ASTC Dimensions

Bimonthly News Journal of the Association of Science-Technology Centers

July/August 2004

# Science for Early Learners:

## Reaching Very Young Audiences

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**One Experience at a Time:** Measuring Success in the Kids Room

**Science Is Everywhere:** Making a Commitment to Family Learning

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**Including Our Youngest Visitors**

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## IN THIS ISSUE

July/August 2004

**Last year at this time, we wrote about an audience seldom found in science centers—older adults—and described how museums are reaching out to these lifelong learners. In this issue, we turn our attention to what has been called the "hidden audience" of science centers—very young children—whose needs are sometimes overlooked even as we bill ourselves as "family friendly." Children's museums, many of them longtime ASTC members, have led the way here; in 1990, ASTC and the Children's Museum of Boston co-published a book,** *Planning for the Very Young,* **that addressed "excellence and equity in preschool activities at science museums." But science centers, which seek to serve audiences of all ages, have continued to evolve their own approaches to early learning in science and technology. We offer some examples here.**

### *Features*



### *Departments*



*Cover:* Young children are natural scientists, constantly forming and testing theories about the way things work. *Photos courtesy, clockwise from top left, Stephanie Miller/New York State Museum, Ontario Science Centre (KidSpark), Maryland Science Center, Franklin Institute Science Museum (Girls at the Center)*

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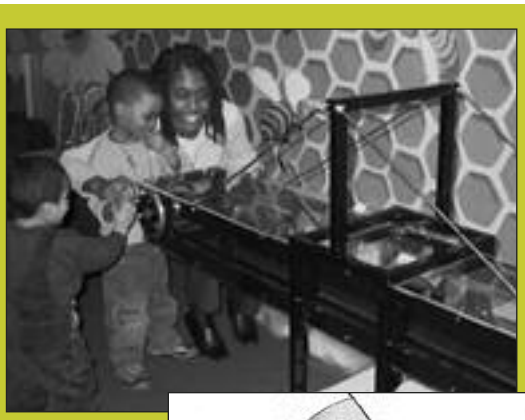
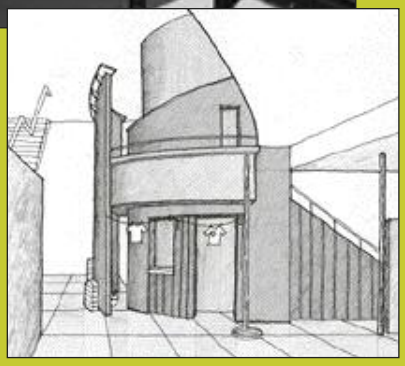
# Preschool Science Place:
## *Creating a Playful Space for Early Learning*

By Marcia Rudy

This November, as part of a larger 55,000-square-foot expansion project, the New York Hall of Science will debut *Preschool Science Place,* a 2,000-square-foot exhibit area for children aged 6 and under and their parents, caregivers, and teachers.

The current, 500-square-foot preschool exhibition at the New York Hall contains thematic modules where children can experiment with and explore concepts of science and technology, such as sound and music, simple machines, light and color, structures, and measurement. Our objective for the much larger, relocated gallery is to involve children in playful science learning centered around the intersecting natural and built worlds of "the city in nature and nature in the city."





**Above, left: Children and caregivers attend a program in the New York Hall of Science's current early childhood exhibition space. Above, right: A family tests a prototype gantry crane for *Preschool Science Place.***

**Right: One of several design challenges in the new space, the enclosed fire stair has been incorporated into CityScape, a two-story, partially built facade where children can role-play as architects, designers, and builders.** *Photos courtesy New York Hall of Science; artist's rendering courtesy BKSK Architects*

### Grounded in research

The decision to expand our exhibit area for very young children resulted from two major factors.

First, we were experiencing an increasing number of family visitors with preschool-age children, especially toddlers. In this, we were not alone. Many other science centers are noting this trend and responding by adding or expanding exhibits for early learners. Recent examples include the Kids Room at the Maryland Science Center (see "One Experience at a Time," page 6), the Kid Science area (for ages 5-8) at the Franklin Institute, and the Discovery Center (for 5 and under) at the Museum of Science, Boston. Children's museums, of course, have long excelled at serving these youngest visitors.

Second, research findings, such as those presented in *The Scientist in the Crib,* a 1999 book by developmental researchers Alison Gopnik, Andrew Meltzoff, and Patricia K. Kuhl, indicate that hands-on science learning can be stimulated and encouraged as early as infancy.

Development of the exhibition took into account children's developmental stages, differences in learning styles, the diversity of our audiences, and the need for individual and cooperative play activities. We included exhibits and activities that linked in part to

- guidelines for prekindergarten science/technology learning published in 2002 by the National Association for the Education of Young Children (NAEYC);
- reports on child developmental stages published by the educational nonprofit ZERO TO THREE;
- Howard Gardner's theory of "multiple intelligences";
- Golinkoff and Hirsch-Pasek's studies on how children really learn and why they need to play more, and
- cognitive scientist Rochel Gelman's findings that young children can do causal reasoning about the animate and inanimate world. (For full references, see "Science for Early Learners: A Resource List," page 8.)

Our work also corresponds to findings from research presented at several recent conferences—the 2003 21st Century Learner conference sponsored by the Association of Children's Museums (ACM), the 2003 ASTC Annual Conference, and the 2004 ACM and American Association of Museums' annual

meetings—where the emphasis was on the importance of play, enriched environments, wordplay and story building, and providing experiences on *how* to learn (process skills) rather than *what* to learn.

## Designed for playful learning

To design and develop our rich and playful new space, we selected Joan Krevlin of BKSK Architects, designer of the museum's two existing outdoor science playgrounds for school-age and preschool children (see "Design for Playing," *ASTC Dimensions,* March/April 2003).

In addition to our educational goals, we wanted to create an immersive urban environment with a strong "sense of place"—the kind of neighborhood that is particular to our area in Queens (one of New York City's five boroughs). Our thematic areas would invite interactions with city trees and animals and include a market, with foods representative of cultural diversity, and buildings in the process of construction.

The space for the new gallery posed some design challenges (adjacency to an open staircase, a partial opening to the floor above, an enclosed fire stair, and a strong element of natural light), but the architect found ways to use these conditions to advantage in achieving a thematically organized environment.

*Preschool Science Place* will be partially enclosed to separate it from the open staircase, and the fire stair will be incorporated in the design of CityScape, a two-story, partially built facade where children can role-play and experiment as future architects, designers, or builders. Children will navigate their way through the two-story building, peering at branches and animals from different vantage points, seeing other exhibit areas, and moving objects up and down with buckets and pulleys. Young visitors and their adult caregivers will be able to send each other messages via speaking tubes, videophones, and computers.

We invited two artists whose works speak to the fun and fantasy of play to help us create a whimsical, tactile, and engaging environment. Sandy Skoglund responded to the challenge of the opening to the floor above by designing *Tree of Trees,* a 10-foot-tall central sculpture made of seven preserved native trees. The sculpture's branches reach up into the open space and spread a canopy of spring and autumn leaves over exhibit areas where children can discover real-life objects, models, taxidermy specimens, and puppets of local animals and plants in their habitats, both in the trees and below ground.

In the Market exhibit area, children will be able to shop and stock shelves, as well as count, weigh, and measure food with scales, rulers, and calculators. In this area, artist Ben Schonzeit has imaginatively reproduced the diversity of nature found in the city with his over-scaled watercolors of animals, birds, vegetables, and fruit. Kids can learn here about fruits and vegetables sold in local ethnic markets; an adjacent garden area will allow them to plant and pick vegetables and fruit, making the association that food comes from nature, not just the store.

CityBuilding is a "construction site," complete with cranes, building sets, blocks, foam bricks, tools, and a brick-yard conveyor system (designed and built by the museum's exhibits department) that extends up to the ceiling. Exhibits here will encourage cooperative play in sorting and arranging bricks or building walls and other structures.

In CityHouses, an area suggestive of a typical city dwelling, wall openings will function as both windows and puppet theater stages where visitors and staff can produce plays. Hand puppets, hand-made animal costumes (squirrel, turtle, butterfly), and books about animals will stimulate role-playing and again invite children to explore the world around them.

SmallTown is a separate area for toddlers, focusing on playful experiences. We planned this area based on research findings which indicate that it is important to encourage and reinforce sensorimotor learning—physical movement, touching, tasting, seeing, and hearing—in children up to age 2, as a way for them to understand the world. Exhibits will include a crawl-through structure, tactile boxes, mirrored walls, soft blocks, musical play stations, and audioscapes of bird, animal, and city sounds. Adult caregivers will be encouraged to interact with and play alongside the children as they explore or look at illustrated science storybooks.

Finally, we reserved the area that has natural light and a view of the outdoors for StudioWorks, a space where staff will offer guided activities. Here, children can design and build science/art projects to take home or involve themselves in contemplative activities from six changing, theme-related Discovery Boxes: ocean life, insect life, bones, plant and animal life cycles, magnets, color, and light. Each box will contain a themed book, tactile artifacts and objects, and activities to do in the studio area and later at home.

To date, we have prototyped foods and scales for the Market, objects to use with the cranes, different building sets and types of blocks, and multilayered and age-appropriate building challenges for the brick-yard conveyor system. As we work to complete *Preschool Science Place* for its opening in November, we look forward to seeing how our youngest visitors will respond to this engaging way to play and learn about science and technology in a "city of nature/nature of a city" environment. ■

*Marcia Rudy is director of public programs and special events at the New York Hall of Science, Queens, New York. For more information on the museum's expansion, visit* www.nyscience.org.

*Curious to learn how real-world study of children's scientific thinking would differ from research undertaken in laboratory settings, University of Pittsburgh cognitive psychologist Kevin Crowley and several colleagues conducted on-site investigations in two children's museums in the late 1990s.*

*The researchers observed solo-child and parent-child interactions with a simple animation exhibit—the zoetrope—at the Pittsburgh Children's Museum, in Pennsylvania, and the Children's Discovery Museum of San Jose, in California. They recorded the length of time spent at the exhibit, the types of interactions observed, and, in the case of the family groups, the conversations that accompanied those interactions.*

*The following discussion of parental influence on science literacy is excerpted from "Everyday Activity and the Development of Scientific Thinking," by Kevin Crowley and Jodi Galco, one of 16 papers edited by Crowley, Christian D. Schunn, and Takeshi Okada in* Designing for Science: Implications from Everyday, Classroom, and Professional Settings (Erlbaum, 2001).

# Thinking about Science Together

**By Kevin Crowley and Jodi Galco**

...When parents were present, children exploring the zoetrope saw more unique kinds of evidence, spent more time collecting the most informative kind of evidence, and were more likely to make paired comparisons between different kinds of evidence. Even if the development of scientific thinking is best explained by mechanisms "inside the head" of an individual child, our findings suggest that parents play an important role in enriching the evidentiary record on which individual children could make inferences, generate explanations, and construct new theories...

...We think the most important implication of our findings is not that parents are providing declarative content for their children's theories, but that parents are modeling a specific kind of meaning-making for their children. Scientific thinking, like the specific thinking that characterizes other disciplines, might be considered a specific kind of causal reasoning, with its own rules about what constitutes acceptable theory, evidence, and argument. When we observed parents talking to children about explanations, we saw them not only shaping the interpretations possible for their child at that moment, but also perhaps scaffolding their children's transitions from general causal thinkers to early scientific thinkers. A parent who explains an interactive exhibit to a child may increase the likelihood that the child understands the exhibit and may also demonstrate that constructing a causal, analogical, or principled explanation is an appropriate activity when one is manipulating a device, either to engineer an outcome or just to see what happens.

In many ways, this argument echoes those that have been made about the development of literacy. Findings suggest that early out-of-school parent-child activities, such as storybook reading, are linked to reading and writing outcomes once children enter school. Among the causal mechanisms proposed to explain this link is that parents who involve children in out-of-school literacy activities not only support the direct development of literacy skills, but also instill in children the value that practicing the habits of literacy is an important priority throughout life.

It seems likely that a related scenario exists in the case of scientific literacy: Parents who involve children in informal science activities not only provide an opportunity for children to learn factual scientific information, but also provide opportunities for children to engage in scientific reasoning, to develop an interest in learning more about science, and to develop a sense that practicing the habits of scientific thinking is an important priority.

Similarly, children are learning a lot about science years before they are taught official science curricula in classrooms. Whether children are visiting museums, watching television shows like "Bill Nye, the Science Guy," surfing the Web, or using a chemistry set, parents are often available to children to act as guides and interpreters. In terms of future classroom success or later choices about science as a career, the most important outcome of everyday parent-child scientific thinking may not be the content children acquire, but the interest, habits, and identity they form as someone who is competent in scientific thinking. ■

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*Kevin Crowley is director and Jodi Galco (now Fender) is a researcher at the University of Pittsburgh Center for Learning in Out-of- School Environments (UPCLOSE). Crowley is also director of research and evaluation at the Pittsburgh Children's Museum.*

*Reprinted with permission from* Designing for Science: Implications from Everyday, Classroom, and Professional Settings *(Mahwah, New Jersey: Lawrence Erlbaum Associates, 2001). The full text of this article is also available in PDF format on the UPCLOSE web site,* http://upclose.lrdc.pitt.edu.

# One Experience at a Time:

## *Measuring Success in the Kids Room*

By Stacey Prinzing

In 2002, the Maryland Science Center launched a new and improved Kids Room. In taking a previously overcrowded 700-square-foot space up to 5,000 square feet, our goal was to create a high-quality experience that would attract and appeal to children aged 0 to 8 and the adults who accompany them.

We wanted our new space to reflect a commitment to early childhood learning in science centers, to provide multiple levels of interpretation, and, ultimately, to help create long-remembered experiences. Before designing our exhibits, we read books and articles on early childhood education, consulted people schooled in the field, and drew on our staff's previous experiences with young children.

This information served us well, but we did not begin to guess how much more we would learn by observing and listening to visitors in the Kids Room. That is what has taught us most about the ways that young children relate to a learning space and how the adult-child dynamic contributes to the experience.

### What we expected ...

Researchers who specialize in early childhood know that young children learn with their whole bodies. For exhibit planners, this means realizing that your visitors will be less concerned about the color you have painstakingly chosen to paint a particular component than about whether they can hold it in their hands, smell it, squeeze it, taste it, crawl under it, or sit on top of it.

By this measure, the Kids Room's 330-gallon Water Play table is a resounding success. The children love being able to play uninhibited by rules against spilling water on the floor. Children laugh out loud as they splash around, endlessly dump and fill little cups, build dams, and practice using water to make wheels turn, basins fill, and boats move from one end of the exhibit to the other.


**Science- and animal-themed costumes in the Dress Up area invite imaginative play.**

It often takes parents a little longer to transition to the idea of "no rules" water play. We do our best to help these adults along by providing plenty of children's smocks and by modeling for the adults activities they can participate in without getting soaking wet. We are well aware that the coverups do more for parent reassurance than for actually keeping any child dry. This isn't high-level science about "filtration" and "stream management," after all. It is an experience where real kids touch real parts of their world.

Helping children take such experience and move it to knowledge they can recall and connect to future learning is a team effort. We provide the exhibit, but we count on children's caregivers to continue the learning process long after they have left the science center. With a little parental guidance, those dam builders just might make the connection the next time they drive past a dam on a local river.

Kids Harbor is another real-world experience in the gallery. In this double-decker structure, which is packed with activities based on Maryland's nautical heritage, kids climb up and down ladders and steps; "catch," measure, and weigh different types of magnetic fish; and enjoy collaborative play in a lighthouse and at the helm of a fireboat.

Many adults walk away from the area very appreciative of having learned something for themselves about the species of fish found in the waters of the Chesapeake Bay or having figured out where Baltimore sits on an aerial view of the Bay. It is not uncommon to hear parents, as they


**Kids Harbor fosters collaboration while replicating real-world experiences based on Maryland's nautical history.**

*Photos courtesy Maryland Science Center*

descend the staircase, talking to their children about how some of the fish in our fishing area are the same ones that live in the harbor just outside the doors of the science center. This interest in the Bay and repeated adult response persuaded us to build our new Chesapeake Bay exhibit right outside the doors of the Kids Room. This recently opened area, which features a giant Blue Crab, is geared toward a younger audience.

## ... and what surprised us

Not every experience in the Kids Room has emerged the way we anticipated, of course. Some exhibits we felt *we* would have loved as children have proved, upon observation, to be uninteresting to the majority of our young visitors.

Few kids, for example, are drawn to interact with our Laser Harp or the lone computer in the space. We thought the laser harp and its feats of technology would encourage kids to really explore and ask questions about how it works. The instrument has no strings to touch, and so there is no transition from momentary delight to the sense of fascination that causes us all to wonder how it works.

In the Dress-Up and Pretend Play area, where children can don various animal and science-themed costumes, we thought kids would love the 52-inch "green screen" that allows them to see themselves on television, swimming with the turtles, or walking on the moon. In fact, the screen has turned out to be less popular than the large mirror that sits beside it. Most children prefer admiring their costumed selves in the mirror to looking at their images on TV.

The lesson from observation is that designing museum experiences for these visitors is more about nurturing their imagination than about showing them the latest that technology has to offer. Parents may be intrigued by the technology at first, but most learn quickly to follow the lead of the child tugging on their arm.

Simple items seem to hold some magical, intrinsic quality that draws every child in. Kids Room visitors often spend large amounts of time chasing rubber balls around and around our 3-foot-tall Ball Spiral. What set out to be an elementary demonstration in acceleration has become a whole-body activity to be experienced, not just watched. Likewise, the Pin Screen we installed as a walk-by exhibit captures the attention of both young and old. No matter what their age, visitors will stand there for 10 minutes or more, watching their handprints appear and disappear in the sea of red pegs.

Finally, the exhibits that engage children most turn out to be the childhood favorites we all remember, like the giant LEGOs or the train with the intricately designed track. Adults may be quick to identify that a child "has the same toy at home," but that rarely seems to matter to the child—it's different here. We have the right-sized tables, and plenty of pieces to create whatever the littlest imagination can conjure.

## Partners in play

As we observe children and adults experiencing our exhibits together, we see plenty of opportunity for collaboration and exploration. Whether it is comparing hand sizes on the Pin Screen or testing to see which ball will travel the fastest on the Ball Spiral, children are learning to observe and to predict, finding space to test their theories and draw conclusions with the help of their adult partners in play.

In creating our exhibits, we have made a conscious choice to leave many questions unanswered and many items unlabeled. A finished puzzle seems to hold little interest for a child, but remove just a few pieces, and it draws out the curiosity in each of us. In the same way, as museum professionals, we live out our own scientific method, putting together the pieces of the puzzle.

The more we observe what our littlest visitors are really doing in the Kids Room, and the more we think about how we can help the grown-ups around them take those lessons to the next level, the more we realize that success for us is measured in experiences, in those moments when children and adults explore and discover and imagine and laugh together. We were delighted when a parent dropped this note in our Comments Box last summer: "I think this room is phenomenal for development. Many people forget about the earliest years when programming for a museum atmosphere. Thanks."

**Designed as a "walk by" exhibit, the Pin Screen has proved irresistible to visitors of all ages.**

As educators, our job is to continue that process—watching and wondering and asking questions and making choices that can open new avenues for young children to learn. ■

*Stacey Prinzing is early childhood education specialist and manager of the Kids Room at the Maryland Science Center, Baltimore, Maryland; for more information, visit* www.mdsci.org.

Photo by Al Read

# Science for Early Learners: A Resource List

## BOOKS & ARTICLES

Bransford, John D., Ann L. Brown, and Rodney R. Cocking, eds. ***How People Learn: Brain, Mind, Experience, and School.*** Washington, D.C.: National Academy Press, 1999. Posted online at *http://www.nap.edu/books/0309070368/html/*.

Gardner, Howard. ***Frames of Mind: The Theory of Multiple Intelligences.*** New York, N.Y.: Basic Books, 1983.

Gelman, Rochel, and A.L. Brown. "Changing Views of Cognitive Competence in the Young." In ***Discoveries and Trends in Behavioral and Social Sciences,*** Neil Smelser and Dean Gerstein, eds. Washington, D.C.: National Academy Press, 1986. Posted online at *http://books.nap.edu/books/0309035880/html/175.html.*

Golinkoff, Roberta Michnick, Kathy Hirsch-Pasek, and Diane Eyer. ***Einstein Never Used Flashcards: How Our Children Really Learn—and Why They Need to Play More & Memorize Less.*** Emmaus, Pa.: Rodale Books, 2004.

Gopnik, Alison, Andrew Meltzoff, and Patricia K. Kuhl. ***The Scientist in the Crib: What Early Learning Tells Us About the Mind.*** New York, N.Y.: William Morrow, 1999.

Roopnarine, Jaipaul, and James Johnson. ***Approaches to Early Childhood Education,*** 3rd edition. Upper Saddle River, N.J.: Pearson/Prentice Hall, 2000.

Shapiro, Bonnie. ***What Children Bring to Light: A Constructivist Perspective on Children's Learning in Science.*** New York, N.Y.: Teachers College Press, 1994.

White, Judith. ***Snakes, Snails, and History Tales: Approaches to Discovery Rooms at the Smithsonian Institution*** (Washington, D.C.: Smithsonian Institution, 1992).

## RELATED ORGANIZATIONS

**Association of Children's Museums (ACM)**
*www.childrensmuseums.org*
Formerly the Association of Youth Museums, ACM offers an annual InterActivity conference and frequent professional development institutes and publishes a quarterly journal, *Hand to Hand*.

**National Association for the Education of Young Children (NAEYC)**
*www.naeyc.org*
A U.S. nonprofit, NAEYC is dedicated to improving the quality of programs for children from birth through age 8. On their web site, look for *Early Years Are Learning Years,* a series of short articles for parents and other adult caregivers that may be reproduced without charge, and *Developmentally Appropriate Practice in Early Childhood Programs Serving Children from Birth Through Age Eight,* a 1997 position paper posted in the NAEYC Resources.

**University of Pittsburgh Center for Out of School Environments (UPCLOSE)**
*http://upclose.lrdc.pitt.edu/people.html*
UPCLOSE is a partner of the Children's Museum of Pittsburgh (see pages 5 and 17). Look in the "Projects" section of their web site for information on "explanatoids," "islands of expertise," and other focuses of this research team.

**ZERO TO THREE: National Center for Infants, Toddlers, and Families**
*www.zerotothree.org*
The web site of this Washington-based nonprofit association devoted to the healthy development of infants and toddlers contains archived articles from their *Zero to Three* journal and other resources for parents and professionals who work with young children.

## ONLINE RESOURCES

**Dialogue on Early Childhood Science, Mathematics, and Technology Education (1999)**
*www.project2061.org/tools/earlychild/default.htm*
The proceedings of the February 1998 Forum on Early Childhood Science, Mathematics, and Technology Education, sponsored by the American Association for the Advancement of Science (AAAS) and the National Science Foundation as part of Project 2061. Among the 15 articles posted here are reports on early childhood mathematics, young children and technology, and science in early childhood.

**Early Childhood Education Quarterly, Vol. 19, Issue 1 (First quarter, 2004)**
*www.sciencedirect.com/science/journal/08852006*
A special issue of NAEYC's scholarly journal, edited by S.L. Golback and H.P. Ginsburg, on the theme "Early Learning in Math and Science" (articles posted in HTML and PDF formats). Topics of the papers include children's learning about water in a museum and the classroom, early mathematical experiences in the everyday activities of disadvantaged children, the effect of older siblings on parent-child interactions, and the ability of preschoolers to use arithmetic strategies of predicting and checking. The issue also includes short descriptions of innovative practices in early math and science.

**Pre-Kindergarten Standards for Teaching and Learning**
*www.ctb.com*
Developed by a panel of early childhood experts selected by the Carnegie Corporation of New York, with funding from the McGraw-Hill Companies, thestandards are intended to provide a "sound and reliable foundation" for what 3- to 5-year-olds should learn in their preschool years. ■

# Science Is Everywhere:

## *Making a Commitment to Family Learning*

By Suzanne Walton

In 2002, as part of a strategic planning process, the St. Louis Science Center (SLSC) launched an early childhood initiative. The plan called not only for expansion and remodeling of the Discovery Room, our existing 2,000-square-foot gallery devoted to young learners aged 3 to 7, but also for the addition of developmentally appropriate science and math opportunities for this audience in our regular galleries.

**A young visitor to the St. Louis Science Center's current Discovery Room (above) constructs her own insect with components from the *Insects* Activity Box. Right: The museum's new Activity Box area, as envisioned in the design charette.** *Photo by Brett Williams; artist's rendering courtesy Kraemer Design and Production*

### Adapting what is

We began by enlisting an advisory board of early childhood education professionals from the local community. Members included professors from Webster University, Southern Illinois University at Evansville, and the University of Missouri–St. Louis, as well as several active and retired preschool directors and community leaders like the executive director of the Cooperating School Districts of Greater St. Louis and an educator who helped bring early learning experiences to the children of St. Louis.

Together, the advisors constituted a powerful voice on behalf of kids and caregivers. All were impressed that a science center was so committed to meeting the educational needs of young children. Among their recommendations: adapting existing exhibits to accommodate different learning styles, adding science literacy workshops for parents and teachers, and using the term "Young Scientists" for this new audience, an acknowledgment that early learners are active participants in the process of scientific discovery.

The next step was evaluating the galleries. For this team, we chose senior staff, museum evaluators, volunteers, advisory board members, and other people from the education community. Together, we went through the existing SLSC galleries, examining each from a young child's point of view in terms of both content and presentation. The result was not only a thoughtful list of improvements, but also a marked increase in participants' enthusiasm and support for young children's learning. The evaluating team's final recommendation was that all future renovation projects include an early childhood content specialist.

One change in content resulting from this process was that we added a hands-on component to our *Structures* gallery, so children could manipulate actual building materials, such as concrete and wood and tin, and experiment with the different geometries found in a city skyline. Next, we plan to incorporate dinosaur footprints, a "dino dig," and activity tables in our *Ecology and Environment of the Past* gallery. Many of the physical improvements suggested by the evaluation team—changes in the height and depth of exhibits and the use of color contrasts and appropriate lighting—turned out to tie in well with ADA requirements. Meeting the needs of our youngest visitors also made us more accessible to older visitors with disabilities.

### Planning for what will be

By far the most complex stage of the process is the one we're in now, the Discovery Room redesign. Our exhibit development team consists of specialists in graphics and design, elementary edu-

## Supporting Teachers in Science

**By Robin Schotter**

At the Louisville Science Center (LSC), we offer a five-day Early Childhood Teacher Institute each summer. The program is designed to increase preschool and elementary-school teachers' knowledge of—and comfort with—science, and to provide hands-on activities teachers can use with children ages 3-8.

Participants (as many as 50 a day) come from Kentucky, Indiana, and Ohio to attend one or more days at the Institute. Each day focuses on a different teaching skill (scientific inquiry, data collecting) or content theme (literature and science, math and science, bubbles, space, insects), all presented from a kid's-eye point of view.

Educators appreciate that. "The science center teaches us the same way we would teach our 5-year-olds," says kindergarten teacher Kari Bowman. "It makes it a lot easier to bring science into the classroom."

Science concepts are demonstrated by credentialed LSC staff and professional educators using inexpensive supplies and common household items. In a lab activity on the nature of air, for example, participants build a maze and try to move a feather, cotton ball, or other light object through it with wind-makers constructed from cardstock or drinking straws. To explore the properties of water, we use food coloring, waxed paper, soap, and toothpicks. All activities are based on national and state standards for science education.

At each step, teachers learn age-appropriate ways to help students collect data and process it. Many tell us that most of the science content they use in their classrooms comes from the Institute. Some say the program has inspired them to present complex concepts—UV radiation, surface tension, sound waves—not normally addressed at such an early age. All participants leave with tools they can apply immediately. Some also can receive professional credit for attending.

For LSC staff, an added bonus is that Institute participants learn how to maximize their field trips to the science center. Because many of our permanent exhibitions are directed to upper elementary and middle school students, early childhood educators have tended to bring their students only to KidZone, our exhibit area for under-7s. At the Institute, they learn how to incorporate other exhibits, demonstrations, and labs into the early childhood curriculum.

In addition to the summer sessions, we run five additional Saturday workshops for teachers during the school year. At the Louisville Science Center, we work hard to spark the curiosity of early childhood teachers and expand their vision of science education. ■

*Robin Schotter is early childhood education coordinator for the Louisville Science Center, Louisville, Kentucky;* www.louisvillescience.org.

**The Discovery Room won't move into its new space until 2006, but visitors are already enjoying a new water table exhibit created by Tom Egan, Artist with Water.** *Photo by Brett Williams*

cation, and evaluation; our charge is to guide all content decisions, exhibit goals and objectives, and formative evaluation as the project develops.

To help us focus our efforts, we asked Kraemer Design and Production, a Cleveland, Ohio firm of design and education professionals, to conduct a design "charette" for us. Over the course of three days, consultants Karol Bartlett and Paul Richard conducted meetings for a wide range of Discovery Room "users," including senior management, content experts, gallery assistants (SLSC's docents), and museum members. Groups gathered separately to offer their impressions of the gallery and its connection to the science center's mission. As patterns developed and content areas emerged, the consultants converted the ideas into drawings. The result was a roomful of wonderful images for potential exhibits.

Of course, we wanted it all—every suggestion, every bit of content, every inspired idea. Reluctantly, our team had to admit that the quantity of space and capital needed to create all of the wished-for exhibits was not practical. In the end, we developed a filtering matrix aimed at "learning styles" and "developmental suitability." We included a modest amount of technology (some wanted none; others saw it as a legitimate aspect of the children's world) and a strong focus on the natural sciences. A respect for the power of play—and the learning that accompanies it—infused, and continues to infuse, all of our efforts.

One realization that emerged from our conversations at all three stages was that parents and caregivers are a vital component in any early childhood initiative. If they are to be part of the "Wow!" experience, they, too, need to recognize that "Science is everywhere." We made it part of our process to develop goals and objectives for adults, too.

### Where are we now?

The St. Louis Science Center is now two years into what we envision as a five- or six-year project. We expect to open our new 4,000-square-foot Discovery Room in 2006. We continue to develop early childhood components to complement our regular exhibits. We have begun offering workshops for caregivers in hands-on basic science, and the response has been enthusiastic. We published a brochure, *What Can We Do at the Science Center? A Guide for Young Scientists and Their Caregivers,* that offers hints on early childhood development and points out exhibits in each gallery that young children will enjoy. We plan to develop a logo for use throughout the museum that will alert visitors to these opportunities.

Our "teams" approach to planning resulted in a well-structured organization for the science center's early childhood initiative. In the process, we came to understand how early experiences in the museum could be the foundation for future learning, providing a base from which children could eventually move out into the galleries. Creating an environment that activates curiosity and promotes creative problem-solving among very young children gives added meaning to all of our work. ■

*Suzanne Walton is manager of early childhood programs at the St. Louis Science Center, St. Louis, Missouri;* www.slsc.org.

**A large new window (left) provides natural light for the parklike setting at the lower end of *WOWtown*. Exhibits here include an 18-foot-tall cottonwood tree with viewing nest, a giant honeybee, and the video microscopy kiosk.**

*Photos courtesy Calgary Science Centre*

# WOWtown:

# *A Young Child's Journey into the World Close By*

By Lorne Perry

The new young children's exploration gallery at the Calgary Science Centre, *WOWtown*, has just opened and I am waist-deep in kids. High overhead, in the blue play structure Urban Crawl, some visitors are hanging right side up, and more are upside down. Nearby, in the Construction Zone, a crew of kindergarten girls is building an ambitious and teetering red "brick" tower. At Curiosity Central, kids' eyes pop as the technomagic of a handheld video microscopy unit reveals a rainbow of colors in their hair.

One student halts in front of his teacher to plead, "I don't want to leave. I want to grow up here!" Moments later, the same teacher (an early-learning specialist) tugs at my arm and points to a group of children new to Canada. Settled in at the Relaxation Station, heads bowed over their journals, her young students are actively drawing and writing.

"You know, I've been trying to get these kids to write all year," she tells me. "This is the first time they have written anything—and without being asked!"

## The design process

The development process for *WOWtown* began with a needs assessment in the community. Our research team organized focus groups and face-to-face discussions with science center staff, teachers, curriculum specialists, parents, and children. We asked simple questions: What do you want? what do kids need? and what should a successful gallery look like? The responses were extremely helpful in shaping the key attributes of the gallery. These attributes are

- a posted age range of 3 to 7 years, to reduce conflicts and allow for free exploration
- a focus on hands-on, tactile exhibits, with limited use of computers
- strong curriculum tie-ins, with real learning power and relevance in daily lives
- exhibits that are learner-driven, inquiry-based, process-oriented, and self-directed.

Dissatisfied with highly finished traveling exhibitions that offer too much to look at and not nearly enough to do, we chose a development team of designers and educators who, collectively, had decades of "get your hands dirty" experience with children on the gallery floor.

With the results of the needs assessment firmly in mind, this team conducted an extensive resource review of science centers and related institutions in North America and Europe, searching out ideas for successful exhibits. We looked on the Internet, reviewed photographs and literature, and conducted invaluable staff interviews.

From all of this, we developed an exhibit filter: Only those exhibits known to be proven performers with children would be considered for inclusion. Our criteria for measuring success were high frequency of visits, extended duration of visits, and multiplicity of outcomes and interpretation. We thus began, not from what kids were supposed to be interested in, but rather from what they had already *demonstrated* they were interested in. A useful tool in the process was a 1990 joint publication of ASTC and the Children's Museum of Boston, *Planning for the Very Young: Excellence and Equity in Preschool Activities at Science Museums.*[1]

## An environment that supports learning

It was not until we had identified a list of truly effective exhibits that we proposed the theme that would provide visual and conceptual unity for the gallery. On entering *WOWtown*, children see a familiar but dramatically rescaled city street and park setting. Twenty-five learner-driven exhibits are tightly integrated into a single, 4,000-square-foot permanent gallery space. Among them are a lifelike honeybee the size of a Volkswagen Bug, a two-story play

structure, a fully equipped grocery store, an 18-foot-tall cottonwood tree with "viewing nest," a waterplay stream with snow-capped mountain and reservoirs, and a hand-operated construction crane.

*WOWtown* is located in a space once occupied by an amateur theater. We have retained the theater's high ceilings and warm-toned, wood-paneled walls. Large, cut-out "spot" murals focus interest and make the space feel larger. We lightened the ceiling with a coat of sky-blue paint and installed a large north-facing window, with a bright yellow casement, to add psychological space and provide visual access to the outdoors. Interior lighting was designed to provide fill and complement the light from the window. The theater's sloped floor, with its varying heights, was also retained and incorporated into the urban street/park "look." A smiling sun and movable, kid-operated clouds complete the environment.

Throughout the development process, we worked with a knowledgeable public-park safety specialist, who reviewed our plans and made recommendations. With his help, we drew up and implemented a safety checklist comprising items that would be dealt with on a daily, weekly or monthly basis. We also got the exhibits fabricator involved early on, which provided us with a realistic timeline, good cost analysis, and budget control.

Our research had taught us that young children are most comfortable when dealing with the familiar. We therefore rejected exhibits about inaccessible things like the planets, Antarctica, or molecules in favor of discovering what was immediately at hand. The animals, trees, and insects featured in *WOWtown* can be immediately recognized as those found in a typical Toronto backyard or park.

Visiting children tend to proceed from the artificially lighted urban area (the grocery store, shadow wall, and construction crane) at the upper end of the gallery to a parklike setting in the lower end, lit by the new window and offering a variety of hands-on activities, including the video microscope.

**The development team applied Howard Gardner's theory of "multiple intelligences" to ensure that exhibits could be used by different types of learners, cooperatively or individually.**

Operation of *WOWtown* is supervised by volunteers under the direction of a full-time, trained staff person who facilitates programming and monitors the condition and safety of the gallery. To meet the needs of parents with young children, a family washroom/cloakroom was built right outside the single gated entrance. Park benches adjacent to the entry and throughout the gallery allow parents to sit to participate or just relax.

We find that teachers often need to justify field trips to *WOWtown*. To help them, we incorporated learning concepts from Alberta's kindergarten, grade 1, and grade 2 curricula directly into our exhibits. The waterplay area, for example, has props and toys for exploring "boats and buoyancy," a central subject area in the province's science curriculum.

To communicate successfully with young children and accompanying adults, our signage relies primarily on pictographs, with little text. Graphics, signage, and murals were all chosen to reflect cultural diversity. After reviewing research done on gender equity at San Jose's Children's Discovery Museum[2], we developed two main characters—a boy and a girl of different ethnic origins—for the gallery.

The design team reviewed and applied Howard Gardner's theory of "multiple intelligences" to make sure we had exhibits that could be used by different types of learners, cooperatively or individually. (The exhibits fabricators were Mike Mott Exhibit Design and Beauchesne & Co., and 3-D figures were created by Studio Y.) All exhibits are designed to support "webs of learning"—the process of making connections through exploring complementary ideas.

In *WOWtown*, a single concept can be explored in many ways: For example, children may go from observing our live beehive to taking a look at bee sample slides under the video microscope. In the craft area, they can draw a picture of a bee or make themselves a pair of "feelers." Those with dramatic ability might go to the puppet theater and use the bee props in a mini-play or demonstrate their own version of the "waggle dance." Individual learners can visit Curiosity Central to explore the contents of a "Bee Science" bin.

## The bottom line

In an environment of shrinking dollars, any expensive new project must offer hard evidence to support its success. Here is what *WOWtown* has done for the Calgary Science Centre since its opening:

- Attendance is up 25 percent in the first quarter of 2004 over last year, and repeat visitation has increased.
- Membership purchases for families with young children are up 14 percent since *WOWtown* opened.
- *WOWtown* is operating at its capacity of 130 children most of the

time. (This is a mixed blessing, both from a maintenance/supervision standpoint and because we must sometimes turn visitors away.)

• Survey forms report that overall science center visitor satisfaction has increased since *WOWtown* opened. Teachers report high levels of engagement and complementary learning by their students.

All of this tells us that by listening to our community, by putting kids before our own egos, by accommodating different cultural backgrounds, and by providing a comfortable and safe environment, we "got it right."

The crowds were thinning at the opening ceremony when 8-year-old Katya walked up to me, holding a sheet of fluorescent orange paper she had decorated with red and green stars. She had made a score card, based on the rating system she had seen movie reviewers use on television. Katya handed me the paper and said, "I give *WOWtown* six stars." ■

**Notes**

1. *Planning for the Very Young: Excellence and Equity in Preschool Activities at Science Museums,* by Dorothy Merrill, Jeri Robinson, and Diane Willow, and edited by Lynda Martin-McCormick (ASTC, 1990) is now out of print. [To order a photocopy or PDF version, write to *pubs@astc.org.*]

2. See "Parents Explain More Often to Boys Than to Girls during Shared Scientific Thinking," by Kevin Crowley, Maureen A. Callanan, Harriet R. Tenenbaum, and Elizabeth Allen. In *Psychological Science,* Vol. 12, No. 3 (American Psychological Society, May 2001). Available in PDF format at *http://kevincrowley.com/olpubs.html*.

*Lorne Perry is project manager and senior designer of* WOWtown *at the Calgary Science Centre, Calgary, Alberta, Canada. His core development team included Danita Maslankowski, Donna Kipta, and Terry Middleton. For a project history, visit* www.calgaryscience.ca/cdc.html#making.

# Staffing an Early Learning Gallery

By Ann Ensminger

Exploration Station Jr., a new exhibit area designed specifically for 3- to 6-year-olds and their families, opened to the public at Pittsburgh's Carnegie Science Center in February 2000. The gallery's many interactive exhibits include the Ball Factory, a multi-level water table, a live animal area, an observation deck, and a construction zone. But just as important as its good exhibits are the people who run the gallery.

**Teen volunteer Rachel Schneider introduces Exploration Station Jr. visitors to one of the gallery's live animals, a box turtle.** *Photo courtesy Carnegie Science Center*

Staff-visitor interactions in Exploration Station Jr. are inquiry-based. Rather than asking, "What color is this?" or "Is this turtle's shell bumpy?" a presenter will prompt, "What do you see (or feel, or hear)?" Staff members, both paid and volunteer, are trained to let the process itself direct the next question, keeping the interaction appropriate and relevant to the child.

Positive phrasing is important in early-learner interactions. In many places, children are greeted with a list of what they are *not* permitted to do. Our staff members tell children what they *can* do—and provide them with a rationale for it, too. Instead of saying, "Don't run!" a presenter will tell children, "Please use your walking feet. If you run, you may miss some exciting things."

Verbal interaction, of course, goes hand in hand with carefully designed exhibits and programs. Working in an early learner space requires one to view the world differently, both literally and figuratively. Staff who reset exhibits and programming materials for the next group of individuals must remember to keep a child's physical size and reach in mind. Instructions should be intuitive, and materials must be arranged to be appealing and capable of being used to their maximum potential. For example, a presenter who is resetting a puzzle will take most of it apart, leaving just two or three pieces still connected. All of the pieces will be visible and near the edge of a low counter or on the floor.

With so many youngsters handling and even tasting our exhibits, it is essential to maintain a clean and safe environment. In Exploration Station Jr., we keep solutions of vinegar and water or other nontoxic products at the ready and clean countertops and manipulatives frequently. Larger items, such as water table toys, construction zone hats, and plastic blocks, are regularly washed in our dishwasher. Three times a week, we pick up all of the balls in the Ball Factory and give the floor a good vacuuming. Plastic covers for electrical outlets are a must.

Interactions with children are only one aspect of our service to visitors. Adult involvement is highly valued and encouraged, too. Posted throughout the gallery are "Tips for Grown-Ups," designed to assist parents, caregivers, and teachers in having successful, meaningful interactions with children. Our intention is to open the door to the "science comfort zone" for the whole family.

At Carnegie Science Center, it is not our goal to teach physics, chemistry, or biology to 3- to 6-year-olds. We seek to inspire curiosity and to relate science to children's everyday lives. Caregivers and children alike don't always realize that what they are doing is science. Our message is that "science is everywhere." ■

*Ann Ensminger (ensmingera@csc.clph.org) is program coordinator of Exploration Station Jr., Carnegie Science Center, Pittsburgh, Pennsylvania. For more information, download the gallery's Educators' Manual in PDF at* www.carnegiesciencecenter.com/pdfs/exStationJr.pdf.

# Including Our Youngest Visitors

By Karen Propst

*What can you do with a big idea and little people? Last year, Indiana's Children's Science and Technology Museum of Terre Haute was one of 30 U.S. ASTC-member museums chosen to receive DNA Program Kits developed by the Science Museum of Minnesota with support from the National Human Genome Research Institute. Most of the material is geared to ages 11 and up, but the museum serves primarily family groups, many with small children. Here's how presenter Karen Propst met the challenge of making preschoolers feel welcome and included in her program.*

**Patience pays off as the "fuzzy stuff"—DNA from wheat germ—starts to appear.** *Photo courtesy Children's Museum of Terre Haute*

*Can you say "Tyrannosaurus Rex"? Good. How about "deoxyribonucleic acid"? Let's try it together. A lot of people shorten Tyrannosaurus Rex to say "T-Rex." In the same way, we can shorten deoxyribonucleic acid to say "DNA." You will soon learn what that word means.*

Not surprisingly, the Children's Museum of Terre Haute attracts a lot of family groups. Our visitors range from infants in strollers to grandparents and even great-grandparents. Since all of our programs are done right out on the floor, we have to be prepared to adapt our presentations to different needs. In the case of the DNA Kit, this has meant finding ways that preschoolers can participate along with their older sisters and brothers.

The exchange above comes at the beginning of a 7- to 10-minute session designed to teach older children about DNA. The methods I use to include 3- to 5-year-olds in the process are a combination of hands-on activity, simple science terms, encouragement, and affirmation. The idea is to help them develop a comfortable attitude toward the kit's basic science experiment: extracting the DNA from wheat.

As the session continues, I help the littlest ones "think small" by giving common examples, such as a pinhole in a big piece of paper or the end of a hair. I talk to them as I construct a small structure with LEGO bricks: *Look at these blocks. We have little building blocks in our bodies, so little that we cannot see them without a special instrument called a microscope. They are called "cells."*

In the same way, I introduce the idea of the nucleus and its chromosomes—the reason why each of us is different from all others. This is a good moment to mention genetic traits like eye color, dimples, hair color. A parent or sibling relationship can add interest.

In the kit is a K'NEX model of the DNA double helix, with different colored pieces to represent the A&T and C&G pairs. Young children can understand the idea that these are "good friends" who always like to play with each other. I tell them there are about 12 pairs of "friends" in this sample, but in the human DNA there are over 3 billion ("That's a really big number!").

I continue talking as we start the actual experiment: *Every living thing has DNA. Wheat germ is used in this experiment, and because wheat is a living plant, it too has DNA.* It is necessary to have sufficient help to ensure that the experiment will work with preschoolers, but accuracy need not be stressed. The goal is for the children to handle the equipment and be involved. I use metric terms, letting them know it is the method used to measure in science. Those who know their numbers can pour water to the 100ml mark on the cylinder; to the others, I say, "Pour to the line at the top." Simple explanations as each ingredient is added—*We don't like to chew something tough. This enzyme makes the building blocks of the wheat softer*—help to hold interest.

When the soda is added, I mention "acids" and "bases." The children hear these new words at the same time they are stirring the mixture and holding test tubes, rods, and pipettes. While the mixture settles, we talk about genetic traits, and I ask them if they recognize hitchhiker thumbs or attached and detached ear lobes, and whether they can roll their tongues. This is a happy "wiggle" time.

Adding the alcohol requires adult control. The child holds the test tube and watches where the two liquids meet. The word "density" can be used if it seems appropriate, but it is sufficient if the preschooler just looks at the test tube and watches for the little bubbles to pull up "fuzzy stuff." This is where the effort to hold the little ones' attention during the previous 5-7 minutes pays off. The fascinated eyes and the excited comments about what "mine is doing" and "I'm doing science" are worth the work.

For this experience to be fun and memorable, the presenter needs to be flexible. One little boy who wanted to participate wasn't sure he could give up his blanket and pacifier to hold the test tube. His mother helped him, and he loved watching the bubbles when we got to that point.

The goal in all of this is not so much to teach as to inspire. The 10 minutes I spend with a preschooler may not leave volumes of knowledge about DNA in his or her memory, but with luck they may help build a foundation of confidence. That foundation is strengthened when an adult sees the light of discovery in a child's eyes and is inspired to continue and increase the child's learning experiences. ■

*When she is not doing floor presentations, Karen Propst fills many other roles at the Children's Science and Technology Museum of Terre Haute, Terre Haute, Indiana.*

## Workshops, New MarketPlace Planned for ASTC 2004

Preliminary programs have been mailed, and excitement is building for the 2004 ASTC Annual Conference, to be hosted by the Tech Museum of Innovation, September 18–21, in San Jose, California. Plan now to attend this year's meeting, the premier professional development opportunity for the science center field.

As always, an array of workshops will offer attendees the opportunity for extended and in-depth experiences. Because of this year's Rosh Hashanah holiday on September 15-16, most of these programs will meet on the Tuesday and Wednesday following the conference. However, two workshops open to all—*The Educators' Roundtable and Planningpalooza: Preparing Your Institution for Attendance and Revenue Growth*—are scheduled for Friday evening, September 17.

One half-day and nine full-day workshops are planned for Tuesday, September 21. Topics include the following:

- *Summer Camps Exchange*
- *Exploring with Amelia Spaceheart: Solar System Space Camp*
- *NEON: National Education Outreach Network*
- *Science and Engineering Activities for After-School Programs*
- *Team Innovation! A Guide to Launching Creative Museums*
- *Experiencing Innovation: Design, Build, Innovate*
- *Creating with Crickets: An Introduction to New Technologies for Playful Invention*
- *Exploring Urban Science, Museum-Style*
- *Painting the Big Picture*
- *Intersections: Where Inquiry and Academic Standards Meet.*

Workshops, behind-the-scenes tours, and informal discussions will be part of an all-day *Open House at*

# Calendar

### JULY

**29–31** **BIG Event 2004.** The Observatory, Herstmonceaux, East Sussex, U.K. ***Details:*** www.big.uk.com/events/.

### AUGUST

**3–7** **Visitor Studies Association Annual Conference.** Albuquerque, New Mexico. ***Details:*** www.visitorstudies.org

### SEPTEMBER

**1** **Math Momentum Workshop.** "Measurement." Hosted by the North Carolina Museum of Life and Science, Durham. ***Details:*** John Leonard, JohnL@ncmls.org; 919/220-5429 x352

**9–12** **GSTA International Conference and Trade Show.** Montréal, Québec, Canada. ***Details:*** www.astc.org/conference

**18–21** **ASTC Annual Conference.** 'Sustaining Innovation in an Era of Rapid Change.' Hosted by the Tech Museum of Innovation, San Jose, California. ***Details:*** www.astc.org/conference

**22** **Math Momentum Workshop.** "Measurement." Hosted by the Lawrence Hall of Science, University of California, Berkeley. ***Details:*** Helen Raymond, hraymond@uclink.berkeley.edu; 510/643-6525

**30** **Math Momentum Workshop.** "Measurement." Hosted by the Buffalo Museum of Science, Buffalo, New York. ***Details:*** Betsy Vazquez, bvazquez@sciencebuff.org; 716/896-5200 x345

### OCTOBER

**1–2** **ASTC RAP Session.*** "Successful Summer Camp Experiences." Rochester Museum & Science Center, Rochester, New York.

**2–3** **Strategies for Collaboration Workshop.** Montshire Museum of Science, Norwich, Vermont. ***Details:*** www.montshire.org/teams

**4–9** **Theatre in Museums Workshop.** Science Museum of Minnesota, St. Paul. ***Details:*** Tessa Bridal, 651/221-4560

**22** **Math Momentum Workshop.** "Data." Hosted by the Museum of Science, Boston, Massachusetts. ***Details:*** Alana Parkes,aparkes@mos.org; 617/589-0338

### NOVEMBER

**4–6** **2004 ECSITE Annual Conference.** Barcelona, Spain. ***Details:*** http://ecsite.ballou.be/new

### JANUARY 2005

**1/1–12/31** **World Year of Physics 2005: Einstein in the 21st Century.** A year-long celebration of the centennial of Albert Einstein's three seminal physics papers. ***Details:*** www.physics2005.org.

### APRIL 2005

**10–15** **4th Science Centre World Congress.** "Breaking Barriers, Engaging Citizens." Hosted by the Museu da Vida, Rio de Janeiro, Brazil. ***Details:*** www.museudavida.fiocruz.br/4scwc/

* *Information on ASTC RAP sessions is available at* www.astc.org/profdev/. *For updated events listings, click on 'Calendar' at* www.astc.org.

# Welcome to ASTC

*The following new members were approved by ASTC's Membership Committee in May 2004. Contact information is available in the Members section of the ASTC web site, www.astc.org.*

## SCIENCE CENTER AND MUSEUM MEMBERS

• **Indiana State Museum and Historic Sites,** Indianapolis, Indiana. Opened in 2002, this 270,000-square-foot, family-friendly museum with IMAX theater invites visitors to explore Indiana's past, present, and future.

• **Markham Museum,** Markham, Ontario, Canada. Founded in 1971, this historic village museum is transforming itself into a modern regional museum with new educational programming and construction of a new visitor center.

• **Rajiv Gandhi Science Centre,** Bell Village, Port-Louis, Mauritius. This collaborative project of the Mauritian Government and India's National Council of Science Museums, comprising a museum and a five-acre science park, opened in 2001.

**The new Rajiv Gandhi Science Centre in Mauritius**

## SUSTAINING MEMBERS

• **Chicago Scenic Studios Inc.,** Chicago, Illinois

• **SciCentr.org,** Ithaca, New York

• **Silver Oaks Communications,** Moline, Illinois.

**A full-day design challenge session led by staff of the hosting Tech Museum of Innovation is one of a dozen workshops scheduled for ASTC 2004.** *Photo courtesy The Tech*

*the Exploratorium,* in San Francisco, on Wednesday, September 22. The event itself is free, but there will be a $20 fee for those who need bus transportation from San Jose for the day. Also featured on Wednesday is a full-day *Math Momentum in Science Centers* workshop on measurement, offered by the Lawrence Hall of Science. (See "Math Momentum Workshops Planned," below, for details.)

New this year, the ASTC MarketPlace will offer conference attendees an opportunity to gather information and ideas on a variety of topics in a casual, free-flowing showcase format. This extended session, scheduled for 2:15 to 4:15 p.m. on Saturday, in the main lobby of the San Jose McEnery Convention Center, replaces the former Saturday and Sunday Speakers Forums.

The ASTC MarketPlace is open to registered conference delegates who represent science centers or museums; all presentations must be noncommercial in nature. Possible topics include exhibit design and fabrication, educational programs, or research and evaluation. Each presenter will be assigned a six-foot table with two chairs (no electricity or audiovisual available). The format is yours to choose: Use this time to meet one-on-one with conference delegates, or set up a compelling stand-alone poster or photo display to represent your work. Be sure to provide a good supply of handouts.

Workshops and MarketPlace participation require preregistration, so be sure to check the appropriate spaces on your registration form. To download a form, or to get additional information on ASTC 2004 workshops, sessions, and events, visit the Conferences page on the ASTC web site, *www.astc.org/conference.* Early birds, take note! The deadline for reduced-fee registration is July 30.

# Math Momentum Workshops Planned

Starting in September, alpha sites in the NSF-funded *Math Momentum in Science Centers* (MMSC) project co-led by ASTC and TERC will begin holding a series of one-day workshops for science center and museum colleagues and their community partners. Each workshop will address one of two topics: data or measurement. For a description of planned activities, visit the Professional Development section of the ASTC web site, www.astc.org.

All MMSC workshops will help participants identify rich math learning environments, learn how to make math accessible to all visitors, explore where and how to highlight math in a science center, and understand how to use math to illuminate science. Fees vary by location; call host museums, below, for more information.

The following workshops are scheduled in 2004:

• *September 1: Measurement*
North Carolina Museum of Life and Science, Durham. *Contact:* John Leonard, JohnL@ncmls.org; 919/220-5429 x352

• *September 22: Measurement*
Lawrence Hall of Science, Berkeley, California. *Contact:* Helen Raymond, hraymond@uclink.berkeley.edu; 510/643-6525

• *September 30: Measurement*
Buffalo Museum of Science, Buffalo, New York. *Contact:* Betsy Vazquez, bvazquez@sciencebuff.org; 716/896-5200 x345

• *October 22: Data*
Museum of Science, Boston, Massachusetts. *Contact:* Alana Parkes, aparkes@mos.org; 617/589-0338

For additional information on the MMSC project, contact Jacquelyn Lowery, jlowery@astc.org; 202/783-7200 x139.

## Member Surveys Due

The deadline for returning the 2004 Member Survey, mailed to all ASTC science center and museum members in late May, is July 16. This year's instrument was revised by the ASTC Board's Data/Trends Task Force to reduce its length and focus on the attendance and finance data institutions need to guide operations in tight times. The results will be analyzed and published as the *Sourcebook of Science Center Statistics 2004.*

Science centers that complete the survey by the due date will receive a free copy of the published report. Participants will also have the chance to purchase the data in CD format. For more information, contact Wendy Pollock, wpollock@astc.org.

## Moving Up

Seven ASTC museum members were approved as Governing Members when ASTC's Board of Directors met in May during the American Association of Museums' annual meeting. Now eligible to vote on ASTC issues and have representatives elected to the board are

• **Boonshoft Museum of Discovery,** Dayton, Ohio
• **Buffalo Museum of Science,** New York
• **Explora,** Albuquerque, New Mexico
• **Montréal Science Centre,** Québec, Canada
• **Petrosains,** Kuala Lumpur, Malaysia
• **Sciencenter,** Ithaca, New York
• **Scitech Discovery Centre,** West Perth, Australia.

## McGrath Fund to Offer Fellowship

The Lee Kimche McGrath Living Memorial Fund, established in honor of former ASTC executive director Lee Kimche McGrath (see ASTC Notes, *ASTC Dimensions,* November/December 2002), is offering assistance to aspiring museum professionals.

The fund, administered by the Community Foundation for the National Capital Region, will provide fellowships to graduate students in art- or science-related museum studies programs. Trustee Dorn McGrath, Lee's husband, says they expect to award their first fellowship later this year. For information, contact the Trustees of the Lee Kimche McGrath Living Memorial Fund, 2710 Brandywine Street NW, Washington, DC 20008; 202/966-9559.

## Exhibition Honors Einstein's Legacy

As scientists around the world prepare to observe the centennial of the publication of Albert Einstein's three revolutionary 1905 physics papers (see Calendar, page 15), science centers hosting the ASTC-managed traveling exhibition *Cosmic Questions: Our Place in Space and Time* will get some extra support.

The scientific discoveries highlighted in the Harvard-Smithsonian Center for Astrophysics exhibition—from the Big Bang to black holes to the mysterious "dark energy"—are all part of Einstein's legacy. NASA's Structure and Evolution of the Universe (SEU) Education Forum, which is coordinating the World Year of Physics 2005 celebration in the United States, plans to work with venues hosting *Cosmic Questions* to arrange Einstein-related events and programs.

For more information or to book the exhibition, contact ASTC Exhibition Services, 202/783-7200 x117. ■

# Grants & Awards

ASTC Governing Member **At-Bristol,** Bristol, England, U.K., recently became one of five British Millennium Project science centers to receive revenue funding from the U.K. government. In a measure passed in March, At-Bristol was awarded £825,000 ($1.5 million) for the period up to 2006. Although only half what the science center had requested, the award was the single largest grant of its kind in the measure. Others receiving funds included Intech, the National Space Centre, Magna, and ThinkTank.

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At the May 2004 Association of Children's Museums (ACM) InterActivity conference in New Orleans, the **Children's Museum of Pittsburgh** was one of three institutions to receive the MetLife Foundation and ACM's Promising Practice Award for 2004. The museum received a $5,000 grant in recognition of its partnership with the University of Pittsburgh Center for Learning in Out-of-School Environments. (See "Thinking about Science Together," page 5.) The Please Touch Museum, Philadelphia, and the Children's Museum of Brazos, Texas, were the other 2004 awardees.

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The following ASTC members have received funding from the National Science Foundation Informal Science Education division for projects beginning in 2004:

• **Chabot Space & Science Center,** Oakland, California: $49,186 as a planning grant for *Imagine That! Career Explorations in Science, Technology, and Engineering for Students and Families,* a project that will deliver activities and information through after-school, summer, and parent programs. Partners include the Columbia River Exhibition of History, Science & Technology (CREHST) and the American Museum of Science & Energy (AMSE).
• **Museum of Science,** Boston, Massachusetts: $49,995 as a planning grant for *Creating Museum Exhibitions for Everyone.* In this study, the museum will partner with four other informal science institutions to plan a nationally distributed research project that will explore universal access to informal learning of science, technology, engineering, and mathematics (STEM).

# Spotlights

*By Carolyn Sutterfield*

**At the Koshland Science Museum, a visitor searches for examples of mutated genes that pass misinformation from one generation to another.** *Photo courtesy Marian Koshland Science Museum*

SCIENCE INSIDE THE BELTWAY—To its ranks of small, focused museums, like the Newseum (moving soon to new quarters) and the Spy Museum, Washington, D.C., recently welcomed the long-awaited public arm of the National Academy of Sciences, the **Marian Koshland Science Museum,** which opened at 6th and E streets NW on April 22.

The museum was funded by a $25 million gift from biochemist and Academy member Daniel Koshland in honor of his late wife, a respected molecular biologist and immunologist. Its mission is to support science literacy and public understanding of research by presenting current—and sometimes controversial—scientific issues drawn from the pages of Academy reports. Together, the members of the three National Academies, official advisors to the U.S. federal government on science, engineering, and medicine, produce more than 200 scientific papers each year.

The Koshland Museum's 6,000-square-foot space comprises three exhibit areas. In the permanent gallery, Wonders of Science, a short film explores scientists' search for the secrets of the universe, and kiosk displays reflect the use of technology in scientific innovation.

The museum has a pair of temporary exhibition spaces. For the opening, the latter featured two hot topics of contemporary research: *Global Warming Facts & Our Future* and *Putting DNA to Work*. Each will be on view for two years. In the small space available, exhibit designers Tom Bowman and Ed Hackley concentrated on large panels, electronic displays, and a limited number of floor exhibits.

In *Global Warming,* for example, the main floor interactives are a copper globe that conveys the temperature difference between a natural atmosphere and one heated by the "greenhouse effect," and a computer kiosk that asks visitors to consider alternative scenarios for responding to climate change. The latter then reveals the trade-offs in money, quality of life, and conservation necessary to achieve them. Wall panels offer interaction, too. A sliding plasma screen displays a century of change in average temperatures around the earth, and another display shows the potential results of flooding in the Chesapeake Bay region.

A highlight of *Putting DNA to Work* is the Microarray, another sliding glass panel that bears 11,000 DNA virus sequences from 1,000 known viruses. It was a tool like this that allowed researchers to identify the SARS virus family within 24 hours. Visitors can try to match the coding themselves, or push a button to get the answer.

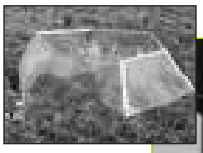
Throughout the museum, content is at a level requiring some sophistication. The Koshland bills itself as "best for visitors age 13 and up," although younger science buffs may find it engrossing, too. The museum plans an extensive schedule of educational programming.

***Details:*** *www.koshlandsciencemuseum.org*

TRADITION MEETS TECHNOLOGY—What happens when you combine the traditional knowledge of native peoples with the technological tools of the 21st century? You get *Sila: Clue in to Climate Change,* a new traveling exhibition produced by the **Canadian Museum of Nature** (CMN), Ottawa, in collaboration with the Centre for Traditional Knowledge.

Four thousand years ago, the Inuit settled in the northernmost reaches of North America, making their living from the land and the sea. Today, as citizens of Nunavut, a territory officially created in 1999 by the Canadian government, they enjoy growing political and economic status even as their way of life is threatened by gradual warming of the arctic tundra and seas. That threat was the inspiration for the compact but content-packed 150-square-foot exhibition.

In Inuktikut, the Inuit language, *sila* is the word not just for "climate" but for all things that surround us in the environment. The trilingual (English, French, and Inuktikut) exhibition addresses climate change globally through multimedia components. Its lessons are learned by two "virtual" teenagers (one Inuit, the other non-native), as they discover how researchers are studying the impact of climate change and how some communities are adapting to it—for example, by using "cleaner" energy sources, such as solar panels. *Sila* offers concrete actions and tools to reduce greenhouse gas emissions at the individual, community, and national levels.




**Multimedia presentations (right) alert *Sila* visitors to climate-change research, like the work of botanists who use a small greenhouse (top) to study how arctic plants might respond to global warming.** *Photos courtesy CMN*

Support for producing five copies of *Sila: Clue in to Climate Change* was provided by the Government of Canada Climate Change Action Fund and the Canadian International Development Agency. Launched at CMN in January, the exhibition began its tour in five Canadian cities in April, in company with the Film Board of Canada's high-definition documentary series *Arctic Mission*. Educational materials for three different school programs can be downloaded at the exhibition's web site, *www/nature.ca/sila.*

***Details:*** Laura Sutin, Media Relations Officer, lsutin@mus-nature.ca

THE ART OF MATH—In 2001, Bruce Shapiro, a onetime internist turned sculptor, was appointed artist-in-residence at the **Science Museum of Minnesota** (SMM). As part of a National Science Foundation grant project, Shapiro was charged with helping a group of teenage students representing the diverse communities of St. Paul to identify an idea related to calculus and build an art piece to illustrate the concept.

The "Math Crew" began its project by getting to know each other and outfitting a workshop in SMM's Youth Science Center. On his web site, *The Art of Motion Control,* Shapiro relates what happened next:

"As I search to understand what makes calculus 'tick,' I have come to believe that its heart and soul are found in the limit concept. The most accessible illustration I can think of is the family of regular polygons with *n* sides. The simplest member is an equilateral triangle (*n*=3). Next comes the square (*n*=4). As the process proceeds and *n* goes to infinity, almost everyone (including very young kids) can predict that the shape 'at the limit' is a circle....

"Archimedes used a similar approach when he derived the value of pi, and although he was not using calculus, his strategy of comparing the areas of inscribed and circumscribed polygons certainly points toward the limit concept. I presented this example to the Math Crew and challenged them to come up with a way of presenting it as an exhibit."

Two days later, Shapiro recalls, a 15-year-old member of the Crew offered his idea: Put a laser inside a cylindrical mirror. When the beam is pointed at various angles, it will trace out a triangle, square, and so on, but when pointed just along the mirror surface, it will form a circle. "We tried a few versions on a small scale, using a plastic jug and some Mylar. It worked! The next step was to design a method to allow movement of a mirror for changing the beam angle."

Step by step, the students developed

**Members of the Science Museum of Minnesota's Math Crew near completion of their Archimedes' Limit exhibit.** *Photo by Bruce Shapiro*

increasingly sophisticated prototypes, abandoning Mylar in favor of mirror-polished stainless steel and using a water fog to reveal the beam. The process, including plenty of Math Crew "sweat equity," is documented on Shapiro's web site, and the completed exhibit, called Archimedes' Limit, now resides in the Calculus Pavilion in SMM's Experiment Gallery. "It was a great thrill to work with the kids on this project," says Shapiro. "I can only hope to rekindle something like it in the future."

***Details:*** *www.taomc.com/teaching_machines.htm*

AN UPLOADED EXPERIENCE—A visit to *Genetics: Technology with a Twist,* the bilingual (English and Spanish) permanent exhibition recently installed at the **Tech Museum of Innovation** in San Jose, California, gives new meaning to the term "value added."

The exhibition has the usual content-rich components. Interactive exhibits in four main areas—Introduction to Genetics, Genetic Medicine, Genetic Counseling, and Genetic Policy—relate current work in the field to real life. Visitors can grow bacteria in the wet lab, inserting a gene to make the microbes glow green; extract DNA from real cells; sequence a gene; track a genetic mutation; and try out the roles of genetic counselor, research scientist, and public policymaker.

Special programs complementing the exhibition have allowed visitors to listen to music inspired by the patterns of genetic code; hear and question a panel of experts assembled to discuss the legal, ethical, and social implications of genetic research; and try their hand at crime scene investigation under the direction of a police CSI supervisor. An online exhibit, *Understanding Genetics,* offers interactive features, recent news articles, and the opportunity to have a genetics expert answer your questions.

But the most innovative aspect of *Genetics: Technology with a Twist* is itself a nifty bit of technology—the radio frequency identification (RFID) bracelet given to each visitor. As a visit proceeds, the chip embedded in the "TechTag" collects information and posts it to the visitor's personal web site. Later, visitors can log on to view results from their wet lab experiments, play back a "virtual speech" they delivered to Congress, or view virtual "GeneKid Cards" collected as they completed TechTag-enabled activities in the exhibition.

The personal web sites will remain active for years, providing opportunities for visitors to extend future visits to the Tech, as the new technology is incorporated into upcoming exhibitions.

Funding for *Genetics: Technology with a Twist* was provided by the National Institutes of Health, with additional support from Agilent Technologies, Genentech Foundation for Biomedical Sciences, and other private donors.

***Details:*** *www.thetech.org/events/geneticsTwist*

**Radio frequency identification "TechTag" bracelets, worn by these visitors experiencing *Genetics: Technology with a Twist,* will let them store elements of their visit on a personal web site for later review.** *Photo courtesy The Tech Museum of Innovation*

# People

The new president and CEO of McWane Center, Birmingham, Alabama, is **Tim Ritchie.** A former president of Louisville Diversified Services, a Louisville, Kentucky nonprofit that provides services to adults with mental disabilities, Ritchie replaces **Tony Zodrow,** who had headed the museum since 2002.

**John Herbst** is the new president and CEO of the Indiana State Museum and Historic Sites, headquartered in Indianapolis, Indiana. Most recently president and CEO of Conner Prairie Inc., in Fishers, Indiana, Herbst was for many years director of the Historical Society of Western Pennsylvania. He replaces **Susan Williams,** executive director of the Indiana State Office Building Commission, who had been serving as interim director.

The Challenger Center for Space Science Education, in Alexandria, Virginia, announces the appointment of **William Gutsch Jr.** as the organization's new CEO and president. As president of Great Ideas, a consulting, writing, and production company, Gutsch has worked on multimedia projects with NASA's Jet Propulsion Laboratory, the Learning Channel, and educational programming for PBS television and the Children's Television Network. He was also chairman of the American Museum-Hayden Planetarium, in New York. Gutsch replaces **Vance Ablott,** who has been appointed executive director of the Triangle Coalition for Science and Technology Education, in Arlington, Virginia.

OMSI, in Portland, Oregon, has hired **Robert Sprackland** as its new science director. A co-founder of the Internet-based Virtual Museum of Natural History (at *curator.org*), Sprackland has conducted research in biodiversity in Papua New Guinea and Australia and written a number of children's science books.

Techniquest, in Cardiff, Wales, U.K., announces the appointment of **Peter Trevitt** as CEO. Currently head of creative services for NMSI Trading Ltd. at the National Museum of Science and Industry, London, Trevitt will join the staff in July as the successor to **Colin Johnson,** who retires on August 31. Earlier this year, Johnson was awarded the Order of the British Empire by Queen Elizabeth II, in recognition of his contributions to science education.

**Ann Mintz,** formerly director of the Berkshire Museum, Pittsfield, Massachusetts, has accepted a new position as president and CEO of the Chester County Historical Society, in West Chester, Pennsylvania.

**Dennis A. Casey** has been promoted to director of education and public programs at the Virginia Museum of Natural History, in Martinsville. Since joining the VMNH staff in 2000, Casey has managed the museum's exhibits program and helped to organize the annual Virginia Science Standards Institute for teachers.

ASTC welcomes **Wendy Margolis** to our Washington office as senior accountant. Wendy was previously controller at Soundprint Media Center, a Maryland-based nonprofit educational broadcasting company.

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