Design Lab*, visitors are in the driver’s seat like never before,” says president and CEO Margaret Honey.

Design Lab is located on the lower level of the museum’s Central Pavilion, which was part of NYSCI’s original facility built for the 1964–65 World’s Fair. The exhibition has five activity areas, each featuring a single group activity that changes every few months. In Backstage, visitors tackle activities related to performing. Last summer, they made shadow puppets out of index cards, fasteners, sticks, and tape. Sandbox activities challenge visitors to create sturdy structures they can stand inside. In Studio, visitors use light-emitting diodes (LEDs) and batteries to design illuminated, animated tabletop structures that will make the city a happier place. Treehouse is a split-level area where visitors figure out a way to move objects between the two levels. The Maker Space offers workshops on various themes for families as well as for after-school and camp groups.

All of the activities encourage creativity, imagination, playfulness, brainstorming, and collaboration. They make use of familiar, everyday materials to help children see design possibilities in the world around them and to prove that creativity does not depend on expensive or specialized materials. The activities also demonstrate that there’s more than just one right answer.

The cost of *Design Lab* was \$4.5 million. Funding was provided by Phyllis and Ivan Seidenberg, the Verizon Foundation, the Office of Naval Research, and the Xerox Foundation. —S.B.

Contact: Mary Record, director of communications, mrecord@nysci.org, www.nysci.org/designlab

Top: The Sandbox area of *Design Lab* encourages visitors to work collaboratively to build structures using only wooden dowels and rubber bands. Bottom: A young visitor builds her own creation in *Design Lab*. Photos by Andrew Kelly/New York Hall of Science





A girl examines fossils in *Explore Oregon's* interactive PaleoLab. Photo by Kristin Strommer, Museum of Natural and Cultural History

EXPLORING OREGON

Last May, when *Explore Oregon* opened at the **University of Oregon Museum of Natural and Cultural History** in Eugene, the museum's exhibition space doubled. The new 2,755-square-foot (256-square-meter) exhibition hall complemented the existing halls on cultural history by focusing on the natural forces that shaped Oregon's landscapes and ecosystems. Organized around the theme of change, the exhibition explores transformative processes such as climate change, sea-floor spreading, volcanism, floods, glaciers, tsunamis, and evolution.

As visitors enter the exhibition, they encounter examples of Oregon's diverse landscapes and ecosystems. How did these natural features evolve and change over the past 300 million years? Visitors find out through displays devoted to geology, paleontology, and

natural history. In addition to interactives and fossils, the displays feature artworks that bring Oregon's deep past to life. There are life-size sculptures of a 7-foot-long (2-meter-long) sabertooth salmon and a giant Harlan's ground sloth, for example. The sabertooth salmon display also includes a large mural, sabertooth salmon fossils, and a touchable 3D skull replica.

Visitors can peer into a microscope to investigate tiny fragments of shell and bone and speculate on what ancient ecosystems they came from. Or they can dig for real fossils and rocks at a model of an Oregon beach site and then take the specimens they uncover to the PaleoLab to identify and curate. "While this interactive was originally designed for younger visitors, it has been so popular among adults that

we've had to supply adult-sized lab coats," says communications manager Kristin Strommer. A stewardship interactive asks visitors to comment on what they love about Oregon and engages them in a dialogue about conservation. Throughout the exhibition, "Go See It!" notes encourage visitors to explore Oregon for themselves.

Museum staff engaged the local community in the development of the exhibition through extensive prototyping. With the support of a grant from the Institute for Museum and Library Services, the museum collected 758 visitor evaluations. "Visitor input from prototyping directly shaped about 25% of the exhibition's displays," says Strommer.

Explore Oregon was funded largely through philanthropic gifts. —S.B.

Contact: Kristin Strommer, communications manager, kstromme@uoregon.edu, natural-history.uoregon.edu/exhibits/explore-oregon

SOUTHERN HOSPITALITY AT ASTC 2014

More than 1,700 science center and museum professionals representing 42 countries gathered in Raleigh, North Carolina, from October 18 to 21 for ASTC's 2014 Annual Conference, hosted by the **North Carolina Museum of Natural Sciences (NCMNS)**. The United States, Canada, the United Kingdom, China, Saudi Arabia, Israel, Germany, and Malaysia sent the largest delegations. With the conference set in the heart of downtown, attendees were surrounded by Raleigh's delightful southern charm.

With 15 preconference workshops, more than 100 concurrent educational sessions, and 6 pre- and post-conference tours, there was no shortage of informative content and discussions in which attendees could immerse themselves. The Exhibit Hall was packed with 123 exhibitors showing off the latest in services, products, solutions, and traveling exhibitions. The Exhibit Hall also featured a networking reception, demonstrations from youth from three member institutions, and the ever-popular Live Demonstration Hour. ASTC's 21 Communities of Practice (CoPs) hosted



From left to right: Vermeulen, Koster (photos by Christine Ruffo); Humphrey (photo by Wayne MacPhail).

meet-ups over the course of the conference to plan the direction of each community for the coming year and engage in lively discussions around current issues in the field. Over 248 individuals from 145 organizations participated in a CoP Meet Up.

NCMNS went above and beyond, hosting Saturday evening's Party Through Space and Time that gave attendees an after-hours peek at the National Medal-winning institution. Partygoers were treated to local food (including both the eastern and western styles of North Carolina's famous barbecue), live bluegrass music, and chances to talk with museum scientists in their labs. Tuesday's Museum Open House Day let conference attendees take a closer look at the museum with behind-the-scenes tours, demonstrations, and events. The nearby Marbles Kids Museum hosted Museum Cinema Day, sponsored by the Giant Screen Cinema Association, with screenings of the latest giant screen educational films throughout the day.

Two intriguing keynotes

This year's conference featured two stellar keynote sessions. **Hayat Sindi** delivered Saturday's keynote address, speaking about her experiences as the first woman from the Gulf Region to receive a Ph.D. in biotechnology, as well as the need to inspire young people, especially young women, to pursue science. Sindi's presentation was followed by a Q&A session with local high school girls. Saturday's session was emceed by National Public Radio's **Frank Stasio** and included words of welcome from **Thomas Ross**, president of the University of North Carolina; **Nancy McFarlane**, mayor of Raleigh; **Emlyn Koster**, president and CEO of NCMNS; **Chevy Humphrey**, president and CEO of Arizona Science Center, Phoenix, and chair of ASTC's Board; and **Anthony (Bud) Rock**, ASTC's president and CEO. The session also featured the presentation of the Roy L. Shafer Leading Edge Awards (see pages 18-19) and a fantastic musical interlude from the Helping Hands Mission Band. On Monday, **Angelo Vermeulen**, artist,



2014 ASTC Diversity and Leadership Development Fellows. Photo by Christine Ruffo



biologist, space systems researcher, and community organizer, delivered a second keynote presentation on mixing art and science and the future of spacecraft design, during a session emceed by **Terri Lomax**, vice chancellor for research, innovation, and economic development at North Carolina State University.

Also during these keynotes, ASTC unveiled a new program and a new partnership. On Saturday, ASTC announced the launch of the World Biotech Tour (WBT, www.WorldBiotechTour.org) in collaboration with the Biogen Idec Foundation. The WBT is a multiyear project designed to increase the impact and visibility of biotechnology to youth, the general public, and underserved communities in an effort to promote science literacy worldwide. (See pages 14–15 to learn more.) A memorandum of understanding was signed on Monday between ASTC and the U.S. Department of Energy (DOE). This partnership is designed to increase energy literacy across the country through ASTC’s science center and museum members, leveraging the DOE’s existing programs.

New directors installed, outgoing directors honored

During ASTC’s Annual Business Meeting on Monday, Humphrey installed the newest members of ASTC’s Board of Directors, who were elected by the Association’s governing members in August. This year, four members were elected and four members were re-elected to a second term.

The new Board members are Margaret Honey, CEO, New York Hall of Science, Queens; Eric Jolly, president, Science Museum of Minnesota, St. Paul; Jennifer Martin, president and CEO, TELUS Spark, Calgary, Alberta, Canada; and Charlie Walter, executive director, New Mexico Museum of Natural History and Science, Albuquerque. (Walter stepped down from the Board shortly after the conference, as he left the museum to become COO of the San Antonio Children’s Museum.) Those Board members re-elected to a second term are Elizabeth Hoyos, director, Maloka, Bogota, Colombia; Neville Petrie, CEO, Science Alive! The New Zealand Science Centre, Christchurch; Stephanie Ratcliffe, executive director,

the Wild Center/Natural History Museum of the Adirondacks, Tupper Lake, New York; and Barry Van Deman, president and CEO, Museum of Life and Science, Durham, North Carolina.

We are extremely grateful for the service of outgoing Immediate Past Chair **Bryce Seidl**, who recently retired as president and CEO, Pacific Science Center, Seattle. We thank outgoing Board members Dennis Bartels, executive director, Exploratorium, San Francisco; Ann Fumarolo, president and CEO, SciPort: Louisiana’s Science Center, Shreveport; and Asger Høeg, former executive director, Experimentarium, Hellerup, Denmark, for their guidance. (Høeg stepped down from the Board in July after moving into a different role at Experimentarium.) For a complete list of Board members, visit www.astc.org/about-astc/leadership.

L’année prochaine à Montréal

We look forward to seeing you at ASTC 2015, which will be held October 17–20 in Montreal, Quebec, Canada, hosted by the **Montreal Science Centre**.



From left to right: Keynote speaker Hayat Sindi (center) poses with Sherry Barndollar Rock (left), former executive director of DACOR Bacon House Foundation, and Anthony (Bud) Rock, ASTC’s president and CEO; Leigh Duke, NCMNS clinical veterinarian, prepares to examine a bullfrog at Museum Open House Day; sparks fly in the Exhibit Hall. Photos by Christine Ruffo

Many thanks

ASTC extends its most heartfelt thanks to the 2014 Conference Program Planning Committee (CPPC), sponsors, speakers, exhibitors, volunteers, and attendees for an amazing conference. We also sincerely thank Emlyn Koster, president and CEO of NCMNS, and his staff and volunteers.

Karen Hager, director, science engagement, Ontario Science Centre, Toronto, will serve as ASTC 2015 CPPC co-chair alongside Guy Labine, CEO, Science North, Sudbury, Ontario, Canada. We are grateful to outgoing CPPC members Len Duda, ASTC 2013 Albuquerque host committee chair, and Joe Hastings, executive director, Explora, Albuquerque, New Mexico.

We express our deepest appreciation to the following annual conference sponsors for their support of ASTC and their commitment to science centers and museums worldwide:

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To learn more about ASTC 2014, visit the conference blog (www.astc.org/category/annual-conference) and the ASTC YouTube channel (www.youtube.com/user/ASTCvideos).

EXPLORE EVALUATION RESOURCES AT INFORMALSCIENCE.ORG

InformalScience.org is a collection of informal science education (ISE) project, research, and evaluation resources curated by the Center for Advancement of Informal Science Education (CAISE). *InformalScience.org* recently released a newly updated evaluation tab designed to make evaluation resources more accessible to informal science, technology, engineering, and math (STEM) professionals. The new tab visually highlights resources to help project leaders leverage professional evaluators to develop evaluation plans and proposals, inform projects, and disseminate evaluation findings.

The new evaluation tab can help you



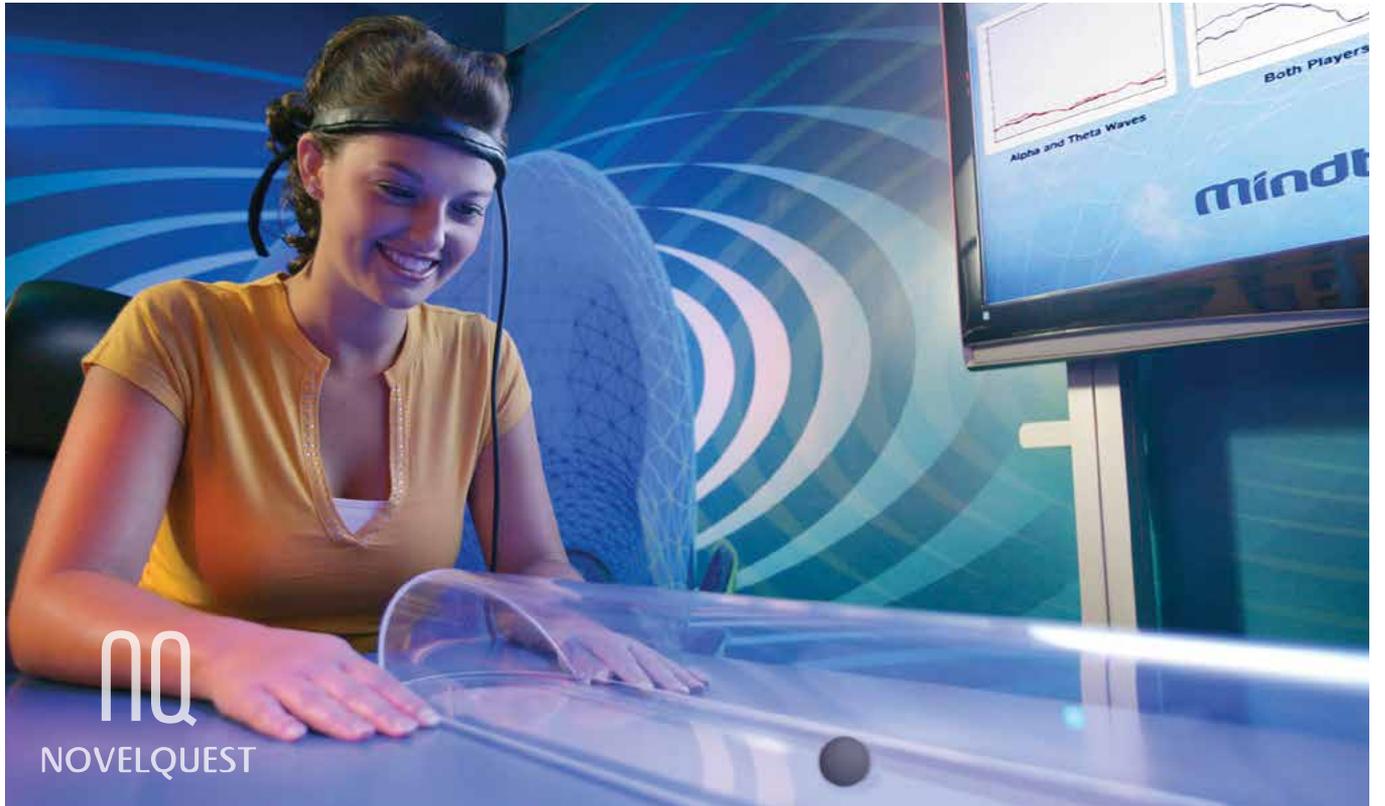
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To explore this new evaluation resource, visit InformalScience.org/evaluation.

ASTC'S WEBSITE GETS A MAKEOVER

In November 2014, ASTC unveiled our brand new website, which can be found in the same location, at www.astc.org. We hope you'll find the site to be more dynamic and easier to navigate. Since we now have an enhanced ability to keep the site regularly updated, we hope you'll visit often! (See From the CEO on page 5 to learn more.)

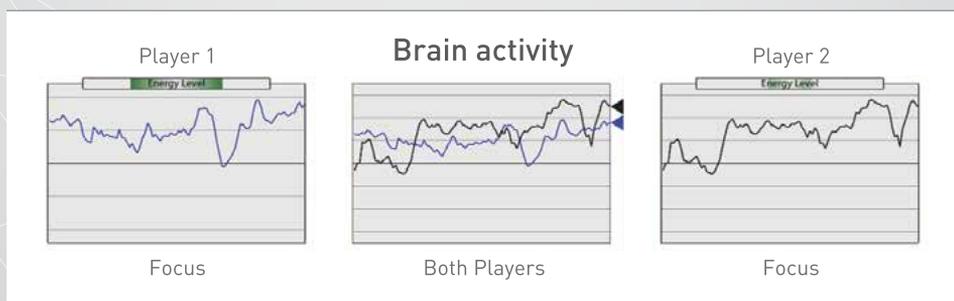
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BIOTECH GOES ON TOUR

The World Biotech Tour (WBT, www.WorldBiotechTour.org) is a multiyear initiative that will bring biotechnology to life at select science centers and museums. The program, formed by a collaboration between ASTC and the Biogen Idec Foundation, is scheduled to run from 2015 to 2017, kicking off next year in Portugal, Japan, and Belgium. The WBT will increase the impact and visibility of biotechnology among youth and the general public at 12 science centers and museums worldwide through hands-on learning opportunities.

ASTC is developing a lab-in-a-box educational kit that will be sent to each site. The kits will include signature hands-on activities and materials and will also utilize social media channels. For example, participants can take a “cellfie” picture of their cheek cells using cell phone microscopes, participate in a game where they attempt to “kill” a virus and have their results posted online, or play a card game that illustrates how biotechnology can address science and



society issues. In addition, the WBT will enlist high school student ambassadors from around the world to give presentations about dynamic biotechnology topics in their schools and communities to inspire others to get involved. The WBT website offers all museums free access to resources necessary to produce a version of the WBT at their respective sites.

Throughout the tour, ASTC will conduct research on how biotechnology is being communicated in informal science environments. The results of the tour will be shared at the Science Centre World Summit in Tokyo in 2017. Applications to be part of the 2016 cohort will be accepted beginning May 2015.

We spoke with **Walter Staveloz**, director of international relations at ASTC, and **Kara DiGiacomo**, executive director of the Biogen Idec Foundation, about their collaboration and their goals for the WBT.

Why is it important to increase public awareness of biotechnology?

Staveloz: There is more biotech in people’s lives than they realize—mostly because it’s not always obvious, but also because people don’t really understand the hidden manipulations of the small organisms that are behind biotech. Since biotech is going to be a central element of any progress in health and agriculture, to name a few areas, it’s important that we help people to see not only the importance of biotech in their lives now, but also how they can become a part of how biotech improves everyone’s lives. For example, alternative energy is an important topic for both biotech and climate change. By substituting biofuels in place of petroleum-based fuel, people can greatly reduce the amount of greenhouse gases emitted from transportation sources.

DiGiacomo: Around the globe, there remains a great lack of understanding of the life sciences and how they impact everyday lives—and the WBT will help bring the wonder and excitement of the life sciences to the general public and ensure that our citizenry is educated and can engage in meaningful conversations. Science centers are well positioned to facilitate dialogue with visitors, communities, and policy makers. It is our hope to inspire more young people to pursue a career in science.

Why did ASTC and Biogen Idec Foundation collaborate?

Staveloz: ASTC is a worldwide organization so it was natural that the Biogen



The official launch of the World Biotech Tour (WBT) was announced at ASTC’s 2014 Annual Conference in Raleigh, North Carolina. From left to right, the heads of the three museums to host the WBT in 2015 (Erik Jacquemyn, Technopolis, Mechelen, Belgium; Mamoru Mohri, Miraikan, Tokyo; and Rosalia Vargas, Pavilion of Knowledge—Ciência Viva, Lisbon, Portugal) pose with DiGiacomo and Staveloz. Photo by Bryan Miller

Idec Foundation would look for a collaborator like us. Wherever they want to go, we have a member organization there. Also, we have some experience managing large-scale projects worldwide.

DiGiacomo: The Biogen Idec Foundation chose ASTC for a multitude of reasons. We hold certain values in very high regard and we see those mirrored in ASTC—including learning, curiosity, teamwork, and a true sense of community.

What is unique about the WBT?

Staveloz: I am really looking forward to seeing how we will train staff in our museums worldwide with new insights on how to communicate biotech. The project includes evaluations and activities so that both the biotech industry and



Walter Staveloz, director of international relations at ASTC. Photo by Carlin Hsueh

the science center field will learn how to communicate biotech concepts better.

DiGiacomo: The WBT truly calls everyone to action. It is our collective



Kara DiGiacomo, executive director of the Biogen Idec Foundation. Photo by Michael Hurley

responsibility to launch new ways of engaging and collaborating with a global community so true innovation in science education can occur.



WELCOME TO ASTC

The following new members were approved by the ASTC Board in early 2014. Contact information is available in the About ASTC section of ASTC's website, www.astc.org.

SCIENCE CENTER AND MUSEUM MEMBERS

- **Coordinating Secretariat for Science, Technology, and Innovation (COSTI)**, Colombo, Sri Lanka. COSTI has been working closely with ASTC to develop a national science center showcasing Sri Lankan traditional knowledge, heritage, biodiversity, and innovations. In late January 2014, the Coordinating Workshop for the Establishment of a National Science Center in Sri Lanka brought together more than 100 people involved in the center's planning and development.
- **Lake Superior Zoo**, Duluth, Minnesota. Since 1923, the Lake Superior Zoo has been inspiring connections to wildlife and action toward conservation through close-up animal experiences including exhibits, animal enrichment demonstrations, educational camps, and more. The zoo spans over 16 acres (6.5 hectares) of hillsides and pines, including Kingsbury Creek.
- **Lander Children's Museum**, Lander, Wyoming. This museum offers a variety of hands-on exhibits and interactive programs that invite children and their grown-ups to explore, learn, and play together. The 1,900-square-foot (177-square-meter) facility opened in 2000.



Wind Veil by U.S. artist Ned Kahn on the façade of Swiss Science Center Technorama. Photo courtesy Swiss Science Center Technorama

- **San Antonio Children's Museum**, Texas. Entering its 20th year, the San Antonio Children's Museum (SACM) serves children ages 0 to 10 and their parents and caregivers. The SACM is currently building a new home, the Do Seum, which will open in June 2015. With over 65,000 square feet (6,039 square meters) of interior exhibition space and 39,000 square feet (3,623 square meters) of outdoor exhibits, the Do Seum will have a greater emphasis on interactive science, technology, art, and literacy activities.
- **Swiss Science Center Technorama**, Winterthur. Technorama offers visitors the opportunity to explore natural phenomena in an informal, hands-on, self-directed way. With nearly 76,000 square feet (7,061 square meters) of interior exhibition space and more than 500 experiment stations, the center welcomes more than 250,000 visitors each year. Technorama made its debut in 1982.
- **Wings Over the Rockies Air & Space Museum**, Denver. Housed in a 150,000-square-foot (13,935-square-meter) 1930s-era former Air Force hanger, the museum maintains a collection of more than 45 aircraft and space vehicles. A capital campaign is underway to develop a 15-acre (6-hectare) on-airport facility with two major galleries, an active aircraft ramp, a control tower, and more.

SUSTAINING MEMBERS

- **CyberTouch, Inc.**, Newbury Park, California. CyberTouch develops and markets custom and integrated touch screen displays and frames for walls, tables, and kiosks. Founded in 1982, this company counts the Massachusetts Institute of Technology, the Natural History Museum of Los Angeles County, and NASA among its clients.
- **IMAX Corporation**, Santa Monica, California. Back as an ASTC member after a six-year hiatus, IMAX not only partners with 738 theaters in 53 countries, but also uses its patented technology to enhance blockbuster movies and create documentaries.
- **Peredvinperssonconsulting**, Helsingfors, Finland. Per-Edvin (Pelle) Persson, former director of Heureka, the Finnish Science Centre, Vantaa, has launched his consultancy. Services include CEO coaching, strategic planning, and corporate identity development. Persson became an ASTC Fellow in 2007 and served as ASTC president from 2004 to 2005.
- **Valenta Consulting**, Chesterfield, Missouri. Carol Valenta retired from the Saint Louis Science Center in 2013 and opened her consultancy soon after, offering educational program development and management consulting.

OUR BOARDS IN ACTION: ROMELIA FLORES

Each “Our Boards in Action” column highlights a board member at an ASTC-member institution, who shares his or her insights and experiences. In this edition, we feature **Romelia Flores**, a member of the Board of Trustees of the **Fort Worth Museum of Science and History**, Texas. Flores is one of IBM’s top 500 technical executives, earning the titles of IBM Distinguished Engineer and IBM Master Inventor.



Romelia Flores, a member of the Board of Trustees at the Fort Worth Museum of Science and History.

What is a typical day like for you at IBM?

I don’t really have “typical days.” Some days I work with IBM clients to solve their business and IT [information technology] challenges in innovative ways. At other times, I help train our IBM millennials. I also collaborate with senior engineers to create new and innovative ideas for clients while utilizing leading-edge technologies. This has led to 23 U.S. patents and 25 more that are currently being evaluated.

How does your professional work influence the work you do as a board member?

I love learning about technology. As a trustee at the Fort Worth Museum of Science and History [FWMSH], I focus on the Innovation Committee. Over the years, we have given university students the opportunity to contribute their engineering or research study skills to the FWMSH. For 2015, I will be work-

ing with the FWMSH on an exhibition that highlights the history of technology.

Tell us about the work you’ve done to empower women, Latinos, and other underrepresented groups in science and engineering.

As an IBM Distinguished Engineer and Master Inventor, I serve as a role model for women and Latinos—both IBM employees and young students. I frequently deliver career discussions, STEM

sessions, and technology demonstrations with the objective of encouraging others to strive for professional success. I have had the wonderful opportunity to link the FWMSH to IBM for technology strategy assessments as well as to deliver STEM and Watson technology discussions to students visiting the museum [www.ibm.com/smarterplanet/us/en/ibmwatson].

Where do you see the FWMSH headed in the future?

The FWMSH recently sponsored Learning Crossroads, a forum at which some of the nation’s brightest minds and digital visionaries shared their thoughts on the future of the digital learning landscape [fortworthmuseum.org/learningcrossroads]. The museum has a history of innovation and aims to be at the forefront of learning. It is exciting to imagine how the FWMSH might utilize new digital tools to help develop young minds and to enable university students to conduct research and advance their studies. We believe it is crucial to continue to incorporate technological advancements into the FWMSH to foster scientific curiosity and discovery in future generations.

Do you have a board member you’d like to see profiled in a future “Our Boards in Action” column? Please send his or her name, position, and contact information to dimensions@astc.org (subject line: Boards).

INTRODUCING THE 2014 ROY L. SHAFER LEADING EDGE AWARD WINNERS

On Saturday, October 18, during the Opening Keynote Session of ASTC's 2014 Annual Conference in Raleigh, North Carolina, two science centers and three science center leaders received Roy L. Shafer Leading Edge Awards.

Now in their 10th year, the "Edgies" commemorate the late Roy L. Shafer, a former science center director, ASTC president, organizational coach, and mentor to many. These awards recognize extraordinary accomplishments in Business Practice, Visitor Experience, and Leadership in the Field. Recipients receive an etched glass award and a complimentary registration to the following year's ASTC Annual Conference.

This year's Leading Edge Award jury was chaired by Jan Luth, Exploration Place, Wichita, Kansas, and its members included Jonah Cohen, the Children's Museum, West Hartford, Connecticut; Chris Cropper, Maryland Science Center, Baltimore; Maribel Garcia, the Mind Museum, Manila, Philippines; Asger Høeg, Experimentarium, Hellerup, Denmark; Erica Lacey, Kirby Science Discovery Center, Sioux Falls, South Dakota; Steve Langsdorf, Roto, Dublin, Ohio; Rae Ostman, formerly of Royal Ontario Museum, Toronto; Whitney Owens, Great Lakes Science Center, Cleveland; Harry White, At-Bristol Science Centre, Bristol, England, United Kingdom; and Nikole Williams, EdVenture Children's Museum, Columbia, South Carolina.

The jury awarded two Leading Edge Awards for Visitor Experience this year. The **Museum of Science and Industry (MSI)** in Chicago was honored for *Future Energy Chicago (FEC)*, a participatory, social experience designed to

deepen visitors' understanding of how energy works in the real world. The centerpiece is a multiplayer simulation game in which teams collaborate and compete to create an energy-efficient future for the city of Chicago.

Through *FEC*, the museum experimented with new ways of integrating live facilitation into an interactive, designed experience. Two operational modalities accommodate distinct visiting groups: students in school groups and the general public. Facilitators control the overall pacing of *FEC* using an iPad with a simple interface that affords them flexibility to adjust to audience needs. MSI's general audience facilitators iteratively refine their script as they explore the best ways to encourage visitors that don't know each other to play together. MSI's school group facilitators developed a pre/post-visit teacher packet with lessons and activities that support, deepen, and extend the learning that takes place in *FEC*.

The Leading Edge Award for Visitor Experience was also presented to **Heureka, the Finnish Science Centre, Vantaa**, for *Heureka Goes Crazy*, an

interactive exhibition about mental health. (See the article beginning on page 42.) The exhibition aims to decrease the stigma connected to mental health problems and to encourage visitors to take care of their own mental health. Throughout the exhibition, the subject is examined with sensitivity, creating a hands-on experience that doesn't cause fear, even though it tackles a difficult topic. The approach is multidisciplinary, and art has been widely used as a means to offer multiple entry points.

Heureka Goes Crazy was developed with scientists and professionals, as well as with peer experts that had experienced mental health problems.

In addition, it was developed within a consortium—Heureka took the lead, along with Universcience in Paris and Pavilion of Knowledge—Ciência Viva in Lisbon, Portugal. Within the consortium, each museum produces one exhibition, which then tours to the other museums. All partners give their input to the contents and the costs are shared.

The jury also presented Leading Edge Awards for Experienced Leadership in the Field to three

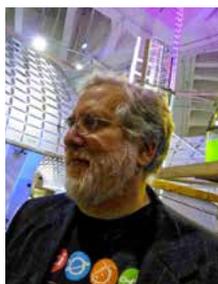


Erik Jacquemyn (front and center, with arms raised) received the Leading Edge Award for Experienced Leadership in the Field for bringing the international science center field together at the Science Centre World Summit 2014. Photo courtesy SCWS

science center leaders. **Erik Jacquemyn**, CEO of Technopolis, the Flemish Science Centre, in Mechelen, Belgium, received this award for bringing the international science center field together at the high-level Science Centre World Summit 2014. While the long-term effects of the World Summit will be measured in the next three years, some outcomes already point to the impact of Jacquemyn's leadership in engaging science centers worldwide, as well as his staff and volunteers, to bring this new vision of a world meeting to fruition. In total, 464 participants attended the Summit. No less than 38% came from outside the science center field, bringing together the leadership of the science center field with leaders of international science and governmental organizations, scientists, astronauts, Nobel laureates, and even the King of Belgium.

This year, for the first time, Leading Edge Awards for Experienced Leadership in the Field were also presented to individuals in a non-CEO role. **Judy Brown**, senior vice president of education, Patricia and Phillip Frost Museum of Science, Miami, and **Eric Siegel**, director and chief content officer, New York Hall of Science, Queens, were both selected to receive this award.

Brown has made major contributions to the field through development and evaluation of innovative educational programming and plays a leadership role nationally in bringing resources of the ISE community to the K-12 educational reform movement. Her recent work in gender equity in STEM builds on her 25 years at the museum. She has constructed a continually evolving



Clockwise from top: The marketing campaign for *Heureka Goes Crazy*, where Heureka's own staff posed with "crazy goggles," helped deal with the taboo topic of mental health issues in an encouraging way (photo courtesy Heureka); in *Future Energy Chicago*, visitors compete in teams and rotate through five games (photo by J.B. Spector, Museum of Science and Industry); Judy Brown was honored for her work in innovative educational programming and gender equity, among other projects; Eric Siegel was recognized for his work with exhibitions, digital experiences, and the Maker Movement.

museum education department focused on in-depth, multiyear programming that strengthens the workforce through equitable access to new technologies, strategies to engage girls in STEM, an early childhood science curriculum, and efforts to build the capacity of informal and formal educators.

Siegel has developed projects like the exhibition *Human+* and the electronic book *False Conviction* that connect science to humanitarian social goals. He leads a large and diverse

team of researchers, designers, and educators to create large-scale exhibition and digital experiences. He also has led the integration of the Maker Movement with the ISE community and has published and spoken widely on a broad range of ISE topics. Siegel is a former president of the National Association of Museum Exhibitions and is on the graduate faculty at New York University in the Program in Museum Studies and Interactive Telecommunications Program.



AMERICAN MUSEUM OF NATURAL HISTORY
TRAVELING EXHIBITIONS

BRAIN

The Inside Story



Drawing on 21st century research and technology, this highly interactive exhibition explores how the remarkable brain has evolved, how it works, and how it makes us human.

“An interactive sensory feast that both surprises and stimulates.” – Live Science

Traveling exhibition available from Fall 2015.
Contact us to learn more: 212-496-3362 • amnh.org/traveling

Brain: The Inside Story is organized by the American Museum of Natural History, New York (www.amnh.org), in collaboration with Codice. Idee per la cultura, Torino, Italy, in association with Comune di Milano – Assessorato Culturale, Italy, Guangdong Science Center, Guangzhou, China, and Parque de las Ciencias, Granada, Spain.



Stephen H. Baumann was appointed the new executive director of the Discovery Museum and Planetarium, Bridgeport,

Connecticut, in August 2014. Baumann previously served as president and CEO of the Starfinder Foundation and has held positions at the Franklin Institute, Philadelphia; Liberty Science Center, Jersey City, New Jersey; and Kidspace Children's Museum, Pasadena, California.



In November 2014, **Robert Griesmer** became the new executive director of the Virginia Air & Space

Center (VASC), Hampton. Griesmer joins VASC after serving as president and CEO of the New Children's Museum, West Hartford, Connecticut. He also served as COO at the Maritime Aquarium at Norwalk, Connecticut. Griesmer succeeds **Brian DeProfio**, who was interim executive director for three years.



Dawn M. Mackety began her duties as CEO of Lake Superior Zoo, Duluth, Minnesota, in November 2013. She

most recently served as director of research, data, and policy at the National Indian Education Association in Washington, D.C. Mackety succeeds **Sam Maida**, who stepped down after a 20-year career at the zoo.



The Cape Fear Museum, Wilmington, North Carolina, has a new director. **Sheryl Kingery Mays** started



at the museum in November 2014 after previously serving as director of public programs and opera-

tions at Historic Jamestowne, Preservation Virginia; curator of education for Henrico County's Preservation and Museum Services Division, Henrico, Virginia; and director of education at the Children's Museum of Maine, Portland. She succeeds **Ruth Haas**, who retired after leading the museum since 2001.



In December 2014, **Charlie Walter** became COO of the San Antonio Children's



Museum after serving as executive director of the New Mexico Museum of Natural History and Science (NMMNHS),

Albuquerque, since 2011. **Gary Romero** is now the museum's interim director. In addition, **Alicia Borrego Pierce** left her position as deputy director of the NMMNHS in September 2014 and is now director of administration at Explora, Albuquerque.



Catherine Gilbert was named vice president of the College of Nanoscale Science and Engineering's Children's

Museum of Science and Technology, Troy, New York, in August 2014. She was previously director of the Museum Association of New York, including time as executive director of Museum-wise prior to the two organizations' merger. Gilbert has also held positions at the Miami Children's Museum, the New York State Historical Association, and the Boston Children's Museum.



The Exploratorium appointed **James Leventhal** director of development in November 2014.

Leventhal previously served as deputy director of development for the Contemporary Jewish Museum of San Francisco and has held positions at the Judah L. Magnes Museum, Berkeley, California, and the Metropolitan Museum of Art, New York City.



ASTC is pleased to announce two new staff members, who both began their new positions in November 2014.



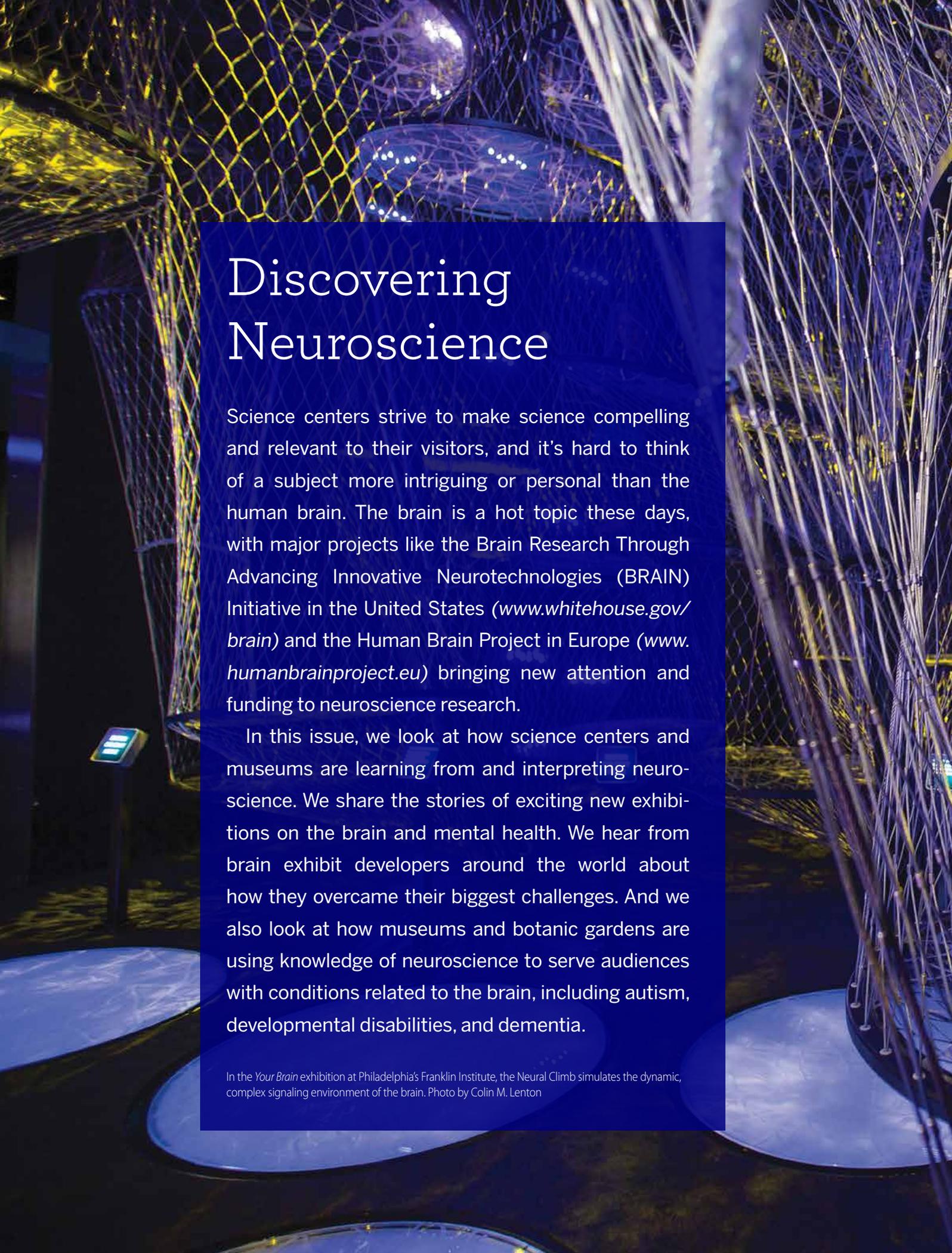
Ann Hernandez joined the ASTC team as program manager for professional development (PD) and works

with ASTC's equity and diversity programs along with other PD initiatives. Hernandez previously worked at the Ann Arbor Hands-On Museum, Michigan. **Jared Nielsen** is the new online producer at the Center for Advancement of Informal Science Education (CAISE). He previously developed exhibits at the Natural History Museum of Los Angeles County, taught at the LA Maker Space, and developed a youth-oriented multimedia computer science curriculum and website.



Douglas S. Jones, director of the Florida Museum of Natural History, University of Florida, Gainesville, was

elected president of the Association of Science Museum Directors. Jones has served on the association's board for six years.



Discovering Neuroscience

Science centers strive to make science compelling and relevant to their visitors, and it's hard to think of a subject more intriguing or personal than the human brain. The brain is a hot topic these days, with major projects like the Brain Research Through Advancing Innovative Neurotechnologies (BRAIN) Initiative in the United States (www.whitehouse.gov/brain) and the Human Brain Project in Europe (www.humanbrainproject.eu) bringing new attention and funding to neuroscience research.

In this issue, we look at how science centers and museums are learning from and interpreting neuroscience. We share the stories of exciting new exhibitions on the brain and mental health. We hear from brain exhibit developers around the world about how they overcame their biggest challenges. And we also look at how museums and botanic gardens are using knowledge of neuroscience to serve audiences with conditions related to the brain, including autism, developmental disabilities, and dementia.

In the *Your Brain* exhibition at Philadelphia's Franklin Institute, the Neural Climb simulates the dynamic, complex signaling environment of the brain. Photo by Colin M. Lenton



Exploring the Wonders of the Brain and Mind

By John H. Morrison

It's an exciting time for neuroscience. Researchers are learning ever more about the brain and consequently, the foundations of the mind. The brain is at the root of everything from learning to sleeping to generating the creative sparks necessary to produce great works of art and brilliant theorems of mathematics. These and countless other processes emanate from this complex web of cells that exchange electrical and chemical signals in precise patterns. Today, neuroscientists are revealing in increasing detail how the brain produces normal behaviors and body functions, and how its dysfunction is related to diseases and disorders like depression, attention deficit hyperactivity disorder (ADHD), Parkinson's disease, and addiction.

Researchers can now record signals from deep inside the active brain, use new imaging technologies to see brain anatomy and activity, and apply genetic engineering and laser technologies to tease apart the roles of precise circuits of interconnected brain cells. These techniques are just the beginning. The Brain Research Through Advancing Innovative Neurotechnologies (BRAIN) Initiative (www.whitehouse.gov/brain) calls on neuroscientists, chemists, engineers, and computer scientists (among others) to create new tools to study the brain. (See the article beginning on page 29.) This U.S. initiative emphasizes the importance of understanding the very basics of brain function to appreciate its role in disease. The BRAIN Initiative, along with other efforts in

Europe (see the article beginning on page 26), Japan, China, and elsewhere are potential game changers in spurring on innovation in brain research and encouraging large-scale, multidisciplinary collaborations between public and private entities to attack the fundamental questions of the brain.

ENGAGING THE PUBLIC

While these initiatives have recently ignited the curiosity of the general public, the brain has always been a subject of fascination with public audiences. The drive to understand more about ourselves—from why we dream to how to keep our brains healthy—is a strong and undeniable force. In addition, who among us doesn't know someone profoundly affected by a neurological, psychiatric, or developmental brain disorder?



Although scientists now understand more about the brain than ever before, many resources available to the public provide faulty information that supports or creates misconceptions. To help answer the need for accurate and accessible information about brain research, the Society for Neuroscience has partnered with the Kavli Foundation and the Gatsby Charitable Foundation to produce *BrainFacts.org*, a website dedicated to promoting the progress and promise of brain research and dispelling all too prevalent “neuromyths”—such as the myth that most humans only use 10% of their brains. *BrainFacts.org* provides scientifically vetted content designed to help educators, policymakers, and the science-interested public delve deeper into the wonders of the brain and mind.

THE ROLE OF SCIENCE CENTERS

Science centers and museums have the potential to enhance the content and extend the reach of websites like *BrainFacts.org*. Pictures of the nervous



Top: A girl holds a human brain at a Brain Awareness Week event held at the National Museum of Health and Medicine, Silver Spring, Maryland.

Bottom: Neuroscientists study the brain and nervous system. They strive for a deeper understanding of how the brain's 100 billion nerve cells are born, grow, and connect. Photos by Joe Shymanski, Society for Neuroscience

Each year, scientists, students, and the public have the opportunity to participate in informal neuroscience education during Brain Awareness Week (www.dana.org/BAW). Started by the Dana Foundation in 1996, Brain Awareness Week is now a worldwide campaign, with people of all ages in 59 countries and 44 U.S. states participating in events each March. This is a fantastic way for science centers and museums to get started informing the public about the value of neuroscience. Resources like *BrainFacts.org's* Find a Neuroscientist, a database of neuroscientists interested in public outreach, can help educators deepen their programs.

There is growing public interest in the brain, and ultimately, I believe this opportunity can open the door to other science, technology, engineering, and math subjects. As a compilation of physics, math, psychology, biology, and computer science, neuroscience can be a gateway subject, sparking interest in science writ large. I invite you to join me in taking full advantage of this opportunity. ■



system can be brought to life with the tactile experience of holding real brain tissue in a science center, and stories of traumatic brain injury are made more immediate when people

converse with survivors, scientists, and policymakers in informal settings. This issue of *Dimensions* is filled with examples of how science centers and museums are tackling this content in big and small ways.

John H. Morrison is dean of basic sciences and the Graduate School of Biomedical Sciences, and professor, Department of Neuroscience, at the Icahn School of Medicine at Mount Sinai in New York City. He was recently named editor-in-chief of *BrainFacts.org*, a public information initiative of the Kavli Foundation, the Gatsby Charitable Foundation, and the Society for Neuroscience. He holds a Ph.D. in neurobiology. To learn more, log onto BrainFacts.org or contact BrainFacts@sfn.org.

The Human Brain Project: A Role for Science Centers and Museums

By David Horrigan

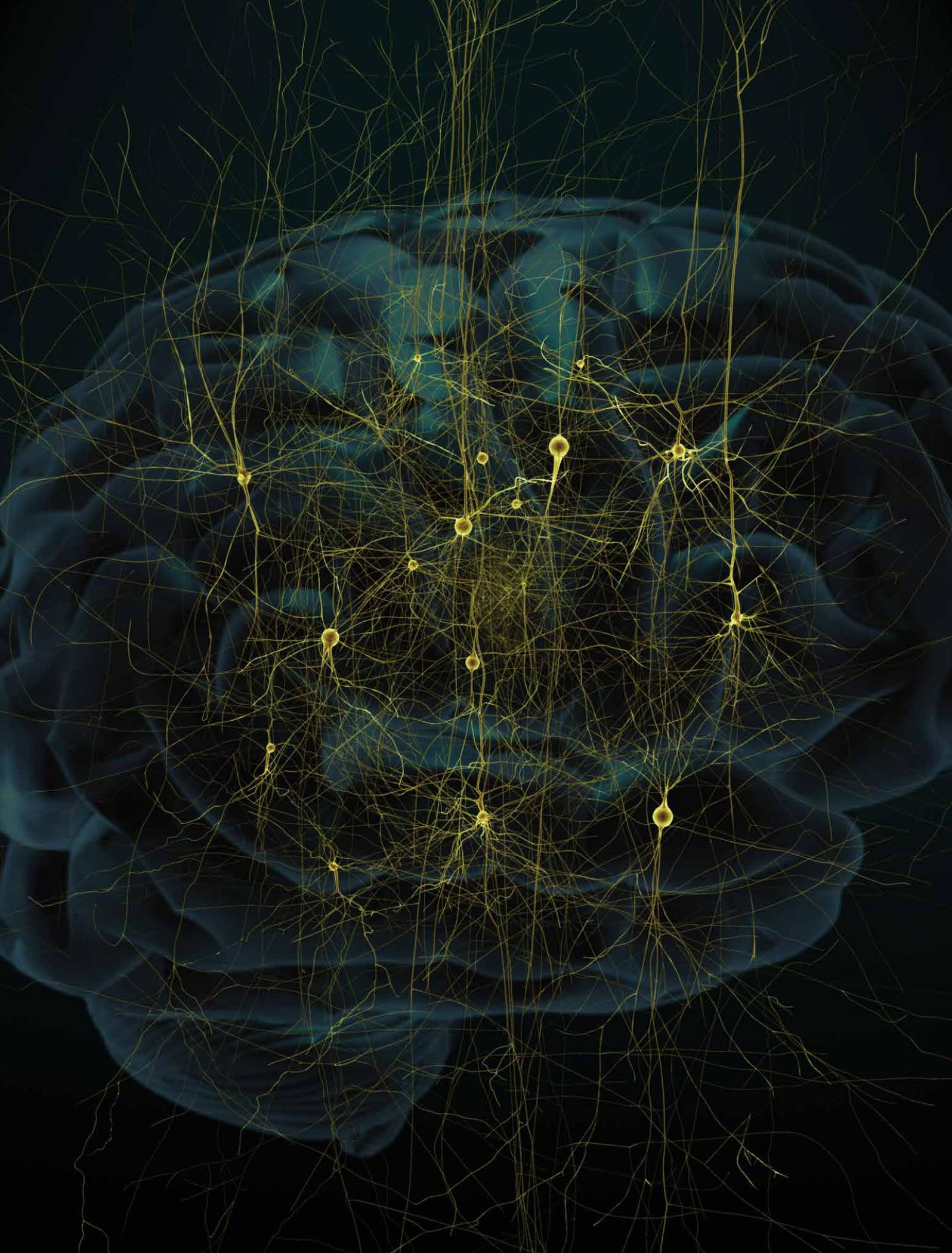
The brain is in vogue. Globally, governments are increasing their investment in, and support for, brain research in big ways. The Brain Research Through Advancing Innovative Neurotechnologies (BRAIN) Initiative in the United States (www.whitehouse.gov/brain; www.braininitiative.nih.gov) and the Human Brain Project (HBP) in Europe (www.humanbrainproject.eu) are two prominent examples. Advances in technology are driving this brain boom. New approaches for understanding the brain give hope to the expanding number of those afflicted with brain diseases and disorders. As the health and economic burdens of brain disease on society continue to grow, there is a need for a more complete understanding of the human brain.

Launched in 2013, the HBP is a €1 billion (USD 1.24 billion), 10-year European Commission Future and Emerging Technologies Flagship initiative involving 112 academic and corporate partners in 24 countries. The HBP aims to achieve a multilevel, integrated understanding of brain structure and function, as well as brain diseases, through the development and use of information and communication technologies (ICT). The HBP's ICT will enable scientists, clinicians, and engineers to perform diverse experiments and share knowledge. It will also pave the way for the project's ultimate goal: the most complete simulation of the whole brain that is possible.

In addition to the HBP's ambitious science agenda, a significant effort is being made to inform the public and receive their feedback on both the science and the societal impact of the HBP and the brain research in general. Having determined that science centers and museums are among the most effective venues for engaging the public in dialogue, the

HBP has included the Bloomfield Science Museum Jerusalem as a full partner in the project along with 111 research partners. The HBP has also initiated a process to co-create content with science centers and museums for future brain-themed exhibitions targeted for launch in 2016.

The HBP Science Center and Museums Program will create content for global exhibitions that will provide an innovative and exciting way for people to learn about the brain and themselves. By co-creating the content with science centers, the HBP hopes to provide the public with engaging brain science that is not only educational but also inspiring. The HBP will periodically update exhibition content to keep the public aware of the global efforts in brain science, and the exhibition architecture will be scalable to fit the needs of science centers of all sizes around the world. Highly interactive delivery mechanisms will invite the public to engage in discourse surrounding the ethical issues





of brain science and research. Funding for the program will come from a combination of science center support, grants, and philanthropy.

The HBP Science Center and Museums Advisory Group supports the program by providing input on strategic direction and infrastructure development. The advisory group, under the leadership of the Bloomfield Science Museum Jerusalem, consists of science centers and museums from around the world, including the American Museum of Natural History, New York City; Copernicus Science Centre, Warsaw, Poland; the Deutsches Museum, Munich, Germany; the Exploratorium, San Francisco; the Patricia and Phillip Frost Museum of Science, Miami; Science Center NEMO, Amsterdam, Netherlands; Science

Centre Singapore; and Universcience, Paris. The first workshop to bring together science center experts and HBP scientists will take place during the first quarter of 2015 in Geneva, Switzerland. A second workshop in late 2015 will aim to broaden the base of participation for science centers and museums.

In the meantime, the HBP continuously contributes content to science centers and other groups around the world on request. Recently, the Times Square Midnight Moment campaign showcased HBP images and artwork on the world's largest digital screens during November 2014 (www.timessquarenyc.org/times-square-arts/media/press-releases/noah-hutton-brain-city/index.aspx). ■

David Horrigan (david.horrigan@epfl.ch) is chief communications officer at the Human Brain Project (HBP), based in Geneva, Switzerland. Institutions that are interested in participating in the HBP Science Center and Museums Program may contact the author.

NSF and the BRAIN Initiative: A Multidisciplinary Approach

By Lily Whiteman and Sarah Bates

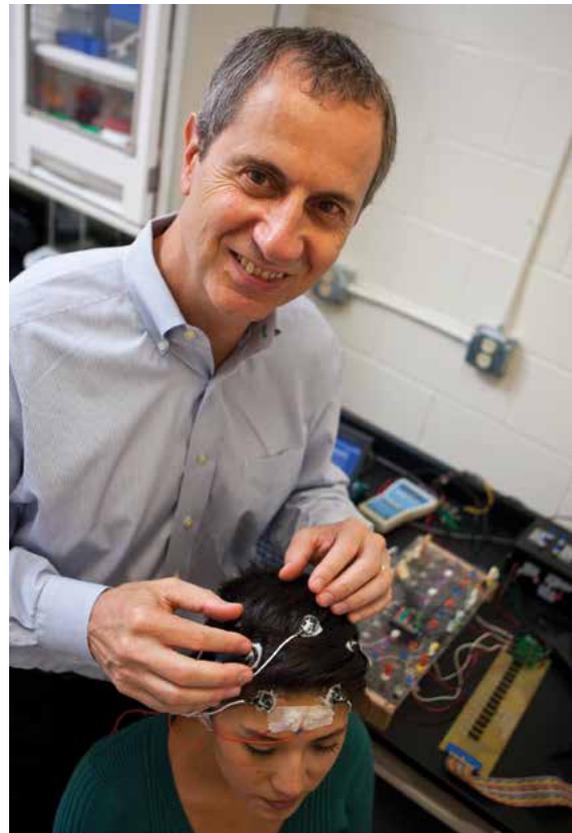
Your brain is what makes you . . . *you*: It defines your personality and intellect and controls your physical movements. Your brain—a nonstop multitasking marvel—also regulates your involuntary responses, such as your breathing and heart function.

But despite its importance, no one knows exactly how the brain works. Why is this vital organ still an unknown frontier? Largely because it is the most complicated structure on Earth. Understanding how the brain generates thoughts, movements, and physiological responses in *any* organism—whether it be a worm or a human—remains a great scientific challenge.

Although the brain is still a long way from being understood, the field of neuroscience has significantly advanced in recent decades. Neuroscientists—many of whom have received funding from the (U.S.) National Science Foundation (NSF)—have uncovered the roles played by many parts of the brain and have developed game-changing technologies for visualizing and analyzing individual parts of the brain in ever finer detail.

Building on these discoveries, U.S. President Barack Obama in April 2013 launched the Brain Research Through Advancing Innovative Neurotechnologies (BRAIN) Initiative (www.whitehouse.gov/brain), which is aimed at revolutionizing our understanding of the brain by accelerating research and technology efforts across many disciplines inside and outside the government.

The BRAIN Initiative was kicked off with a total of \$100 million in initial commitments from NSF, the (U.S.) National Institutes of Health, the Defense Advanced Research Projects Agency, and a number of private research institutes. Since its launch, the initiative has expanded to include the participation of several other federal agencies, scientific societies, and nonprofit organizations.



Walt Besio, associate professor of biomedical engineering at the University of Rhode Island, invented an electrode that is helping to improve epilepsy diagnosis. Photo by Joe Giblin/University of Rhode Island



Because isolated discoveries in single fields won't help us create an integrated picture of how all the parts of the brain work together, multidisciplinary brain research is essential to the BRAIN Initiative. NSF is unique among federal agencies in funding fundamental research across a broad range of science and engineering disciplines, including biology, chemistry, physics, mathematics, the social and behavioral sciences, and computer science (www.nsf.gov/brain).

So from the beginning, NSF has promoted multidisciplinary research as the cornerstone of its participation in the BRAIN Initiative. For example, NSF is sponsoring many workshops across neuroscience-related disciplines to identify priority research areas (www.nsf.gov/news/special_reports/brain/events) and last year established a \$25 million integrative Center for Brains, Minds, and Machines at the Massachusetts Institute of Technology (bit.ly/NSFCMMB).

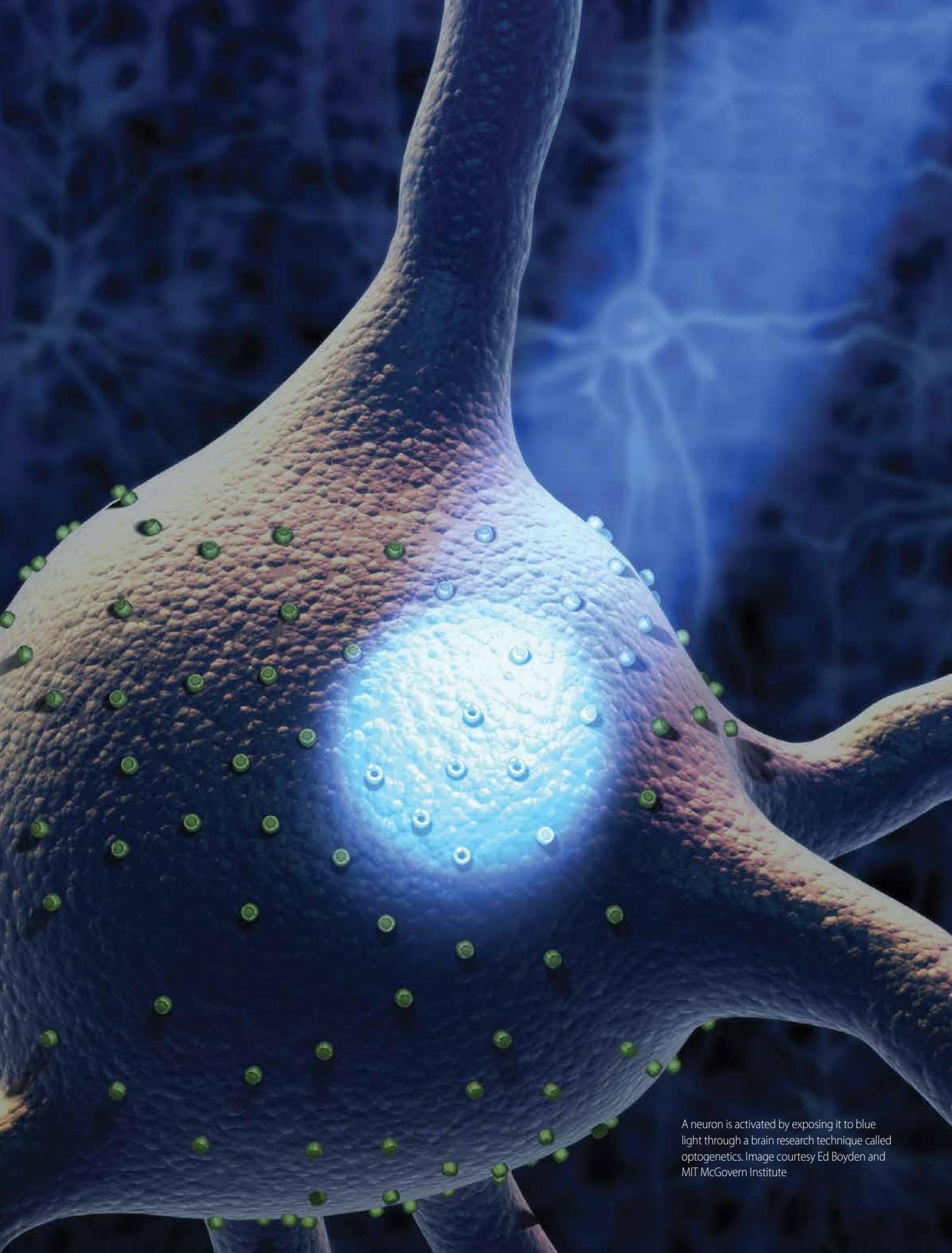
Most recently, NSF awarded 36 Early Concept Grants for Exploratory Research to enable the development of new technologies designed to improve our understanding of how complex behaviors emerge from the activity of brain circuits (bit.ly/BRAINeager). A majority of these projects are collaborative and multidisciplinary in nature.

Also, NSF is offering several new BRAIN Initiative-related funding opportunities (www.nsf.gov/news/special_reports/brain/funding)—including expanding its Industry/University Cooperative Research Centers program (bit.ly/IUCRChome).

In addition to advancing research, NSF's BRAIN Initiative activities are enhancing workforce education and helping to create new career opportunities. Science centers and museums may support such efforts by offering informal learning experiences about the brain that may inspire young people to pursue careers in neuroscience.

Working together, we can look forward to a new era in our understanding of the brain . . . and ourselves! ■

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A neuron is activated by exposing it to blue light through a brain research technique called optogenetics. Image courtesy Ed Boyden and MIT McGovern Institute

What Museum Professionals Can Learn from Neuroscience Research

By Kalie Sacco and Grace Troxel

The Brain Research Through Advancing Innovative Neurotechnologies (BRAIN) Initiative (www.whitehouse.gov/brain) has committed over \$300 million in support of neuroscience research and development projects, including work funded through the (U.S.) National Science Foundation (NSF). (See the article beginning on page 29.) This support is just one indicator that researchers are deepening their understanding of how people learn and how brain development and structures affect the learning process.

How can designers of museum experiences and settings leverage this knowledge to enhance learning experiences at their institutions? The following resources provide a brief introduction to the work being done in this area.



ARTICLES AND REPORTS

While much research has been conducted on brain science and how it relates to learning in classrooms, a cursory review of literature shows that comparatively little has been done on informal learning environments specifically. The following articles and reports may have applications to informal learning practice. When possible, we have provided links to the full text of the articles; many of them are available on *InformalScience.org* through EBSCO's Education Research Complete library. To access the



At the ASTC 2014 session “Twist and Shout: Using Physical Movement in STEM Education,” participants “crab walk” the length of a cow’s intestine (110 feet or 34 meters) to experience how movement can enhance learning. Photo by Christine Ruffo

articles, you must be a registered, logged-in member of *InformalScience.org*. Membership is free and open to anyone in the informal science, technology, engineering, and math (STEM) learning field.

Falk, J.H. (1997). Recent advances in the neurosciences: Implications for visitor studies. *Visitor Studies*, 9(1), 227–238. Retrieved from InformalScience.org/research/ic-000-000-008-040. Although this article is several years old, it provides

an overview of brain imaging techniques and lays the foundation for a neuroscience-based understanding of cognition and learning.

Immordino-Yang, M.H., & Damasio, A. (2007). We feel, therefore we learn: The relevance of affective and social neuroscience to education. *Mind, Brain, and Education*, 1(1), 3–10. Retrieved from InformalScience.org/research/ic-000-000-010-197. This article describes recent advances in

neuroscience, indicating that facets of cognition like memory, attention, decision making, and social functioning are influenced by emotion-related processes. The authors argue that a better understanding of this “emotional thought” and how it relates to neurobiological processes can spur the design of new learning environments. Although the article focuses on the aspects of learning that are cultivated in formal schools, designers of informal learning environments may take emotion-based experiences into account when creating new learning experiences as well.

Kelly, A.E. (2011). Can cognitive neuroscience ground a science of learning? *Educational Philosophy & Theory*, 43(1), 17–23. Retrieved from *InformalScience.org/research/ic-000-000-010-195*. Learning progress (particularly in classroom settings) is often measured by tests and assessments. However, learning researchers may not always be able to distinguish between behavioral changes caused by the intervention versus “accidental” learning. In this article, the author contends that the learning sciences should look to the neuroscience field for indicators of learning progress that are grounded in empirical data.

King, H. (2013). *An understanding of neuroscience for science educators: An ISE research brief discussing Oliver, “Towards an understanding of neuroscience for science educators.”* Retrieved from *relatingresearchtopractice.org/article/277*. This research brief summarizes an article that argues for greater collaboration and understanding between neuroscience research and education practice. The author describes how common educational and learning myths are not supported by neuroscience findings. Educators who have integrated such myths into their thinking (for example, that students can be “right-brained” or “left-brained” learners) might consider changing their education strategies to promote more effective learning.

National Research Council (2000). *How people learn: Brain, mind, experience, and school.*

Washington, DC: The National Academies Press. Retrieved from *InformalScience.org/research/ic-000-000-010-193*. Although this popular trade book focuses on formal education and classrooms, some of the questions it covers can also be applied to informal learning—for example, how experts learn and how this is different from how nonexperts learn.

Nemirovsky, R., Keiton, M.L., & Rhodehamel, B. (2013). Playing mathematical instruments: Emerging perceptuomotor integration with an interactive mathematics exhibit. *Journal for Research in Mathematics Education*, 44(20), 372–415. Retrieved from *InformalScience.org/research/ic-000-000-010-280*. Perceptuomotor integration means merging the perceptual and motor aspects of using a particular tool. This article explores perceptuomotor development and its role in math learning through two case studies of visitors engaging in an interactive math exhibit at a science museum. It is possible that such engaging, hands-on experiences at science centers and museums can support neurological development of math skills.

The Royal Society (2011). *Neuroscience: Implications for education and lifelong learning.* Retrieved from *InformalScience.org/research/ic-000-000-010-196*. This report highlights advances in neuroscience with potential implications for lifelong learning and identifies the challenges and limitations of applying neuroscience to in- and out-of-classroom learning environments.

Sawyer, R.K. (2011). The need for a deeper exploration and conceptual understanding: The critical role of creativity and collaboration in real-world learning. *Mind, Brain, and Education: Implications for Educators*, 5(1), 27–36. Retrieved from *InformalScience.org/research/ic-000-000-010-199*. In this interview, learning researcher R. Keith Sawyer describes the importance of and interconnections among creativity, collaboration, and the science of learning. He talks about some recent studies and examples of how neuroscience research supports the idea that creativity is important for learning.

One article indicates that memory, attention, decision making, and social functioning are influenced by emotion-related processes. The authors argue that a better understanding of this “emotional thought” and how it relates to neurobiological processes can spur the design of new learning environments.

Sousa, D. (2011). Mind, brain, and education: The impact of educational neuroscience on the science of teaching. *Mind, Brain, and Education: Implications for Educators*, 5(1), 37–44. Retrieved from InformalScience.org/research/ic-000-000-010-200. This article describes the new, interdisciplinary field of “educational neuroscience” and its applications and implications for educational practice.

Van Dam, N. (2013). Inside the learning brain. Retrieved from www.astd.org/Publications/Magazines/TD/TD-Archive/2013/04/Inside-the-Learning-Brain. This blog post highlights a few evidence-based claims about how the brain influences learning, such as “active engagement is necessary for learning” and “deployment of short learning sessions will increase knowledge retention.”

CONFERENCE PRESENTATIONS

The following presentations at past ASTC Annual Conferences discussed findings from neuroscience and how they can be applied in informal learning settings.

“Funny, Why & How: Using Humor as a Tool to Enhance STEM Education,” ASTC 2014. In this presentation—part of the session “A Scientist Walks Into a Bar: Humor in STEM Education” (www.astc.org/2014/10/19/a-scientist-walks-into-a-bar-humor-in-stem-education)—Jen Lokey of the Powerhouse Science Center in Durango, Colorado, coupled the

latest brain research with personal experience to talk about how humor can be used to support STEM learning. Access the presentation (including citations of neuroscience and learning research) here: InformalScience.org/research/ic-000-000-010-202.

“Museums and the Mind: Applying Cognitive Neuroscience to Free-Choice Learning,” ASTC 2008. Jayatri Das of the Franklin Institute in Philadelphia brought together learning and neuroscience experts to discuss practical applications for integrating neuroscience findings into informal learning environments. Read more about the session here: www.astc.org/2008/10/20/museums-and-the-mind. Resources cited during the presentation are listed here: InformalScience.org/research/ic-000-000-010-194.

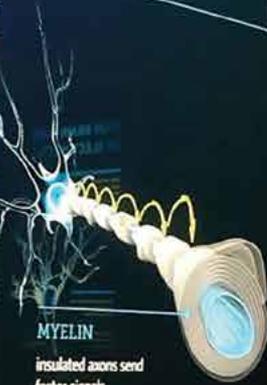
“Twist and Shout! How Physical Movement Can Enhance the Practice of STEM Learning,” ASTC 2014. In this presentation, Lokey described ways to incorporate physical movement into STEM learning experiences. She cited research showing that brain scans of people who have recently exercised show an increase in brain plastic and other neurological effects that can enhance learning. The presentation is available here: InformalScience.org/research/ic-000-000-010-201. It was part of the session “Twist and Shout: Using Physical Movement in STEM Education” (www.astc.org/2014/10/18/twist-and-shout-using-physical-movement-in-stem-education). ■

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BRAIN SIGNALS MOVE AT DIFFERENT SPEEDS

How fast a brain signal moves depends on several factors. How far does the signal have to go? Is the fiber wrapped in myelin, an "insulation" made of proteins and fats? Thick, myelin-covered fibers transmit the signal faster.

We know that myelin plays an important role in signal transmission by studying multiple sclerosis. This disease damages the myelin, which "short circuits" brain signals and, in turn, impairs movement.



FIRING NEURONS

Scientists use tiny electrodes to record the sound of brain activity. Each 'pop' you hear is a single neuron of a rat's brain firing an electrical signal.

Audio recording courtesy of Eric M. Chaffee, University of Washington

A young visitor tests his reaction time to measure neural signaling speed.
Photo by Daryl Moran

How the Brain Became *Your Brain*

By Jayatri Das

Your brain is always changing. That's the key message of *Your Brain*, a new exhibition at the Franklin Institute in Philadelphia that opened in June 2014 (www.fi.edu/exhibit/your-brain). Covering topics from basic neuroscience to cognitive psychology, *Your Brain* creates fun, hands-on experiences to enable visitors to look inside their own heads.

The seeds for *Your Brain*, which is housed in the Frank Baldino, Jr. Gallery within the museum's new Nicholas and Athena Karabots Pavilion and underwritten by Teva Pharmaceuticals, were planted nearly 10 years ago. Early topic testing revealed that visitors were most interested in brain science as the topic for the expansion's feature exhibition. But no one could have predicted how timely the exhibition would be on opening day. With high public interest, new research tools, and increased funding from the Brain Research Through Advancing Innovative Neurotechnologies (BRAIN) Initiative (www.whitehouse.gov/brain), the study of the brain has expanded exponentially in the intervening years. *Your Brain* aims to bridge the gap between the cultural perception that the human brain remains mysterious and the rapidly advancing science that is beginning to answer our questions.

FINDING THE RIGHT STORY

Given the broad scope of brain science, we knew that identifying a storyline would be key to creating a coherent exhibition. Our core audience is families with children ages 8 to 13. For past exhibitions, we have used K-12 science standards as a starting point for shaping content appropriate for this audience. But with few topics in neuroscience explicitly represented in K-12 curricula, this time we were starting from scratch.

To find the sweet spot where primary research

and popular science intersect, we surveyed recent articles in leading scientific journals and major popular science communication outlets. Some topics, like language, cognition, and brain disorders, were highly represented among both research and popular articles. Other topics, especially at cellular and molecular levels, were primarily in the research literature. These topics would be important to address as the basis for emerging knowledge, but we would need to find accessible entry points for presenting them. Fortunately, topics predominantly in the popular media, such as the five senses, provided those connections.

With the help of a distinguished and enthusiastic scientific advisory panel, we built these core topics into a comprehensive list of concepts to test with visitors. Through focus groups with children, adults, and educators, as well as an online survey of Franklin Institute members, we conducted front-end evaluation to assess our audience's knowledge about the brain and measure reactions to various exhibit concepts. We found, as expected, that interest was uniformly high, driven by the inherent personal relevance of the brain and awareness from mass media. We also found that people's understanding of brain science was consistent across all groups, even science educators. While they generally knew what the brain does, they had little knowledge of how it works and that it changes throughout life.

The conversations kept circling back to the fact



A tilted room skews perception, demonstrating how the human brain prioritizes vision over other senses. Photo by Tom Crane

that everyone wanted to learn how his or her own brain worked, crystallizing the lens to focus our exhibition. We decided to follow the story of *your* brain—a theme that allowed us to cover a broad range of topics from basic neuroscience to ethical decisions about emerging research, and one that made us think about how to make each interactive device as personal and experiential as possible.

MAKING THE INVISIBLE HANDS-ON

Unlike trains, planes, and Newtonian physics, the fundamental mechanisms of the brain exist inside your head at a scale too small to see. Add the challenge of developing a long-term exhibition about a scientific field that changes daily. How would we create more than 70 interactive experiences that show visitors how their brain is constantly changing, signaling, and creating their unique world?

As our team brainstormed ideas, we looked to our scientific advisors for suggestions of research experiments that could be modified into exhibit devices. For example, we adapted a computer program created for a study on body language perception to build a device where visitors manipulate the motion of an animated stick figure to convey different emotions. Our advisors also provided guidance on which concepts were likely to stand the test of time versus those that might change during the course of the exhibition. As we brought these ideas to reality in our prototyping shop, our in-house formative evaluation process became invaluable. Although our team had only minimal prior knowledge of how people learn about the brain, we built devices that proved successful, made changes if things were too complex, and experimented with blending physical and digital interfaces to bring the invisible to life.



Bright colors and pop art-style illustrations introduce visitors to big questions about the brain.
Photo by Colin M. Lenton

Our front-end evaluation, exhibit constraints, and experiential approach led to several key decisions about content. First, we focused on only the broad theme of functional localization in the brain, rather than specific structures, because we discovered that people find the names difficult to process and unhelpful in understanding function. Second, by focusing on the human brain, we didn't address the rich body of knowledge about animal brains. Finally, we chose to reserve important content about brain disorders for ongoing exhibit programming staffed by museum educators, rather than including it in stand-alone exhibits. We have found that such programs elicit deeper conversations about these sensitive topics and allow content updates as new research emerges.

In the end, the collection of experiences in the exhibition combines multiple elements. A few

devices are explicit, large-scale models of well-accepted neural mechanisms. Visitors can observe real specimens and scientific data, such as visualizations, which can change throughout the exhibition's life. Most devices, however, are based on phenomena where the effects are timeless and explanations can be updated as we gain new understanding of the brain. One such phenomenon is demonstrated in a device showing how distorted speech that at first sounds like gibberish is easily understood once the brain knows what the words are.

SCAFFOLDING LEARNING THROUGH DESIGN

With a footprint of 8,500 square feet (790 square meters), *Your Brain* is a series of six smaller galleries. Each gallery draws artistic inspiration from scientific visualizations and physically immerses visitors in learning about the brain through dramatic



Visitors use a mock scanner to look inside a human brain. Photo by Colin M. Lenton

environments created with lighting, sound, color, and graphics. The bright introductory gallery welcomes visitors to explore the visual and tactile characteristics of the whole brain and takes them to the cellular level with a preserved squid giant axon on display (chosen over a human axon because of its larger size). Visitors next enter a series of darkened galleries to investigate the complex web of neurons and pathways inside the brain, through experiences such as firing a large model neuron, measuring the speed of neural signaling, and creating faces with found objects to test the brain's visual perception.

Brightly lit by the building's architectural window wells, the next gallery brings visitors back to a seemingly normal street scene that is actually filled with sensory illusions, like a tilted room. Visitors then explore everyday situations where they may take their brains for granted, through experiences including memory tests, a lie-detection activity, and a display of brain images and specimens across the lifespan. In the last gallery, visitors are invited to consider the impact of future research on their lives through media-facilitated discussions and ask their own questions about the future.

These physical environments have an affective impact on visitors and create emotional connections

that, as scientific research has shown, strengthen memories as they form (e.g., LaBar & Cabeza, 2006). Notably, the centerpiece of *Your Brain* is the Neural Climb, where visitors clamber through an 18-foot-tall (5.5-meter-tall) structure while other visitors below them trigger lighting and sound effects with their footsteps to evoke the active, dynamic signaling inside the brain. We hope this experience will follow in the footsteps of the museum's classic walk through the Giant Heart in creating a memorable emotional impact for generations to come (www.fi.edu/exhibit/giant-heart).

Subdividing the exhibition allowed more control over how visitors experience content. The sequential layout builds a scaffolded approach to learning about the brain, where each gallery prepares visitors for the next. It also appears to be helping visitors digest the experience at a manageable pace. Although summative evaluation is ongoing, our preliminary results show that the average dwell time in *Your Brain* is approximately 45 minutes. The time spent per floor area of the exhibition is comparable to the museum's three most popular existing exhibits, suggesting that despite *Your Brain's* significantly larger footprint, it is sufficiently engaging to hold off museum fatigue.

As visitors explore *Your Brain*, it is fascinating to see how each person creates a unique experience based on his or her past knowledge and individual perceptions.

CONTINUING THE CONVERSATION

Your Brain has catalyzed an ongoing dialogue in our community about brain science. Through funding from the (U.S.) National Institutes of Health, we are collaborating with the Center for Neuroscience and Society at the University of Pennsylvania to develop K-12 neuroscience curriculum resources, reach thousands of underserved students, and lead professional development workshops for teachers. From September 2014 to March 2015, we are hosting Let's Talk About Your Brain, a series of six public conversations that aims to integrate the science, values, and societal impact of how issues such as violence and aging affect Philadelphia. Other ongoing programs, like the Philadelphia Science Festival, have used *Your Brain* as a platform for connecting world-renowned researchers with an interested public audience, ensuring the sustainability of this dialogue.

As visitors explore *Your Brain*, it is fascinating to see how each person creates a unique experience based on his or her past knowledge and individual perceptions. Sometimes a young child is learning about the brain for the first time. Families often collaborate and compare their reactions to a device in order to explore their differences. Even notable scientists have been spotted taking "selfies" with exhibit elements that represent their work.

The multilayered, interdisciplinary nature of brain science offers an ideal framework for each of us to discover how we interact with our world. ■

REFERENCE

LaBar, K.S., & Cabeza, R. (2006). Cognitive neuroscience of emotional memory. *Nature Reviews Neuroscience*, 7, 54–64. Retrieved from www.nature.com/hnrn/journal/v7/n1/full/nrn1825.html.

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Jayatri Das (jd@fi.edu) is chief bioscientist at the Franklin Institute in Philadelphia.

THINKING ABOUT DEVELOPING A BRAIN EXHIBIT?

Here is some practical advice:

- **Create multisensory exhibits** since brain science is inherently multisensory. These experiences are especially helpful in engaging visitors of different ages and abilities.
- **Gauge your audience.** For complex subjects like brain science, consider which topics are most relevant to your audience and also how to organize them. While nontraditional for core exhibits, a linear flow may help scaffold content. Work with architects and your operations team to decide how best to create a powerful visitor experience that maximizes learning opportunities.
- **Remember that no two brains are alike**, so think carefully about accessibility. Rather than trying to make every phenomenon work for everyone, create diverse interactives that allow individuals to build their own unique experiences in the exhibit.
- **Include group experiences** where visitors can compare their perceptions. When designing these interactions, test prototypes with groups.
- **Use digital technology wisely.** Technology is helpful in exhibits about the brain, but adults are often less comfortable with nontactile, gesture-based, and other new technologies than children. Match your digital interface with the intended audience for the interactive.
- **Consider how to acquire human brain specimens** for exhibits, since it can be challenging and time-consuming due to issues of consent. A human gift registry that supports medical education is likely to be a better source than a hospital or research laboratory.
- **Combine art and science.** Many brain data visualizations are breathtaking works of art. Their aesthetic appeal can draw visitors into their science content, and most researchers love to contribute their work for display. —J.D.

When Heureka Went Crazy

By Heidi Rosenström

Heureka, the Finnish Science Centre, in Vantaa, developed a traveling exhibition that aims to decrease the stigma connected to mental health problems and encourage visitors to take care of their mental health. Called *Heureka Goes Crazy*, this award-winning¹ interactive exhibition was developed in cooperation with Pavilion of Knowledge—Ciência Viva in Lisbon, Portugal, and Universcience in Paris (www.heureka.fi/en/travelling-exhibition/heureka-goes-crazy, www.youtube.com/results?search_query=heureka+goes+crazy). The exhibition was open at Heureka from October 2013 to September 2014 and is now at Ciência Viva.

Mental health touches everyone. For example, more than 20% of Europeans receive professional help for mental health problems during their lifetime (Kovess-Masfety et al., 2007), and nearly 20% of U.S. adults have a mental illness (National Institute of Mental Health, 2014). Therefore, the topic is of huge societal importance. In a science

center, mental health can be approached through many different areas of science and humanities, as well as through art, enabling a multidisciplinary approach. In addition, the science center environment allows us to try to simulate the experience of common mental disorders, as well as give a voice to people affected by mental illness.

“NOTHING ABOUT US, WITHOUT US”

We began the project by contacting the Finnish Central Association for Mental Health (FAMH), a national organization that promotes patients’ interests. FAMH became part of the exhibition’s scientific advisory board, along with leading Finnish psychiatrists. Together, they encouraged us to emphasize mental well-being.

Through FAMH, we gathered a group of 10 peer experts—people who had experienced mental health problems and received training in communicating their experiences. These peers were the true experts of the exhibition and were involved from stage one until the exhibition closed at Heureka. We met with the peers one-on-one, with the entire development team, and in an idea-generation session with staff.

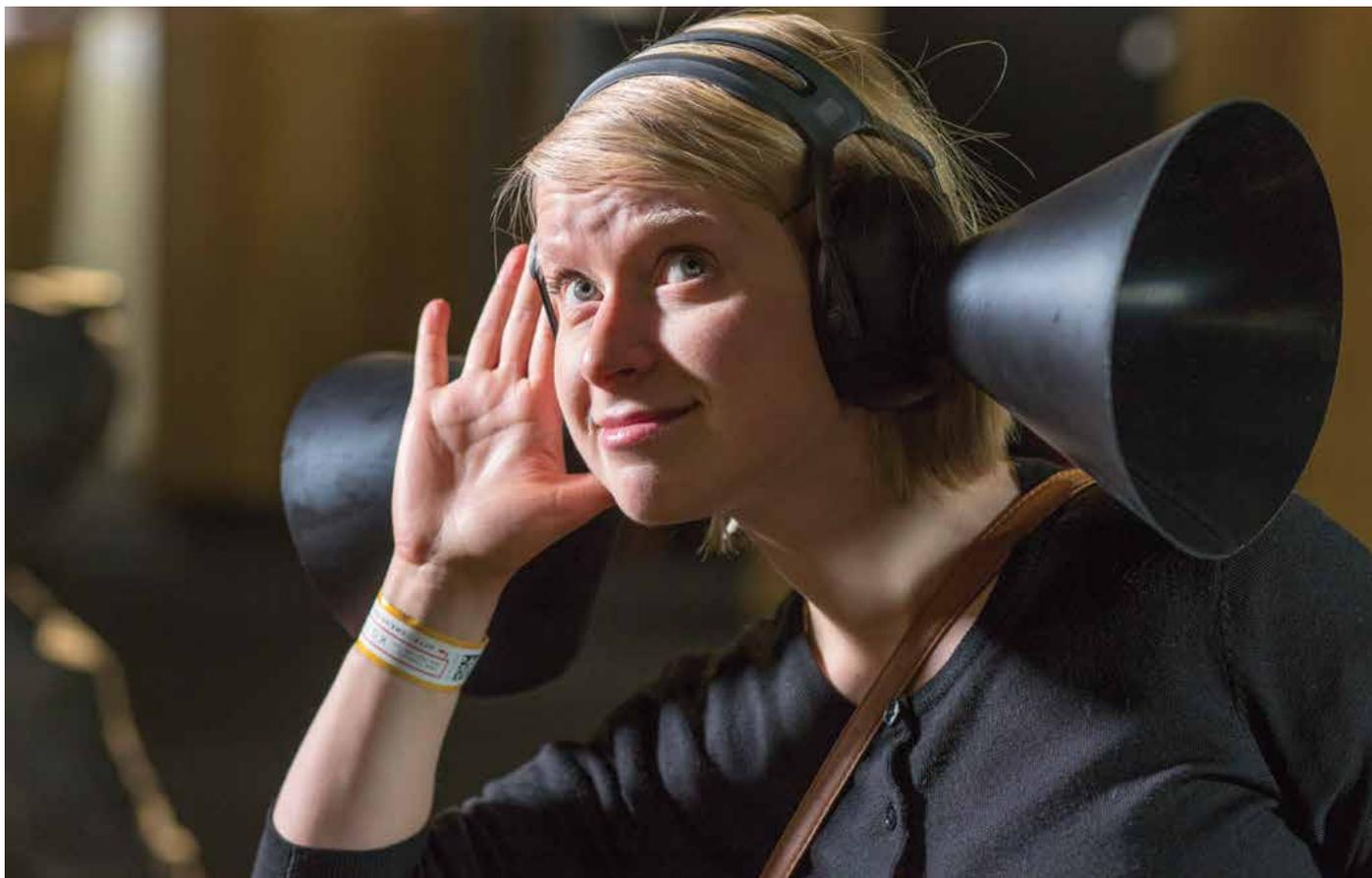
It was important to the exhibition development team to open the planning process to both the peers and Heureka’s staff. Though most of our colleagues were enthusiastic about the topic, some had doubts and concerns, probably stemming from common prejudices and insecurities about the unknown. Involving our entire staff in the project allowed everybody the chance to become comfortable with the topic and with talking about it with visitors.

The peers and staff participated together in a session to generate exhibit ideas. One of the greatest benefits of this session was the staff and peers getting to



Heureka Goes Crazy team members (wearing “crazy goggles” from the exhibition’s marketing campaign) receive a Leading Edge Award at ASTC 2014. From left to right: Tapio Koivu, Heureka; Carlos Catalão and Rosalia Vargas, Ciência Viva; the author; Chevy Humphrey, ASTC’s Board chair; and Mikko Myllykoski, Heureka. Photo by Christine Ruffo

1. *Heureka Goes Crazy* was awarded the Roy L. Shafer Leading Edge Award for Visitor Experience at ASTC’s 2014 Annual Conference. (See page 18 to learn more.)



The Schizophone by French artist Pierre-Laurent Cassière gives a feeling of the loss of attentiveness that accompanies many psychotic disorders. Photo courtesy Heureka

know each other and developing a better understanding the subject. For this session, exhibition coordinator Jussi Kahlos and I divided participants into groups of one peer expert plus three to four staff members from different departments. We had the groups use classical brainstorming techniques, first to generate ideas and then to further develop some of the ideas.

Throughout, the development team discussed, presented, and tested ideas and prototypes with the peers, who made many helpful suggestions. For example, early in the project, we had envisioned simulating depression with a grey, windowless room, where the visitor could wear weighty boots or lie under a lead blanket to appreciate how hard it is to get up or go out when depressed. Some of our scientific experts favored this idea, too. But all the peers described depression as nothingness and not feeling anything. How would we simulate something that cannot be felt?

Instead, we constructed a setting where the visitor stands in a living room and hears the thoughts of a depressed man and his wife and child, portrayed with life-size dolls. The visitor becomes immersed in somebody else's reality. Since mental disorders affect the whole family, we were also able to display this dimension.

A SOCIAL EXHIBITION

We focused the exhibition on three themes:

1. The Labeled discusses how mental disorders have been viewed and treated in the past and present, and the notion that what is considered “normal” depends greatly on society. For example, in *Old Cures for Insanity*, visitors can learn how depression and schizophrenia were treated by noted experts of their time, like Jean-Étienne Dominique Esquirol, Sigmund Freud, and Anton Ludwig Ernst Horn.

2. How Does It Feel tries to simulate what it can be like to suffer from

mental disorders. In *When Reality Distorts*, visitors enter a room that looks like a barber shop and hear both the barber's voice and other voices “inside” their head. They also see subtle visual cues, like blinking eyes on a hair model poster, which add to the feeling of paranoia.

3. Go Crazy! promotes mental well-being and encourages visitors to have fun through social engagement. For example, in *Dance like Crazy*, visitors can dance to music coming from loudspeakers inside big hats that hang from the ceiling. The loudspeakers direct sound so well that only someone below the hat hears the music, while people nearby see the person dance in silence.

We decided not to go too deep into the medical aspects of mental disorders, in part because the science is constantly changing, but mainly because science centers are not the places to give medical



In the exhibit *My Life*, peer expert Inka tells about her experience with anorexia and how she coped with it. Photo courtesy Heureka

advice. We didn't want people to look for diagnoses for themselves or their family members. As our Portuguese collaborators put it, "This is a social exhibition!" Our evaluation studies of the exhibition and a guest book both indicate that our strategy worked. People learned more about mental disorders and their effects, but the exhibition didn't raise a lot of worries.

A FRIENDLY DESIGN APPROACH

Designers Mikko Kauhanen and Touko Korhonen devised a concept that creates a unique atmosphere and gives space for visitors to reflect, talk, and explore. They started with the idea of a jewelry box and reasoned that, just like people, jewelry boxes look similar on the outside, but their insides and contents are unique. The boxes, or booth-like exhibit structures, were made of laminated veneer-lumber, and the insides are covered with paintings by Finnish artist Vappu Rossi.

Rossi became engrossed in the topic while creating 20 paintings for the exhibition, and once it opened, she hosted guided tours focusing on her paintings.

Art is present in the exhibition in other ways, too. Portraits taken by Finnish photographer Karoliina Bärlund display people, some of whom have experienced mental health problems—but even the development team doesn't know which ones because mental health doesn't show on the outside.

Another piece is the Schizophone, by French artist Pierre-Laurent Cassière. This acoustic sculpture consists of a headset with two funnels, one for each ear. The Schizophone doesn't try to simulate schizophrenia, but it gives a realistic feeling of the loss of attentiveness that accompanies many psychotic disorders. The funnels pick up sounds in an unusual way—Schizophone users can't hear nearby sounds, but they hear clearly those from farther away. The feeling is one of unease when significant and

insignificant information are mixed up and the brain can't make sense of it.

We wanted to encourage dialogue, so many of the exhibits were developed as multiuser experiences, allowing visitors to tackle both the fears and joys of the exhibition together. In addition, visitors can meet the peer experts, sometimes in person and also at the exhibit *My Life*. Visitors sit at a round table and select a peer's name. A life-size film of the peer appears on the screen at the other side of the table, and the peer talks openly and touchingly about his or her experiences with mental health problems and ways of coping. The *My Life* exhibit conveys a strong atmosphere of equity, trust, and respect, which is preserved throughout the exhibition.

A PROVOCATIVE NAME AND MARKETING PLAN

When it came to naming the exhibition and developing a marketing campaign, the topic presented a challenge.



Artist Vappu Rossi paints one of the walls for Test Yourself, an exhibit with neurocognitive tests and where visitors can participate in a scientific study. Photo courtesy Vappu Rossi

We wanted to find a name that would awaken interest and state the content without being offensive. We developed the name *Heureka Goes Crazy* together with FAMH and the peers, who felt that, even with serious issues, humor is a good thing. They emphasized that Heureka itself was going crazy so we were not labeling anyone.

The consensus was to avoid a straight-laced, edifying, or condemning marketing campaign. On the other hand, we felt it shouldn't be too "crazy," either. We also wanted to avoid branding people who struggle with mental health issues, as well as avoid references to stereotypical madmen in movies or to the frightening experience of mental health problems. A natural outcome was to involve the whole staff of Heureka in the campaign, which

portrayed more than 50 staff members wearing "crazy goggles" to show that we all see the world differently, depending on the glasses we wear.

LEAVING THE COMFORT ZONE

Heureka Goes Crazy created many new and fruitful practices that will influence how we approach future projects. By developing an exhibition on a topic outside people's comfort zone, Heureka intellectually challenged its own mission: "We share the joy of discovery." Issues of mental health cannot be dealt with only through the concept of joy. Our experiences with *Heureka Goes Crazy* reassured us that, by covering a topic not easily discussed around the family dining table, we can stimulate public discussion. We can influence people's attitudes,

as well as attract new audiences.

As science centers, we should not restrict ourselves to easily approachable topics purely about natural sciences; we should develop exhibitions about issues that are hard to talk about and even painful. By addressing these topics bravely and displaying them sensitively in an optimistic and constructive way, we can broaden our own horizons and be more inclusive. ■

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Heidi Rosenström (heidi.rosenstrom@heureka.fi) is an exhibition producer at Heureka, the Finnish Science Centre, in Vantaa. Heureka Goes Crazy is currently at the Pavilion of Knowledge—Ciência Viva in Lisbon, Portugal (with the local name Loucamente). It will then travel to Universcience in Paris in November 2015, and it will be available for rent after it closes in Paris in August 2016.

Brain Teasers

We asked exhibit developers: **What was the biggest challenge you faced in developing your brain exhibit or exhibition, and how did you address it?** Here is a sampling of what they told us. For an extended version of this article, visit www.astc.org/category/astc-dimensions.

“Is that real?” A boy presses his nose against the glass, misting the side slightly as he speaks. The scene sums up why we decided to exhibit a real human brain in At-Bristol Science Centre’s exhibition *All About Us*.

It is reassuringly difficult to obtain and display human tissue in the United Kingdom, but with the help of the University of Bristol it wasn’t long before we had a list of potential donors and a license. The biggest problem remained: **How could we quickly**

convey to visitors that this is a real brain from a real person?

First, we decided to display the specimen in a sleek tank engraved with the image of a person to help focus visitors on the humanity of the donor. Second, the exhibit is out in the open so you can get up close. Finally, we offer a series of films telling the story of brain donation from different perspectives—potential donors, surgeons in training, a donation coordinator, and an anatomy lecturer.

Emma Cook, exhibitions manager, At-Bristol Science Centre, Bristol, England, United Kingdom



Two boys examine a real human brain at At-Bristol Science Centre. Photo courtesy At-Bristol Science Centre

The University of Montana spectrUM Discovery Area's *Brainzone* and *Brainlab* bring real-time research from the university's Center for Structural and Functional Neuroscience (CSFN) to the museum floor and mobile science program. Our greatest challenge lies in **translating CSFN's high-level laboratory research into accessible, inspirational learning experiences**. The museum educators and neuroscientists on the project have learned to embrace the fact that we come from fields with different values, cultures, and even languages. At spectrUM, we are driven to empower the next generation of Montanans to believe they belong in science, technology, engineering, and math (STEM) and higher education. CSFN shares this value but most strongly prioritizes communicating current, authentic research and science. Through this partnership, we have developed shared culture and, ultimately, a richer experience for our learners.

Holly Truitt, director, University of Montana spectrUM Discovery Area, Missoula



Visitors play the *Brain Garden* game. Photo courtesy the Koshland Science Museum

One of the challenges in producing interactive experiences about the brain in the *Life Lab* exhibition at the Marian Koshland Science Museum was **showing the dynamic nature of brain development over time**. When we created the *Brain Garden* game, we needed to quantify the impacts of education, health, and lifestyle choices on the brain. Weighing the negative impacts of an event like having a stroke in relation to the positive effect of choices like early childhood education wasn't simple. In the end, we developed a game that reflects some of the multifaceted experiences that influence our brains.

Erika C. Shugart, former deputy director, Marian Koshland Science Museum of the National Academy of Sciences, Washington, D.C.

Museu da Vida has been exploring neuroscience since 2011 through our Celebrating the Brain event, part of the Brazilian Brain Awareness Week. For 2015, we are planning a temporary exhibition on neuroscience that will bridge the lay perception of the nervous system and state-of-the-art knowledge from the scientific community.

The biggest challenge for popularizing neuroscience is **dispelling the myths disseminated by the mass media**, such as "Smart people have big brains." However, these popular misperceptions can be the gateway to new interpretations. To help participants challenge their previous ideas, we enable them to explore brains on the macro level (by looking at real brains, touching 3D models, and coloring drawings of the brain) and the micro level (by observing neurons).

Fábio Gouveia, science communicator, **Paulo Colonese**, science educator/communicator, and **Diego Vaz Bevilacqua**, director, Museu da Vida/Fiocruz, Rio de Janeiro, Brazil



At Museu da Vida's 2014 Celebrating the Brain event, children observe pictures, models, and real animal brains. Photo by Luciana Sales, Parque da Ciência



Several spaces in *Wonder Years* encourage caregivers to interact with the young children in their lives. Photo courtesy the Science Museum of Minnesota

Wonder Years: Science of Early Childhood Development at the Science Museum of Minnesota aims to bring information about brain development to the public so that we can be better caregivers and advocates for our youngest citizens. This leads to the project's biggest challenge: **How do you create an exhibition about very young children for all of the adults in their lives in an environment that needs to engage audiences of all ages?**

To address this challenge, we designed an exhibition where visitors participate in experiences like looking through goggles to see what young children see; view videos of positive adult-child relationships and children trying to complete cognitive and physical tasks; and interact with young children in areas designed for reading, dramatic play, and cognitive development tasks.

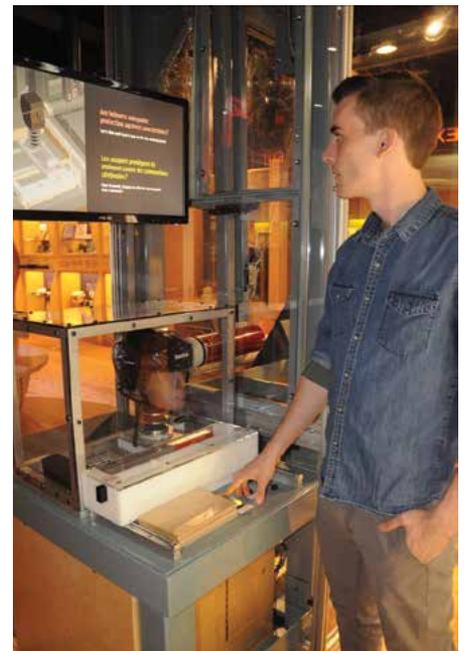
Laurie Kleinbaum Fink, director of science programs, Science Museum of Minnesota, St. Paul

Once we decided to include a brain exhibit in the *Hall of Human Life* at the Museum of Science, the biggest challenge was **deciding what topics would be relevant to the public and yet easy to grasp**. We wanted to focus on a health condition that changes with time and is influenced not only by our genetics and physiology but also by environmental factors. That is why we picked major depression. That was not a decision that was easy for advisors and staff to accept at first as we were all aware that visitors do not anticipate thinking about depression during a museum visit. The fact that the exhibit has been well received has affirmed our mission to make accessible the science behind who we are.

Elizabeth Kong, manager, Hall of Human Life, Museum of Science, Boston

To explore the topic of brain injuries and concussions, the Ontario Science Centre developed a novel interface in *The AstraZeneca Human Edge* exhibition that allows visitors to strike the head of a crash test dummy by operating an impact arm attached to a pendulum. They discover that—depending upon the location and speed of the impact—helmets do not adequately protect against rotational forces to prevent concussions. The biggest challenge in developing this exhibit was coordinating the complex mechanical and electronic components. Extensive testing and several iterations were required to ensure safe and reliable operations. In addition, **we were uneasy about visitors walking away with the message that helmets are ineffective**, so we developed a display of helmets from real crashes, featuring stories of how helmets saved lives.

Bhavleen Kaur, senior scientist, Science Content and Design, Ontario Science Centre, Toronto



At an exhibit at the Ontario Science Centre, a visitor tests whether helmets adequately protect against concussions. Photo courtesy the Ontario Science Centre

At Bloomfield Science Museum Jerusalem, we felt that our brain exhibitions should present relevant research and the scientific methodology behind it. For that, **we had to “crack the hard nuts” of clarity, relevance, and fascination.** To emphasize **clarity**, we enlisted enthusiastic Ph.D. students from the brain labs of the Hebrew University of Jerusalem to help researchers translate their findings into clear messages for the public. Although research on neurodegenerative diseases is perceived as particularly **relevant** to our well-being, we wanted to present the importance of the whole spectrum of brain research. Our approach is to present every topic as two parts of a whole: one exhibit presenting the daily phenomenon and another presenting the scientific research forming the basis of the explanation. The **fascination** of brain research results from discoveries about ourselves. Connecting these discoveries to art was a way of saying, “Look how beautiful and interesting it is to understand the reason behind it all.”

Varda Gur Ben Shitrit, deputy director of content development, Bloomfield Science Museum Jerusalem

Pacific Science Center recently opened *Memory: Past Meets Present*. We experimented with **crowd-sourcing images of other people’s memories. It was difficult at first to get good high-resolution responses**, but putting out the call for submissions over months rather than weeks was the key to success. In addition, setting up easy and specific photo delivery protocols and prizes for those photos

ultimately used in the exhibition encouraged our visitors and eased our management of the process. Every year, over a four-year period, half of this exhibition will rotate with new content and the other half will remain the same. We will apply these lessons to the 2015 version of the exhibition to help us keep the permanent elements fresh and incorporate the next generation of content.

Mary Olson, current science project manager, Pacific Science Center, Seattle



Visitors type their earliest memories at the Share a Memory digital interactive in *Memory: Past Meets Present* at Pacific Science Center. Photo by Beth Gibson

Creating Accessible Opportunities at the Intrepid Museum

By Barbara Johnson Stemler

Located in New York City, the Intrepid Sea, Air & Space Museum engages the public in the history, science, and technology of seagoing vessels, aviation, and space exploration (www.intrepidmuseum.org). In 2008, the Intrepid Museum launched a program for individuals who are deaf or hard-of-hearing, and due to its success, accessible programs are now an institutional priority. We increased the scope and depth of programs to benefit individuals, organized groups, and families of visitors who are blind or partially sighted, or who have intellectual disabilities, emotional or behavioral challenges, developmental or physical disabilities, autism spectrum disorders, or dementia (www.intrepidmuseum.org/access.aspx).

In this article, I describe our programs specifically designed for people with conditions related to the brain, namely autism, developmental disabilities, and dementia. Our programs are continually informed by advances in neuroscience that improve our understanding of how the brain filters everything we see, hear, and feel to shape our current experiences and create recollections of the past.

EARLY MORNING OPENING

Designed for children with autism and their families, Early Morning Opening programs offer social and educational opportunities before the museum opens for the day to the general public. The families represent a range of chronological and developmental ages, as well as communication and social skills.

Most individuals with autism integrate and interpret sensory stimulation differently from individuals with a typically developed brain. Children with autism often experience heightened anxiety, overstimulation by crowds, and hypersensitivity to auditory input (Grandin, 1995). Therefore, the quiet, calm,

and adjustable environment of the museum before it opens is intended to increase participants' comfort and ability to focus.

The programs are held free of charge eight times a year and have a theme, such as pilots and planes, life at sea, or the Space Shuttle *Enterprise*. We require advance registration and limit attendance to 75 family participants. We ask parents for information about their children and how we can support their experience, and we share these notes internally. A week before the program, we send a reminder email with a social narrative about what families can expect to do and see, a vocabulary sheet highlighting key words and concepts, and a visual "first, then, last" schedule.

Guided gallery tours with small groups are typically 30–45 minutes, with educators actively engaging different areas of the brain to encourage and reinforce meaningful connections. Tours incorporate physical movement exercises, role playing, opportunities to touch models and artifacts, music and sound effects, object-based learning, and augmented communication (using visual



A child participates in the Access Family program for visitors with developmental disabilities. Photo courtesy the Intrepid Sea, Air & Space Museum

vocabulary sheets, gestures, and pictures). For an aviation-themed program, educators might ask open and closed questions about aircraft in the collection, pass out an authentic pilot helmet for families to touch, show historic photographs, and demonstrate roll, pitch, and yaw through movement and a scale model.

If at any time children have difficulty self-regulating and need a break, families are directed to a designated quiet room with natural light, self-soothing resources, and calm activities, including a weighted plush animal to place across a child's lap or shoulders, coloring materials, fidgets to manipulate, and space to stretch out.

Parents report that they can enjoy the museum experience more, knowing it is easier to track children and that other parents won't judge their child's behavior. Afterward, we invite participants to stay in the museum if they are interested and able. We hope that, over time, families will build enough

comfort and confidence to venture into the Intrepid Museum on their own. (See also *Dimensions*, November/December 2012, pages 43–46, www.astc.org/DimensionsPDFS/2012/NovDec.pdf.)

ACCESS FAMILY

Every month, we host an Access Family program for children with developmental disabilities, a group of conditions that can impact day-to-day functioning and are often experienced throughout a person's lifetime (Centers for Disease Control and Prevention, 2013). About 50% of children who participate in these programs have speech delays, auditory processing disorders, intellectual disabilities, attention-deficit/hyperactivity disorder (ADHD), or fine and gross motor disabilities. The other 50% of children are self-identified as having autism.

Therefore, our Access Family and Early Morning Opening programs share several accommodations, teaching techniques, and programmatic goals.

Attending a fun, intellectually stimulating event benefits both individuals with dementia and their caregivers, especially when no one judges behavior, word recall, and prior knowledge.

Similarities include the goal of providing a safe, welcoming, and social environment for the whole family. A key difference is that Access Family programs occur on weekends during regular museum hours. Therefore, these free programs are more frequent, tour groups are usually predetermined by age, and the children who attend generally have a higher tolerance for crowds and loud noises and a greater capacity for sustained attention. Families spend approximately one hour in the gallery, followed by an hour in a classroom setting.

Educators engage learners through visual, auditory, and kinesthetic (movement) activities in a multisensory experience in the gallery and use routine and repetition to increase comfort and enforce new ideas. Visual supports provide concrete examples of abstract concepts and help participants focus on, generalize, and contextualize the museum collection. These visual vocabulary resources are also sent to families prior to their arrival to help children preview and prepare for the experience.

Participants represent a continuum of cognitive abilities and learning needs, from a child who is chronologically 10 years old while developmentally a toddler, to a highly verbal child who has a short attention span and lacks social skills. Although staff members try to anticipate the varied learning and social-emotional needs of the group, it is important to respond to individuals in the moment.

The museum has recently extended its offerings to include Access Family programs for adults and their families.

THE STORIES WITHIN

Designed for individuals with dementia and their caregivers, the Stories Within program serves two diverse audiences through engaging, guided multisensory experiences designed to elevate positive emotions while sparking conversation and

memory. For professional or family caregivers, the program is a respite from the pressures and exhaustion of caring for another individual. For individuals with dementia, the experience enriches their lives and provides a conduit for connecting with others. Attending a fun, intellectually stimulating event benefits both parties, especially when no one judges behavior, word recall, and prior knowledge.

While dementia can affect the ability to retain short- or long-term memory in the cortex, an individual's emotional memory in the amygdala can still function properly (Lunde, 2013). Therefore, a person's mood can be lifted by an experience even after they no longer consciously remember exactly what happened. Similarly, a body of research shows that different areas of the brain control musical processing and memory recall (Alzheimer's Association, undated), so individuals might recall a tune or lyrics more easily than other memories.

We ask caregivers in advance of their visit for information about current physical mobility and hearing, vision, communication, and recall abilities, as well as about particular passions and past careers. Almost half of our visitors are war veterans or have some family history with the military, so we like to know of these experiences in case the immersive museum environment triggers a memory or emotion, whether positive or negative.

Program themes focus on stories about sailors, the home front, or engineering and technological advances from the 1940s to 1980s. This time frame is intended to maximize the potential long-term memory or associations that participants might have. Like the participants, educators remain in the present and focus on the objects and images immediately in front of the group. Since some participants have limited or no short-term memory, educators don't compare objects or bring up prior experiences without a verbal description or visual example.

The gallery experience is also stimulated through visual, tactile, and musical supports whenever possible. For example, when learning about Rosie the Riveter, a cultural icon representing women factory workers during World War II, the group examines images of women working in factories, a riveting gun, and Intrepid's airplane from that era. An aircraft restoration specialist also conducts a riveting demonstration, and the group sings "Rosie the Riveter" by Redd Evans and John Jacob Loeb.

Last, we provide participants with keepsakes, such as postcards, buttons, song lyrics, and pins, to extend the positive emotions and give caregivers something to share and talk about. (See also the article beginning on page 54.)

We continue to rethink and refine our current practices in response to the feedback of our constituents and peers. Every day, we increase our awareness and institutional investment in serving our community to the fullest. We extend our deepest thanks to our funders who make this work possible and to the dedicated staff and volunteers and the families and teachers who support our efforts. ■

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HOW TO CREATE AN INCLUSIVE, ACCESSIBLE ENVIRONMENT

If you are interested in enhancing accessibility at your museum, consider the following basic principles, which can be applied holistically or to a particular program:

- **Conduct an accessibility audit leading to an action plan.** Use a strengths-based approach to analyze your museum's physical layout, web presence, public programming, funding opportunities, staff attitudes, and experience. What is easily attainable and what is a long-term goal? Audits can be conducted internally or by professional consultants. Ideally this is an ongoing effort as circumstances change.
- **Be knowledgeable of best practices.** Familiarize yourself with current trends, programming standards, teaching techniques, and appropriate language. Observe what other museums, service providers, and special education teachers are doing. Take advantage of what professional networks offer, such as ASTC's resources at www.astc.org/professional-development/archived-resources.
- **Collaborate and communicate with the community.** Invite members of the intended audience to co-develop pilot programs and resources. Create an advisory council of trusted and invested stakeholders who will continue to provide feedback. Encourage partnerships with schools, service providers, and other institutions. Nothing should be created in a vacuum.
- **Don't be afraid to fail!** Be willing to take risks and learn from mistakes. There is always room for improvement and growth. —B.J.S.

Roots and Reflections: Engaging People with Dementia

By Libby Rhoads

The Roots and Reflections program at the U.S. Botanic Garden in Washington, D.C., is designed for individuals with dementia and their care providers. People with dementia have much to give, and no matter the stage of the disease, I believe a person with dementia has the ability to communicate, express, share, and feel. Museums, with their extensive collections and knowledgeable staff, can encourage and promote reflection and reaction, even when words are not available.



Residents at Grand Oaks Assisted Living Oasis at Sibley Memorial Hospital in Washington, D.C., work on potting small plants for their rooms and common areas. Photo courtesy the U.S. Botanic Garden

Drug treatments for dementia—a loss or decline in memory and cognitive abilities—are still under development, so nonpharmacological treatments like art therapy, horticultural therapy, music therapy, and reminiscence are sought out as ways to better manage the disease (Heathcote & Curteis, 2006). Museums with collections themed around art, horticulture, or history are ideal venues for

these nonpharmacological approaches (Gellis, McClive-Reed, & Brown, 2009; Silverman, 1998). Gardens, in particular, are being investigated as beneficial spaces for the treatment of dementia-related anxiety and agitation (Whear et al., 2014).

Each Roots and Reflections tour is designed around a broad concept (e.g., Plants to Pantry or What's in a Name?) that uses the U.S. Botanic Garden

collection to spark memories and discussion among participants. Tours frequently visit specific plants and use plant or plant-related scents and textures to engage visitors. One popular plant is our coffee tree, *Coffea arabica*. Roasted coffee beans are familiar to most visitors, regardless of cultural background. The look, touch, and smell of the roasted beans, in combination with cherries from the tree, generate enthusiastic conversations about coffee preferences, uses, and connections to the past. We also give visitors a printed handout with images, plant names, and a few facts to spur conversation once participants have left the garden.

Occasionally, we take programs off site to visit individuals who are unable to travel. These programs involve tactile elements designed to allow participants a sensory experience. We bring materials for participants to make a product (e.g., a lavender sachet, homemade herbal tea blend, or mini terrarium) that can serve as a cue for conversation and interaction post-program. We've found anecdotally that simple, hands-on, sensory activities are more engaging for these participants than discussion-based activities. Regardless of their ability to form a complete sentence or have a verbalized opinion, participants can feel engaged and connected to the activity through participation or assisted participation, or even by watching and reacting to someone else participating.

To date, we have offered Roots and Reflections on a request-only basis, but in 2015, we plan to create a registration-based version for the general public, offering it once a month for people with dementia and their care providers. We hope also to coordinate some studies of the impacts of museum and public garden visits for people with dementia.

Roots and Reflections program provider Alex Torres says, "Gardens and plants have such a magical effect that is not always fully understood or appreciated. Seeing the excitement that the [U.S. Botanic] Garden inspires in our seniors' groups is amazing proof of the power and importance of these types of programs." ■

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ASTC's Board and staff wish to thank our **Partners** for their leadership and generosity. We are truly grateful for their visionary support.









4D/3D Films Produced by Shanghai Science & Technology Museum (SSTM)

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The Actions Inside 18'



Diseases are often caused by harmful bacteria. Immune cells in our body like neutrophils, dendritic cells and macrophages fight against them to guard us. Antibiotics join the fight. They are efficient in killing harmful bacteria as well as beneficial ones. Moreover, they may make our immune system less efficient. What shall we do to maintain our health?

Adventure to the Jurassic Sea 17'



150 million years ago, Ophthalmosaurus "Boa" lived in the vast ocean of the Jurassic period. He and his mother were separated in a dogfight. To find his mom and get back to his family, "Boa" embarked on a journey of adventure to the deep with his friend Ammonite "Jack".

The Kingdom of the Saber-Tooth 20'



Top predator Machairodus lived 6 million years ago in Northwest China. Along with the rising of the Tibet Plateau, the climate changed violently, which brought unimaginable challenges to the survival of the ancient animals living in this region. These are the natural laws of evolution! What destiny will be to our heroes, the Machairodus brothers?

SSTM is also making a series of documentary entitled "Endangered Species of China", focusing on some of the unique and most endangered animals existing in China.

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CHRISTOPHER NOLAN
DIRECTOR OF 'INTERSTELLAR'

NASA has selected 12 informal education institutions, including eight ASTC members, to receive approximately \$6 million in agency funding to provide compelling science, technology, engineering, and math (STEM) opportunities:

- **Boston Children’s Museum:** \$241,584 for Our Sky, a series of out-of-school time and museum education programs that inspire an appreciation and understanding of Earth and Space Science
- **Discovery Museum and Planetarium,** Bridgeport, Connecticut: \$499,977 for Discover NASA, including upgrades to the Challenger Learning Center and the creation of K–12 amateur rocketry and spacecraft design programming
- **EdVenture Children’s Museum,** Columbia, South Carolina: \$893,308 for Flying Higher, which will develop a permanent hands-on exhibition that conveys the fundamentals of flight, technology, materials science, and NASA’s role in aeronautics
- **Great Lakes Science Center,** Cleveland: \$799,478 for Mission to STEM: Activating NASA Artifacts and Next Generation Science Standards with Digital Missions for Students and Families, which will develop a digital experience focused on collaboration and teamwork, emphasizing the benefits of a systems approach to STEM challenges
- **Maryland Science Center,** Baltimore: \$450,428 for Understanding the Sun Through NASA Missions, which will inform rural educators and library patrons about NASA Heliophysics science and NASA missions studying the sun
- **Museum of Science and Industry,** Chicago: \$694,219 for Our Place in Space: A Formal-Informal Partnership to develop an inquiry-based

curriculum in space science, observation, and exploration for middle school teachers

- **Oregon Museum of Science and Industry,** Portland: \$382,540 for Lenses on the Sky, which will engage audiences in NASA-themed STEM content and enhance the capacity of communities to incorporate engaging NASA and STEM content into informal experiences that complement the K–12 curriculum
- **Space Science Institute,** Boulder, Colorado: \$735,455 for From Our Town to Outer Space, which will bring NASA science and engineering to underserved communities through a national public library exhibition program.

The (U.S.) National Science Foundation has awarded six grants totaling about \$7.5 million through its Advancing Digitization of Biodiversity Collections Program, a nationwide effort coordinated by the iDigBio program based at the **Florida Museum of Natural History** at the University of Florida, Gainesville. Three awards involve ASTC members:

- \$614,732 for Collaborative: Documenting the Occurrence through Space and Time of Aquatic Nonindigenous Fish, Mollusks, Algae, and Plants Threatening North America’s Great Lakes. Christine Niezgodna of the **Field Museum of Natural History,** Chicago, is among the Collaborating Award Principal Investigators (PIs).
- \$322,110 for Collaborative Research: The Key to the Cabinets: Building and Sustaining a Research Database for a Global Biodiversity Hotspot. Laura Whyte of the **Adler Planetarium,** Chicago, and Norris Williams of the **Florida Museum of Natural History** are among the Collaborating Award PIs.

- \$413,454 for InvertEBase: Reaching Back to See the Future: Species-Rich Invertebrate Faunas Document Causes and Consequences of Biodiversity Shifts. Petra Sierwald from the **Field Museum of Natural History** is the PI of this project. Elizabeth Shea of the **Delaware Museum of Natural History,** Wilmington, and Gavin Svenson of the **Cleveland Museum of Natural History** are among the Collaborating Award PIs.

The Cleveland Foundation has awarded \$450,000 to **Great Lakes Science Center** for the launch of Cleveland Creates, which seeks to rebuild a culture of entrepreneurship and innovation through an engineering and design “thinking” curriculum for seventh graders.

The **Discovery Museums,** Acton, Massachusetts, received \$150,000 from the Sudbury Foundation for the development of a new exhibition focused on early brain development. The exhibition, which is scheduled to open in 2017, is targeted toward children ages 0 to 3 and their families.

The **Exploratorium,** San Francisco, was among 13 real estate developments from around the world selected as winners in the 2014 Urban Land Institute Global Awards for Excellence competition.

James Piercy

Interviewed by Joelle Seligson

In January 2011, science communicator James Piercy was involved in a devastating car crash that took his wife's life and left him with a serious brain injury. In the four years since that tragic day, Piercy has begun delivering science talks again—this time, from the vantage point of his own experience. Through *Science Made Simple*, based in Cardiff, Wales, Piercy travels throughout the United Kingdom and overseas to present “What’s Going on in His Head?”—a talk in which he draws on his own injury to educate audiences about the brain.



James Piercy has developed a presentation entitled “What’s Going on in His Head?” based on his experiences as a survivor of a serious brain injury. Image courtesy J. Kavanagh

Tell me about your journey from January 2011 to today.

I was in hospital for about two months. As part of my recovery, I gave a presentation to colleagues about what had happened to me and things that I had learned along the way. I thought, “I should do more of this. Maybe it would help people understand what brain injury is all about.”

What does your presentation entail?

It takes a chronological view of my story, starting with what happened on that awful day to where I am now. I’ve been incredibly lucky. I could’ve been much more severely affected by the injury, and my consultant tells me that my recovery is phenomenal. It seems to me I have a duty to share what I’ve learned. Brain injury affects millions of people every year.

How do you get your story across?

We have some laughs. I think it’s important to be able to laugh about things. It’s quite different from other presentations that I’ve done in the past, which were about demonstrating scientific phenomena. Now it’s just me telling my story, and that’s a powerful way to connect with audiences. I’m not talking about brains; I’m talking about *my* brain.

What effects did the accident have on your brain?

I suffered damage to the left hemisphere of my brain, which left a weakness on the right-hand side of my body. It’s much improved now, but if I get tired, it comes back. The biggest problem I have is fatigue. When I’m tired, my speech might be affected; my walking can be a bit funny, too. I have to be careful not to push myself too hard.

What are some misconceptions about brain injury?

Sometimes there is an association with mental illness. Some people can have psychiatric effects; it changes their mood and behavior. So others might think that they are mentally ill or that they’re stupid. For the most part, people can do all the things that they used to do—they’re just a bit slower now.

How could science centers and museums educate audiences about brain injury?

The brain is a fascinating and quite poorly understood thing. We all know that it controls everything that we do and think, but how? There’s some fascinating, cutting-edge research going on in neuroscience, and the effects of damage to the brain are a key way in. Think about how you can use the first-person approach to connect with audiences. Look for stories that can make a real, strong connection to other people.

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

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The logo for the 2015 Annual Conference features a stylized 'ASTC' in purple and pink, followed by '2015' in large green numbers. Below it, 'Annual Conference' is written in white. The background of the entire page is a blue-tinted image of a modern building with a glass facade and a large molecular model in the foreground. There are several overlapping colored squares (green, orange, yellow, pink) on the left and right sides of the page.

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