



Dimensions

Bimonthly News Journal of the Association of Science-Technology Centers

May/June 2010



Variations on a Theme: *Science Centers Address Biodiversity*



Biodiversity: *Time for Action*

The Calumet Environmental Education Program: *A Model for Science Learning*

An Oasis in the City: *Tokyo's Institute for Nature Study*

Variety is the Spice of Life: *Biodiversity and its Conservation as a Basic Commitment*

Biodiversity in China

Lessons from the Tree of Life

Partnering for Conservation in the Solomon Islands

Grassroots Gardening

Making Big Abstract Science Accessible



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ASTC Dimensions

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IN THIS ISSUE

May/June 2010

The United Nations has declared 2010 to be the International Year of Biodiversity. Defined as the variety of life on Earth, biodiversity refers not only to the world's diverse array of species, from animals to plants to micro-organisms, but also to the genetic variation within species, and the ecosystems where species live and interact. Whether through exhibitions, workshops, outreach programs, community partnerships, or Public Participation in Scientific Research projects, science centers can play an important role in increasing public understanding of biodiversity, its value, the threats it faces, and what can be done to help.

Features


Biodiversity: <i>Time for Action</i>	3
The Calumet Environmental Education Program: <i>A Model for Science Learning</i>	5
An Oasis in the City: <i>Tokyo's Institute for Nature Study</i>	6
Variety is the Spice of Life: <i>Biodiversity and its Conservation as a Basic Commitment</i>	7
Biodiversity in China	8
Lessons from the Tree of Life	9
Partnering for Conservation in the Solomon Islands	11
Grassroots Gardening	13
Making Big Abstract Science Accessible	14
Public Participation in Scientific Research	15

Departments

ASTC Notes	16
Calendar	17
Spotlights	18
Grants & Awards	19
People	20

Cover: Science centers address biodiversity issues through a variety of initiatives. *Photos, from top:* High school teachers explore prairie biodiversity at a workshop organized by the Field Museum's Calumet Environmental Education Program (*photo by Kirk Anne Taylor*); birdwatching is an accessible activity that lends itself well to Public Participation in Scientific Research projects (pictured: a house sparrow, *Passer domesticus*) (*photo by Thierry Hubin, Royal Belgian Institute of Natural Sciences*); one of many native frog species of Kolombangara, Solomon Islands, where the American Museum of Natural History's Center for Biodiversity and Conservation is partnering with local communities to protect natural areas (*photo courtesy the CBC*).

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Biodiversity:

Time for Action

By Gérard Cobut

The Convention on Biodiversity has been signed by 192 countries since its promulgation in 1992 in Rio de Janeiro. Ten years later, governments adopted the Biodiversity Target, aiming to reduce the loss of biodiversity—the variety of life on Earth, from genes to species to ecosystems—significantly by 2010; the wording “halting the loss” was even more popular, especially in Europe. Now we *are* in 2010, declared the International Year of Biodiversity (IYB, www.cbd.int/2010) by the United Nations, and what do we see? Very limited positive change. Governments worldwide have failed to meet the convention’s aims and targets. The parties to the convention are likely to reschedule their set of targets for the decade 2010–20.

When we see extremely ambitious goals sadly having to be rescheduled, it is no big surprise when some members of the public think, “Are they kidding?” or worse, “Those folks—governments and scientists alike—are not serious about this issue; they cannot be trusted.”

We as science center and museum professionals may feel threatened in our scientific mission or even betrayed by a part of the political world that is not taking the issue seriously enough.

If we want the motto “Save Biodiversity” to be more than a slogan—or even a political call to rally interest—it is key for science centers and museums to take a strong lead in providing clear language and narratives. There is a severe communication problem regarding biodiversity. Even the term can be confusing and difficult to explain, and there is a widespread lack of understanding about its meaning. For example, in a 2007 study by the U.K. De-



The great-crested grebe (*Podiceps cristatus*) represents a success story. Once critically endangered, it gained protection in Belgium some 30 years ago and is now quite common even in city or suburban lakes.

Photo by Thierry Hubin, Royal Belgian Institute of Natural Sciences

partment for Environment, Food, and Rural Affairs, many members of the public thought that “biodiversity” referred to alternative energy, organic food, or even “biological washing powder” (a type of laundry detergent).

If the level of public understanding is so poor on such a major issue, then, as with climate change, it is time for science centers and museums to step up to the challenge. Our visitors should find the answers to such fundamental questions as, “What exactly is biodiversity?”, “Why should I care?”, and most importantly, “What can I do?”

The understanding of biodiversity concepts by our citizens is central to the issue. They need—and have the right—to be properly informed, so they can understand and act on the issue. People’s understanding of the importance of biodiversity may affect the way they influence their leaders and decision makers, particularly when they vote.

We as science centers and museums—along with zoos, aquariums, botanical gardens, and wildlife societies—should attract the public’s attention on biodiversity, communicate

what it is, and focus on the role biodiversity plays in human well-being. In addition, we should preferably keep a positive outlook by, for example, communicating successful biodiversity restoration projects to balance the “negative” main message about biodiversity loss.

The Ecsite Nature Group

Within Ecsite, the European Network of Science Centres and Museums (www.ecsite.eu), this topic is taken ever more seriously. It is not by coincidence that the Ecsite Annual Conference 2009 saw the birth of the Ecsite Nature Group. This new group aims to encourage cross-fertilization between science centers, science museums, natural history museums, research institutions, universities, aquariums, and zoos. The Ecsite Nature Group already has more than 70 members. The group will hold its second one-day workshop on June 2, before the Ecsite Annual Conference 2010 at DASA in Dortmund, Germany.

For the Ecsite Nature Group, as well as for many science communicators, hot topics include how to depict all the

Many people see a landscape such as this one as “natural,” but it was created by humans and, biologically speaking, is not extremely diverse. This is an example of the public’s difficulty in understanding biodiversity. Public Participation in Scientific Research (PPSR) projects are one way science centers can contribute to public understanding. The seven-spotted ladybug (*Coccinella septempunctata*, inset) is one of the native European species being tracked in the U.K. Ladybird Survey, a PPSR project. Photos by Thierry Hubin, Royal Belgian Institute of Natural Sciences



aspects of biodiversity: its levels of organization, the threats it faces from human activity, the services it delivers, its social and cultural aspects, and its loss. And last but not least, the group aims to engage people in biodiversity promotion: from tiny daily acts to large-scale monitoring and conservation actions.

Engaging the public

The following examples, which were highlighted in the Winter 2010 issue of the *Ecsite Newsletter*, reveal more about what can be done to engage the public in biodiversity issues.

- In Brussels, Belgium, the Royal Belgian Institute of Natural Sciences—also known as the Museum of Natural Sciences—is hosting IYB activities targeted to families, schools, scientists, and professionals. The “I give life to my planet” campaign, launched by the museum in cooperation with 50 partner organizations, aims to stimulate the general public to take small actions in everyday life. As part of the campaign, the museum has developed a free booklet, *366 Acts for Biodiversity*, which presents a biodiversity tip for every day of the year. The same tips can be found on the campaign web site (www.vip.biodiv.be) and are available as a computer screen saver.
- The Natural History Museum, London, has launched the IYB-UK (www.biodiversityislife.net), a wide partnership that includes around 300 charities, farmers, local councils, wildlife rangers, schools, colleges, zoos, museums, and botanical gardens. Events include talks, exhibi-

tions, public debates, artwork, and Public Participation in Scientific Research (PPSR)—or “citizen science”—projects.

- The United Kingdom capitalizes on its celebrated naturalistic tradition to involve many people throughout the country in PPSR projects like the U.K. Ladybird Survey (www.ladybird-survey.org). Helen Roy and Barnaby Smith from the U.K. Centre for Ecology & Hydrology can rely on wildlife enthusiasts and the general public to feed their records of ladybug sightings. People can upload photographs of their observations, too. In this respect, the general use of decent quality digital cameras included in mobile phones is a small revolution. More than 60,000 ladybug records have currently been received. This enormous



Common seals (*Phoca vitulina*) are returning to Belgian beaches. This species is slowly but steadily recovering in the North Sea due to conservation laws and actions. Photo by Thierry Hubin, Royal Belgian Institute of Natural Sciences

data accumulation allows the project coordinators to track and understand the current competition between the native ladybugs and the invasive harlequin ladybird (*Harmonia axyridis*).

- The Natural History Museum, Arhus, Denmark, has been collaborating with the private web site Fugle og Natur (“Birds and Nature”) (www.fugleognatur.dk/wildaboutdenmark/index.asp) for several years. If users find a specimen they cannot identify, they can post the discovery on a web forum, preferably along with a photograph. Most of the time, some other user can identify the specimen very quickly. The user then enters geographical data for the observation, which is integrated into an interactive map of Denmark. A link is provided to the identification manual, which is continuously updated by the users.

W as science centers and museums have pretty good knowledge of the general public and are more aware of biodiversity issues than most people. Furthermore, many of us have a close relationship with biodiversity scientists; many institutions are even actively producing biodiversity science. IYB is a unique opportunity to pass our knowledge and expertise directly to the public and our visitors—as long as we succeed in converting cutting-edge research into a scientifically strong and reliable message that the general public can understand. But that is our core business, isn’t it?

This matter brings an ethical responsibility, but also new opportunities to position ourselves as reliable actors to promote biodiversity for the benefit of humankind. It is time for action. ■

Gérard Cobut is a biologist and museologist at the Museum of Natural Sciences, Brussels, Belgium. This article is a sequel to an editorial he wrote with Bob Bloomfield, head of innovation and special projects at the Natural History Museum, London, in the Winter 2010 issue of the Ecsite Newsletter. To learn more about the Ecsite Nature Group, contact Aliki Giannakopoulou at agiannakopoulou@ecsitemuseum.eu.

The Calumet Environmental Education Program:

A Model for Science Learning

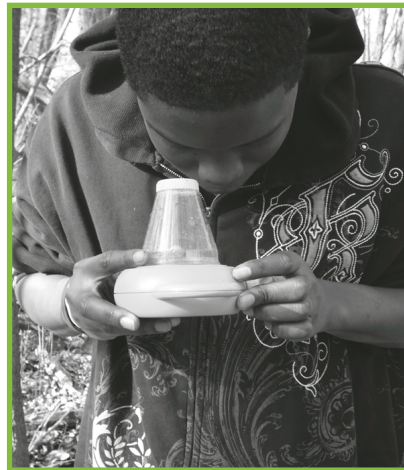
By Kirk Anne Taylor

"I always wanted to be able to connect what I taught in class to a real-world situation. [The Calumet Environmental Education Program (CEEP)] allows students to not only learn about environmental issues, but also take action on an issue. I feel my students learned more during this year than any other year."

—Milton Katsaros, CEEP Teacher

In 2002, the Field Museum in Chicago launched the Calumet Environmental Education Program (CEEP) as a new model of conservation education that translates science into action for students and teachers. Developed by the museum's Division of Environment, Culture, and Conservation (ECCo), CEEP began as a pilot project for schools in the Calumet region of southeast Chicago. Since its inception, CEEP has grown to serve more than 2,700 students and 100 teachers from 23 Calumet schools annually. Students in grades 4 to 12 learn about local biodiversity through a consecutive ladder of environmental education programs that build content knowledge grade level upon grade level.

ECCo uses museum collections and resources to promote environmental conservation and cultural understanding through programs in Chicago and South America, engaging the human communities that live in and around the world's biologically rich landscapes. We work with partner organizations to identify and use communities' strengths to protect biological diversity and cultural heritage. CEEP enables ECCo to work with schools and community partners, including the Forest Preserve District of Cook County, Chicago State University, the Calumet Stewardship Initiative (an alliance of over 20 community-based organizations), and the Chicago Department of Environment, to address pressing environmen-



A high school student discovers the biodiversity of wetlands at Sand Ridge Nature Center in South Holland, Illinois.

Photo by Laura Milkert

tal concerns in the Calumet region.

Stretching along the southern shores of Lake Michigan from southeast Chicago to northwest Indiana, the Calumet region contains outstanding pockets of rich natural areas, intermingled with abandoned steel mills, landfills, and ongoing industrial activity. Despite a historic legacy of contaminated waterways and hazardous waste sites, the Calumet region is home to several critical remnants of endangered Great Lakes ecosystems. This natural biodiversity and the need for conservation, together with the existing infrastructure of community leaders and organizations to implement these changes, make Calumet an ideal location for a program like CEEP.

Integrated curriculum

The CEEP curriculum has three components—Mighty Acorns (grades 4–6), Earth Force (grades 7–8), and Calumet Is My Back Yard (CIMBY) (grades 9–12)—which engage students in science by letting them apply what they have learned to real-life community conservation issues.

- In *Mighty Acorns*, students visit a local natural area three times a year, participating in exploration of local biodiversity, educational activities that illustrate basic ecological concepts, and stewardship activities, such as removing invasive species and spreading native seeds.
- *Earth Force* helps youth develop the problem-solving skills needed to create long-term solutions to community environmental issues. Students choose a local environmental issue—such as toxic cleaning solutions in schools or air pollution—and develop and implement a community project to address it.
- *CIMBY* students participate in stewardship and ecological monitoring activities in local natural areas throughout the year. On leadership days, students visit a variety of ecosystems and share ideas about conservation with students from other schools. In the summer, interested students participate in science and conservation internships.

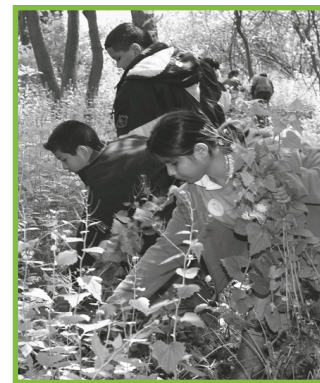
The CEEP curriculum model was designed to build upon the Chicago Public Schools' initiative to cultivate clusters of schools that work together to improve the effectiveness of education at every grade level. Consequently, CEEP was piloted with one high school and its eight elementary feeder schools. The subject matter that students learn in their regular classes is integrated into field experiences so that students gain a greater understanding of the environment and acquire skills they need to act on what they have learned. Learning outcomes for each grade level are driven by Illinois Learning Standards.

One significant advantage of having a common curriculum for the CEEP cluster of schools is that it has enabled us to provide common professional development for all the teachers in that cluster. CEEP was designed to expand teachers' knowledge of local biodiversity and basic ecological concepts. During CEEP workshops, teachers integrate

environmental content into their existing classroom curricula, practice environmental education activities, and coordinate activities with teachers from other grades.

Lessons learned

CEEP was initiated with the expressed intention of evaluating this integrated environmental education model. An evaluation protocol was developed by an external evaluator, Terrie Nolinske of TNI Consultants in Professional Development. The assessment protocol consisted of attitude and knowledge surveys given to students and teachers at the beginning (pre-test) and end (post-test) of the school year for three consecutive years, from 2002 to 2005. An independent statistician reviewed the assessment protocol to verify that attitude and knowledge changes were a result of CEEP. Of the 62 teachers that took part in the program from 2002 to 2005, 54



CEEP students remove invasive garlic mustard from Eggers Woods, located in southeast Chicago. Photo by John Weinstein

completed the evaluation. We also analyzed the responses of the 111 students who participated in the program for all three school years consecutively.

Highlights of the CEEP evaluation demonstrate the power of professional development and hands-on learning to effect change in both students and teachers.

- Students and teachers made statistically significant gains in knowledge about biodiversity, the local community, and local environmental issues.
- Teachers were able to compose teaching objectives specific to the environment, focusing on the goal of preparing students for further environmental study.
- Teachers reported feeling more confident about their knowledge of environmental issues. In 2002, 69 percent of teachers reported that a "lack of knowledge makes it difficult to include environmental content in my teaching." In 2005, only 14 percent agreed with this statement.
- Students reported that CEEP stimulated their interest in science through activities and field trips.

Moving forward, we intend to expand the CEEP model to additional schools in Calumet. We are also working to connect CEEP with existing programs run by our partner organizations so that we can offer schools a slate of programs that build on one another year after year. This approach enables us to strategically allocate our collective resources throughout the region. ■

Kirk Anne Taylor is urban conservation manager at the Field Museum, Chicago, Illinois. The 2005 CEEP evaluation is available online at www.fieldmuseum.org/ceeppublication/pdfs/TNI_Executive_Summary.pdf (pdf, 40 pp.)

An Oasis in the City: Tokyo's Institute for Nature Study

By Miki Takahashi

As Japan's comprehensive science museum, the National Museum of Nature and Science (NMNS, www.kahaku.go.jp/english/), based in Tokyo, aims to provide visitors with opportunities to learn about how various organisms coexist on Earth. To fulfill this mission, NMNS dedicates efforts to research, the collection and preservation of specimens, and exhibitions and educational activities.

One of NMNS's four branches is the Institute for Nature Study, located in the center of Tokyo and designated as a natural monument and historic site since 1949. As an isolated natural habitat surrounded by offices and shopping centers, it is a valuable place that maintains rich biodiversity and has been well conserved for many years. Covering an area of almost 50 acres, the institute preserves many of Tokyo's original natural habitats—such as forests, marshes, and ponds—and provides a home for native species, including the common kingfisher (*Alcedo atthis*) and lesser emperor dragonfly (*Anax parthenope*).

At the institute, visitors can observe plants and animals and learn how their ecosystems work. As people walk around the institute, they encounter signs or ex-



A researcher at the Institute for Nature Study lectures about plants to the public.

Photo courtesy the National Museum of Nature and Science

planations that draw their attention to the species living in the woods. Bulletin boards, updated monthly throughout the year, educate children and families about seasonal flowers and animal behavior. The institute also sponsors events, including walking tours, seminars for teachers, and lectures presenting the latest results of the institute's ecological research.

The institute is an excellent resource for developing a deep understanding of nature. It gives people the opportunity to contemplate the value of biodiversity and enjoy the experience of nature, even in an urban area. ■

Miki Takahashi is a member of the international affairs staff at the National Museum of Nature and Science, Tokyo, Japan.

Variety is the Spice of Life: *Biodiversity and its Conservation as a Basic Commitment*

By Franciso J. Franco del Amo and Francisco Armesto Ramón

Since its founding in 1999, the Aquarium Finisterrae—House of Fishes in A Coruña, Spain, has understood that biological diversity should be one of our main topics for dissemination and education. We therefore display the marine biodiversity of the coasts where our aquarium lies and have carried out various educational and research projects related to biodiversity. During the International Year of Biodiversity, these activities make the aquarium an interesting point of reference for science centers working to educate the public on the preservation of biodiversity and the environment.

The Aquarium Finisterrae, along with the House of Sciences and the Domus—House of Mankind, is part of the Scientific Museums of A Coruña (Museos Científicos Coruñeses, =mc2), which were founded and are run by A Coruña's city council. The main aim of =mc2 is to work on the social perception of science, developing resources such as exhibitions, publications, and competitions to promote the culture of science. The Aquarium Finisterrae, which features hundreds of hands-on exhibits, is a blend of a modern aquarium and a science center, specializing in environmental matters.

The pharmacy of the sea

One of the aquarium's projects related to biodiversity and its conservation is the traveling exhibition entitled *Farmacuáticos: A botica do mar* (Pharmaceuticals: The pharmacy of the sea), which presents marine organisms as a source for the development of medi-

cines. The exhibition consists of photographs, aquariums with live marine organisms, cabinets containing preserved specimens, computers, microscopes, and other elements.

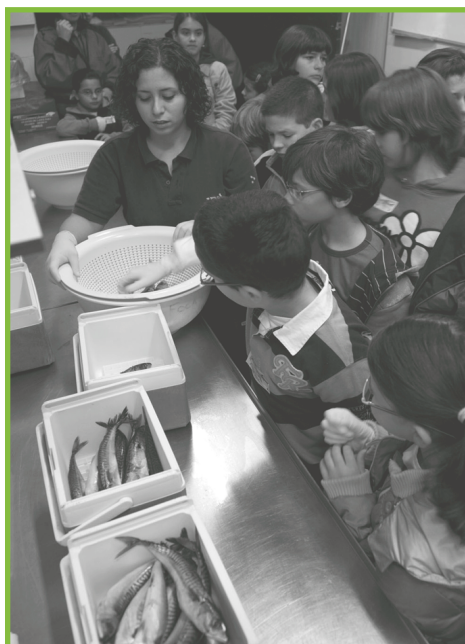
There are four main themes spread out over the 34 modules in the exhibition. The first theme presents the biological foundation for and the natural origin of medicine, while the second takes visitors through all the marine taxonomic groups, with a special emphasis on those species of pharmaceutical interest. The third theme addresses pharmaceuticals that can be bought in drugstores today and explains the research process, from identifying a potential medicine to putting it on the market. Finally, the fourth theme fo-

cuses on cultural anthropology and the traditional use of marine products in health care. For example, there is a hands-on exhibit devoted to cod liver oil, traditionally used as a tonic, and another related to the use of seaweed as an antacid for the stomach. Pharma-Mar (Grupo Zeltia), a Spanish company specializing in pharmaceutical exploration of marine resources, collaborated with the aquarium in designing and setting up the exhibition. The exhibition opened in June 2008 and will be on display at the aquarium until June 2011 before beginning its tour. As of March 2010, 500,000 people had visited the exhibition.

In *Farmacuáticos*, we present scientific content in an entertaining and colorful way, highlighting the emotional aspects to cultivate a positive attitude about the need to preserve biodiversity. We make use of hands-on approaches as the ideal means for transmitting messages, awakening curiosity, and making people think. Fish and invertebrates are not presented as distant or foreign beings, but rather as animals that are part of our daily lives. We also underline the relationship between humankind and marine animals throughout history.

Choose the Right Fish

Another project that is directly related to the preservation of biodiversity is the science in society campaign Choose the Right Fish, initiated by the World Ocean Network and piloted at the Aquarium Finisterrae; Nausicaa, Boulogne-sur-Mer, France; and the Acquario di Genova, Genoa, Italy. The



Children learn about the sustainable consumption of fish during the Choose the Right Fish campaign. Photo by Cesar Quirán

goal is to encourage consumers to change their behaviors in order to help solve the problems of overfishing and the deterioration of the marine ecological balance. This is a practical campaign, and so the consumer actions proposed are quite simple: We suggest that people buy sustainable, abundant fish and shellfish—selected by a committee of experts—that live close to our coastline.

During the campaign, collaborating markets, fish sellers, and restaurants brand sustainable species with a label reading, “OK. Good for the sea, good for you.” Informational brochures and posters are handed out to clients. By

involving small- and medium-sized companies, we can transform our good intentions regarding marine conservation into reality. Choose the Right Fish also includes a web site (www.mrgoodfish.com/en/index.html), an educational video, a scientific monograph entitled *Overfishing*, a traveling photography exhibition, and a hands-on exhibit that will be displayed permanently at each of the three aquariums.

Biodiversity conservation

Our focus on biodiversity logically led to the development of research projects carried out by aquarium officers



A young visitor explores an exhibit about seaweed as source of medicines and food products, in Farmacuáticos at the Aquarium Finisterrae. Photo by Xurxo Lobato

Biodiversity in China

By Frances Leung

Featuring more than 400 specimens, the exhibition *Biodiversity in China—An Exhibition on China’s Wildlife Specimens* enables visitors to appreciate, in close proximity, the beauty of Chinese wildlife. The exhibition—which was produced by the Hong Kong Science Museum, Kowloon, Hong Kong, China—opened on December 19, 2009, and will remain on view through August 31.

Timed to coincide with the International Year of Biodiversity, the exhibition endeavors to help visitors realize the importance of environmental protection and learn how to coexist harmoniously with our valued neighbors on the planet. More than 75,000 people had attended the exhibition as of February.

The exhibition marks the first time that these wildlife specimens—which come from the extensive collection of the Chongqing Museum of Natural History, Sichuan Province—have been displayed outside of Mainland China. Many endangered species, such as the giant panda (*Ailuropoda melanoleuca*), golden eagle (*Aquila chrysaetos*), and Chinese giant salamander (*Andrias davidianus*), are highlighted. They are displayed in settings that reflect the unique characteristics of their indigenous habitats.

Our goal is to help visitors to appreciate the amazing biodiversity in China and understand how it is being threatened by human activities. China’s 3.7 million square miles of diverse ecosystems and climates are home to more than 30,000



Living mainly in the middle and lower Yangtze River, the Chinese alligator (*Alligator sinensis*) is one of the smallest species of crocodilians in the world. Photo courtesy the Hong Kong Science Museum

species of plants and 6,700 species of vertebrates (about 10 percent of the total number of vertebrate species in the world). However, urbanization and environmental pollution in China have led to extensive habitat destruction. Recently, China has begun to target its wildlife conservation efforts through research, establishment of nature reserves, and artificial breeding of endangered species.

A wide range of education and outreach programs, organized in collaboration with local conservation groups such as the World Wildlife Fund Hong Kong, supplement the exhibition. Programs include field trips, lectures, films, teacher workshops, and children’s activities. A summative evaluation will be conducted to gauge the effectiveness of the exhibition and its programs in arousing visitors’ concern for biodiversity conservation. ■

Frances Leung is assistant curator at Hong Kong Science Museum, Kowloon, Hong Kong, China.

and focused on the conservation of regional species. Such is the case for the short-snouted seahorse (*Hippocampus hippocampus*), whose endemic populations are under threat. The Aquarium Finisterrae formed part of a project directed by the Marine Investigation Center in Vigo, Spain, to breed this fish in captivity and then take it back to the sea.

The aquarium’s most successful conservation project involves the *santiaguino*, or small European locust lobster (*Scyllarus arctus*), a very typical crustacean on our coasts that is threatened by overfishing. Some months ago, our researchers, in collaboration with counterparts at the University of A Coruña, characterized all the lobster’s larval phases and bred it in captivity, paving the way for repopulation.

All of these actions coincide with the goals established by the United Nations General Assembly for 2010: to highlight the importance of biodiversity to human life, to reflect on our achievements in the conservation of biodiversity, and to encourage efforts to reduce the rate of biodiversity loss. ■

Francisco J. Franco del Amo is technical manager at the Aquarium Finisterrae, A Coruña, Spain. Francisco Armesto Ramón is projects manager at the Museos Científicos Coruñeses, A Coruña, Spain.

Lessons from the Tree of Life

By Jane Pickering and Ellen Giusti

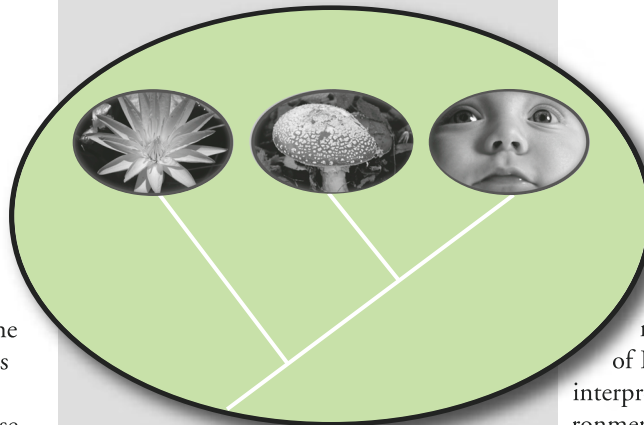
The Tree of Life may be one of the most cross-culturally shared and enduring images in the worlds of religion and folklore. However, it is less familiar as a scientific construct depicting the evolutionary relationships of Earth's past and present biodiversity.

We here at the Yale Peabody Museum of Natural History in New Haven, Connecticut, spent two years translating the biologist's concept of the Tree of Life into a 1,000-square-foot exhibition. *Travels in the Great Tree of Life* opened in February 2008. Following the final evaluations, staff could measure how far the museum's public had come toward understanding this framework that underpins our modern understanding of biology—that all living things, from the smallest micro-organism to the largest redwood tree, are genetically related.

Readying the foundation

While the Tree of Life forms the basis for much museum-based research, few if any exhibitions have explicitly addressed the concept. As a natural history museum with more than 12 million specimens, we felt eager to take on the challenge of representing all of the species that have ever lived—probably over 100 million.

To launch *Travels in the Great Tree of Life*, museum staff convened a brainstorming group composed of 12 scientists from several disciplines and eight museum professionals, including educators and exhibit designers. After two days' discussion, we decided to build the exhibition's learning goals on the concept of phylogenetic relationships—the basic tenet that relationships



This phylogenetic tree diagram illustrates that mushrooms are more closely related to humans than to plants. Image courtesy the Yale Peabody Museum of Natural History

among species are based on recency of common ancestry and not on observed similarity of physical characteristics.

We recognized immediately that this deceptively simple concept would require front-end evaluation. Evaluator Ellen Giusti and her colleague Monique Scott carried out interviews in exhibition galleries at the Peabody Museum as well as at the American Museum of Natural History, New York City. The evaluation team also conducted a small number of focus groups with teachers, middle and high school students, and parents. Using simple tree diagrams, the team probed visitors' appreciation of the Tree of Life concept.



A hummingbird is displayed inside the mouth of an *Albertosaurus* in order to illustrate how closely related animals can look very different. Photo by Sally Pallatto

Surveying the landscape

The evaluation team found that while many visitors felt familiar with the expression "Tree of Life," these visitors most often interpreted it as a vague ethical or environmental concept rather than as a scientific construct. Visitors on the whole did associate the phrase with biodiversity, but also with the concepts of ecosystem, conservation, and, quite commonly, with Disney's epic "Tree of Life" at Animal Kingdom theme park or the "Circle of Life" musical sequence from *The Lion King*.

Despite the inherent bias of interviewing visitors in a natural history museum, very few respondents conveyed a sense of the Tree of Life as a representation of how organisms are genetically related to each other. Visitors also did not grasp the tremendous size and dynamism of the Tree of Life. Recognizing that visitors already had "top-of-mind" associations about the "Tree of Life," we realized we would need to define the phrase as used in the exhibition—that is, as biologists defined it.

The majority of respondents recognized a scientific diagram of a Tree of Life as related to evolution. Visitors commonly misinterpreted species arrangement on the tree as a trajectory of progress leading to a supposed human ascendancy as the most evolved species on the tree.

Visitors showed great interest in how organisms were related. They wanted to know the histories of and relationships among themselves, the plants in their gardens, and interesting species from distant lands and times.

Informed by the front-end evaluation,

we decided that we would extend our focus beyond phylogenetic relationships to include three related concepts, as follows: 1) the Tree of Life is vast; 2) identifying the relationships within the Tree of Life is a complex undertaking that is producing interesting and nonintuitive/unexpected findings; and 3) the Tree of Life, particularly as we come to understand the relationships it represents, has several practical applications.

We found that Tree of Life research supporting advances in realms such as medicine, agriculture, and conservation had not entered visitors' minds much, if at all. We needed explicitly to address the question, "Why should we care?"

At last, to plant

We began exhibition design eight months into the project, at the end of a six-month evaluation period. The exhibition team included four research scientists, as well as the museum's head of exhibits, head of education and outreach, and designer. The team devised seven exhibition sections geared to reflect current research and good didactic opportunities for specimens and other resources, as follows:

- *Discovering the Tree of Life* (film), an introduction to the topic
- What is a Phylogenetic Relationship?, storyboarding the term using a hands-on interactive sculpture of a tree that visitors could manipulate
- Evolution along the Branches of the Tree of Life, showing, through animated techniques, how organisms' traits change over time
- Convergence and Divergence, illustrating that organisms that resemble each other can be only distantly related, while those that look different from each other can be closely related
- Computational Complexity, discussing the monumental challenges of uncovering the millions of relationships within the Tree of Life
- Big Surprises, focusing on recent discoveries about the Tree of Life that reveal unexpected relationships between and among organisms, for example, the close phylogenetic rela-



A visitor uses an interactive game to determine where the domestic cat is found in the Tree of Life. Photo by Sally Pallatto

tionship among tiny elephant shrews, elephants, aardvarks, manatees, and golden moles

- Why Study the Tree of Life?, describing the ways that information from Tree of Life research is practically applied today.

The exhibition in full bloom

"It never occurred to me how many things are related somewhere in their evolution."

—Exhibition visitor

Twenty-six months after the project launched, on February 16, 2008, *Travels in the Great Tree of Life* opened to the public. Visitors passed a beautiful looping animation "showing" the "growth" of the Tree of Life up until today, "culminating in" the amazing biodiversity at the tips of the branches. Inside the gallery, children marveled at a sharp-toothed *Albertosaurus* with its "cousin," a tiny hummingbird, in its mouth—a dynamic illustration of how physically diverse organisms can be closely related. Nearby, other visitors pondered the phylogenetic relationship between a specimen of poison ivy and its close relative, the mango. Children and adults alike discovered where their pet cat was situated in the Tree of Life, through an interactive game.

Staff unanimously acknowledged as the stars of the show the charming black and rufous giant elephant shrews (*Rhynchocyon petersi*), courtesy the Smithsonian National Zoo, not only

for their lively antics, but also for their diverse extended family. One anticipated exhibition challenge—which surfaced at the evening opening party—was the elephant shrews' unfortunate daily habit of going to bed around 3:00 p.m. We had to add signage to encourage late-in-the-day visitors to return at another time.

Soon after the exhibition opening, we conducted a summative study involving visitor tracking in the exhibition as well as structured exit interviews. The evaluation revealed the following:

- Fifty-seven percent of respondents—representing a huge increase over front-end findings—defined the Tree of Life as "relationships between organisms" or "evolution."
- Forty-one percent of visitors, when describing something new that they learned in the exhibition, cited the interrelationships of organisms.

(continued on page 12)



These two black and rufous giant elephant shrews (*Rhynchocyon petersi*) played a starring role in the exhibition *Travels in the Great Tree of Life*. Photo by Sally Pallatto

Partnering for Conservation in the Solomon Islands

By Brian Weeks, Catherine Smith, and Eleanor Sterling



The view from the porch of the Imbu Rano Lodge, a research and education center in Kolombangara, Solomon Islands, which helps the local community benefit from international research interest in lands protected by a Community Conservation Agreement. Photo courtesy the CBC

In 1929, the Whitney South Seas Expedition, sailing under the auspices of the American Museum of Natural History (AMNH) in New York City, reached the Solomon Islands in the southwestern Pacific. The resulting ornithological collection exposed patterns of biodiversity that spawned Ernst Mayr's seminal work on speciation. The Whitney expedition epitomizes the founding mission of many natural history museums: to catalog the variety of biological and cultural diversity on Earth. As the catalog of global diversity grew throughout the 20th century, so did awareness of widespread and escalating threats to diversity. Concern soon morphed into an urgent need for action, and in 1993, AMNH broadened its mission to include *sustaining the world's cultural and biological diversity* by creating the Center for Biodiversity and Conservation (CBC, <http://cbc.amnh.org>). The CBC leverages the scientific and educational resources of AMNH to further conservation policy and action worldwide, including an

innovative community-based program in the Solomon Islands.

Community Conservation Agreements

The nearly 1,000 islands of the Solomon Archipelago, spanning 750 miles, support an incredible array of terrestrial and aquatic diversity, human ways of life, and languages. The islands lie at a crossroads, linking biologically rich Australasia with the isolated islands of a sprawling Pacific. This unique position has translated into an incredible diversity of species, many of which are found nowhere else on Earth. In 2003, Christopher Filardi joined AMNH's ornithology department and used molecular data to revise many of Mayr's findings from the 1930s. Recognizing that extensive habitat modification from commercial resource extraction (such as logging) was threatening the region's biodiversity, Filardi joined the CBC in 2005 as biodiversity scientist

for Pacific programs. This resulted in AMNH's re-engagement in Melanesia on a larger scale and redefined Filardi's work to include direct conservation action.

The CBC's work in the Solomons is based on the premise that humans are integrally connected to their environment, and that the success of conservation efforts depends on nurturing this connection. With protected areas covering less than 0.5 percent of the nation's land and seascapes, land use is almost entirely determined by local communities via customary land rights. Living largely outside of the cash economy, landowners in recent decades have increasingly turned to resource extraction to satisfy direct cash needs (e.g., education and health care costs). Some sectors of extractive industry have ruthlessly exploited this situation, providing limited compensation to very few people in return for widespread devastation of the natural environments upon which whole communities depend.

Paradoxically, the same land tenure system that has proven susceptible to exploitation by resource extractors offers an opportunity for biodiversity conservation. To provide an alternative to resource extraction, Filardi and the CBC have worked with international conservation interests to set up the Solomon Islands Community Conservation Partnership (SICCP), an in-country, nongovernmental organization that partners with landowners to implement Community Conservation Agreements (CCAs). These long-term, transparent partnerships with landowning communities provide annual benefits in the form of ongoing support for education and health care in return for restrictions on commercial resource extraction on customarily owned land. Potential pitfalls of this type of partnership (e.g., unequal distribution of funds) are largely avoided by the use of traditional decision-making processes, as well as by providing exclusively noncash benefits, and only upon completion of an annual conservation status audit.

The agreements partner resource owners with national and international conservation investors that (through SICCP) finance community-wide benefits and provide economic development opportunities via research and ranger jobs, tourism, and training associated with the CCA. The indirect economic benefits of CCAs appear, superficially, to be less than cash payments offered by commercial resource extractors, but have nonetheless proven to be sufficient incentive to tip

the balance and provide communities with a desirable, sustainable alternative.

Kolombangara: An example

Kolombangara, one of five CCA sites across the Solomons, is home to a startling array of both terrestrial and marine diversity and some of the last remaining intact coast-to-cloud forest corridors in the region. The CCA encompasses over 30,000 hectares of forest and is the largest terrestrial protected area in the Solomon Islands. The process of instituting the CCA catalyzed the founding of the Kolombangara Island Biodiversity Conservation Association (KIBCA), a charitable trust that represents the interests of the landowners and upholds the CCA.

In partnership with KIBCA and the sustainable plantation timber company Kolombangara Forest Products Ltd., AMNH established the Imbu Rano Lodge, a research and education center at the CCA's edge. Imbu Rano reflects community interest in maintaining a presence in traditional lands under CCA protection and provides a means to benefit from international research and ecotourism. The CBC is working to solidify a long-term partnership between KIBCA and SICCP to expand benefits derived from protection of customary lands and ensure ongoing alternatives to logging that meet local needs.

Moving forward

This conservation work aims to achieve lasting protection of the human and non-

human living diversity that has thrived for millennia along the rich land-sea interface in the Solomon Archipelago. CCAs have the potential to conserve the biological wealth of the Solomons while enabling diverse human communities to continue engaging in activities that have sustained and enriched their culture for generations.

Without some direct and meaningful form of conservation, the persistence of both biological and cultural diversity across the Solomon Islands continues to be severely compromised with each new large-scale resource extraction deal. CCAs allow the people living in these landscapes to share the economic burden of conservation with the international community, and provide them with a desirable alternative to signing commercial extraction deals that satisfy direct cash needs but cripple the livelihoods of generations to come. The CBC's engagement in the Solomon Islands serves as an example of how scientific institutions can support meaningful conservation by partnering with local decision makers. ■

Brian Weeks is Network of Conservation Educators and Practitioners production manager at the Center for Biodiversity and Conservation, American Museum of Natural History, New York City. Catherine Smith is a freelance biologist with extensive experience in the Solomon Islands. Eleanor Sterling is director of the Center for Biodiversity and Conservation.

(continued from page 10)

- Seventy-one percent of respondents found unexpected interrelationships among and between species to be the most interesting information that was new to them. This mirrored the experience that many scientists have reported about their work on the Tree of Life. Realizations of unexpected relationships successfully connected visitors to the idea that research continues on the Tree of Life.

Disappointingly, relatively few visitors expressed an appreciation of the

vast scientific knowledge that the Tree of Life construct conveys to biologists, or of the application of such research to society. The evaluation team found that just 6 percent of interviewees mentioned practical uses for the Tree as something new they had learned. When prompted, about half of the respondents' top-of-mind ideas—virtually the same percentage as among front-end respondents—suggested that the primary value of the Tree of Life is basic scientific knowledge and education. Tracking indicated that the graph-

ic panel and film that conveyed this concept did not attract many visitors. This may have been related to the fact that this exhibition section was crowded and close to the exit. But in hindsight, perhaps it reflects that the compelling nature of some specimens distracted visitors' attention. Many visitors headed straight to the shrews' enclosure and remained there for most of their visit.

Evaluation showed that the use of specimens helped illustrate essentially abstract ideas. But left for future surveys is the question of how to convey



Jean-Marc Lalonde (left) and Cora Martin of Science North experiment with propagating pincherry, a small native tree, in preparation for a workshop on gardening with native species.

Photo courtesy Science North

Biodiversity loss is an urgent global issue, but what can be done locally to help? Those interested in being a part of the green movement often feel a daunting sense of futility. The challenge for environmental educators is to create programs that not only educate but also introduce participants to avenues for action and ownership. With this in mind, Science North, Sudbury, Ontario, Canada, has joined with partners to create a workshop on gardening with native plants, empowering gardeners to quite literally make a difference in their own backyards.

The city of Sudbury's history has sensitized the population to the dangers of environmental decline and has motivated

Grassroots Gardening

By Jenny Fortier and Dana Murchison

residents to become more engaged ecocitizens. By the early 1970s, emissions from nearby mining operations had left the landscape devastated. Sudbury's soil became acidic and contained high levels of heavy metals, resulting in a drastic reduction in plant and consequently animal biodiversity. More than 30 years of government, industry, and community partnerships to regreen these areas through liming, fertilizing, grass seeding, and tree planting have resulted in the dramatically improved landscape Sudburians enjoy today. While significant progress has been made, the city of Greater Sudbury's Biodiversity Strategy emphasizes that much of the area's biodiversity has yet to be restored. This is particularly true of native plant species, as only a select variety were planted during the greening effort.

Several months ago, a partnership among municipal government, local industry, and Science North was formed to create a gardening workshop that would enable community members to contribute to the Biodiversity Strategy's broader goals. During the workshop planning process, we approached local naturalist and gardening enthusiast groups and attended green events to spread the word and find out which topics were of greatest interest.

Scheduled to be held on May 15, the workshop will empower attendees with the know-how and materials to start a burgeoning native garden. Participants will learn the value of native plants, as well as how to identify, propagate, and care for them. They will also learn how to collect seeds in the wild and will receive native seeds to take home.

Participants enrolled in the workshop to date include several members of gardening, local food source, and naturalist groups, as well as an owner of a landscaping company. Our goal is for these individuals to relay the workshop information to their members and employees. Through the process, we are hoping to form long-lasting partnerships, increase community awareness, and have a positive impact on the local environment. ■

Jenny Fortier and Dana Murchison are staff scientists at Science North, Sudbury, Ontario, Canada.

the enormity and labyrinthine complexity of the Tree of Life in an exhibition.

Harvesting for the next season

Having packed up the show, waved goodbye to the elephant shrews, and developed an online version of the exhibition (www.peabody.yale.edu/exhibits/treeoflife), we found ourselves asking the same question we had asked visitors: "Why should we care?"

Our venture has confirmed the power of a museum exhibition to convey something as profound as the evolution-

ary relationships of Earth's past and present biodiversity. We have applied the lessons we learned to enhance our educational activities in the area of biodiversity. We also have shared our findings with many colleagues in the museum world. With such cross-communication, we believe we can help fulfill the deepest purpose behind *Travels in the Great Tree of Life*. ■

Jane Pickering is deputy director of the Yale Peabody Museum of Natural History in New Haven, Connecticut, and served as project manager and exhibit developer for

Travels in the Great Tree of Life. Ellen Giusti is an independent consultant who conducts evaluations of museum exhibitions and programs. The exhibition was curated by Michael J. Donoghue, G. Evelyn Hutchinson professor of ecology and evolutionary biology, Yale University. Travels in the Great Tree of Life was supported by the U.S. National Science Foundation through the Angiosperm Tree of Life, EuphORBia, and CIPRES projects. Details of the exhibition and copies of the full evaluation reports can be found at www.exhibitfiles.org. The evaluations are also available at www.informalscience.org.

Making Big Abstract Science Accessible

By Marilyn Hoyt and Dan Wharton

In a recent editorial, David Dickson, director of the London-based Science and Development Network (www.SciDev.Net), effectively summarized the challenge of scientists and informal science educators during the International Year of Biodiversity. He wrote, "...the issues scientists think most important often seem abstract and far removed from the day-to-day concerns of ordinary people. The rate at which the world is losing species is a typical example."

Science centers are well positioned to produce the interface between the "abstract" and "day-to-day." As professionals with 55 combined years experience working in a science center and zoos, we have found several principles that help audiences make personal connections to, develop an interest in, and learn effectively about both abstract and applied science and technology.

- 1) Learning should be driven by the experiences and questions visitors and students bring with them.
- 2) Visitors should be given ample opportunities for personal interactions with content via hands-on exhibits, supported by demonstrations, simulations, workshops, theater, encounters with scientists, and supporting media ranging from text to films to web-based exercises (Bell, Lewenstein, Shouse, & Feder, 2009; Chittenden, Farmelo, & Lewenstein, 2004; and Friedman, 2000).
- 3) Learning experiences should draw upon an understanding of how we have been shaped by evolution. For example, the brain's reward centers light up when we learn something new. And, in reference to biodiversity, Edward O. Wilson's biophilia hypothesis suggests that humans have an innate interest in ourselves and other living things.



Summer science campers use a seine fishing net to sample the wildlife at Black Rock Forest.

Photo courtesy Black Rock Forest Consortium

In this article, we will explore ways that institutions have used these principles to help their audiences understand the issue of biodiversity and its relevance to their lives.

Biodiversity introduced via observation

For over a century, zoos have been using biophilia to stimulate wonder and interest in animals through observation. In the last 30 years, zoos have been extending this fundamental experience to biodiversity issues—most notably, extinction and the component issues that drive it. By observing animals firsthand in zoos, visitors begin to see biodiversity issues as immediate rather than abstract. Currently, zoos worldwide are working with traditional observation plus complementary panel exhibits, video from the field, and hands-on kiosks to teach about biodiversity loss. Visitor studies suggest that both learning and identification with the issues grow in these enhanced learning environments (Bruni, Fraser, & Schultz, 2008).

An early U.S. exhibition on biodiversity, *Hidden Kingdoms of the World of Microbes* at the New York Hall of Science, Queens, utilized a microbial "zoo" to connect visitors and students with the incredible biodiversity that

microbiology addresses. In this 1989 exhibition, science museum visitors could easily observe living microorganisms in mixed groups—moving about, mating, and feeding (even on each other)—through monocular "Wentzscope" microscopes for the first time. At the same time, applied science (those day-to-day concerns), presented via the story of the development of mass production of penicillin during World War II, yielded keen interest and measurable learning (Taylor & Serrell, 1991).

Biodiversity introduced via research

In another example, the Black Rock Forest Consortium (www.blackrockforest.org) in Cornwall, New York, moves the abstractions of biodiversity to everyday concerns by facilitating research that benefits the local community. This consortium of 20 regional education and research institutions focuses on a 3,835-acre forest in the Hudson River Highlands. A synergistic approach to research, bringing together scientists in climate, ecosystem, earth, plant, and conservation disciplines, delivers not only papers advancing science, but intern, camp, and school trip opportunities for students from

schools in the consortium. The nearby village of Cornwall sees solid effects on its day-to-day concerns as it benefits from research and census activities providing solutions to deer problems.

Partnering for biodiversity

Colombia is among the five countries with the greatest biodiversity in the world. Maloka in Bogotá (www.maloka.org) places a high priority on biodiversity and has become a valued partner in the national environmental community. *The Hall of Biodiversity*, a permanent exhibition that reproduces the high Andean forest ecosystem surrounding Bogotá, anchors Maloka's efforts. Originally developed in collaboration with the Botanical Garden of Bogotá, the exhibition is enhanced by educational materials produced with local teachers and students and by a new exhibition, *The Hall of Life*.

Additionally, Maloka's outreach programs raise awareness of the threat urban development poses to Bogotá's native species and ecosystems, including the wetlands inside the city and the mountains that surround it. Programs also focus on stewardship of the city's water supply, which originates in these mountains. Current partnerships with key national and city agencies, as well as the public, will lead to increasingly effective community outreach materials. Many of these will be introduced as part of the International Year of Biodiversity.

Audiences will continue to learn in science centers, zoos, nature centers, and preserves via opportunities to observe, develop their own hypotheses, explore, and analyze results. Our chal-

lenges and opportunities both lie in our capacity to provide access. Biodiversity provides yet another test bed for science centers developing the interface between abstract, complex science and the experiences visitors bring to us—those day-to-day concerns. ■

Marilyn Hoyt is a nonprofit consultant and former CEO of the New York Hall of Science, Queens. Dan Wharton is senior vice president of conservation science for the Chicago Zoological Society/Brookfield Zoo, executive editor of Zoo Biology, and a member of the Center for Advancement of Informal Science Education (CAISE) Policy Study Inquiry Group. This article was prepared with help from Alan J. Friedman, consultant in museum development and science communication; Nohora Elizabeth Hoyos, director, and Andrea M. Gardeazábal, coordinator of marketing intelligence, Maloka, Bogotá, Colombia; William Schuster, executive director, the Black Rock Forest Consortium, Cornwall, New York; and Martin Weiss, science interpretation consultant. English/Spanish translation was provided by Maria Rodriguez Rosell, a member of the first class of Science Career Ladder Explainers at the New York Hall of Science.



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In the 1989 exhibition *Hidden Kingdoms of the World of Microbes*, visitors learned about biodiversity by observing living micro-organisms. Photo courtesy New York Hall of Science

Public Participation in Scientific Research

Covering topics ranging from backyard birds to acid rain, Public Participation in Scientific Research (PPSR) projects, often called "citizen science," contribute to public understanding of key scientific concepts, build interest in scientific activities, and develop science-related skills. These are the conclusions suggested by evidence from a Center

for Advancement of Informal Science Education (CAISE) Inquiry Group study on PPSR released in July 2009. Rick Bonney of the Cornell Lab of Ornithology was the lead author.

"The natural world is full of questions whose answers require a PPSR approach," the authors noted. "Many more projects could be created that will appeal to the

increasing numbers of amateur naturalists and stargazers who are interested in lending their brains to science."

The full report is available at <http://caise.insci.org/uploads/docs/PPSR%20report%20FINAL.pdf>. ■

Welcome to ASTC

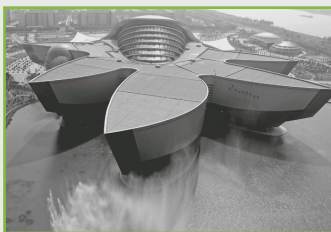
The following new members were approved by the ASTC Board in September 2009. Contact information is available in the About ASTC section of the ASTC web site, www.astc.org.

SCIENCE CENTER AND MUSEUM MEMBERS

- **Guangdong Science Center**, Guangzhou, Guangdong, China. Open to the public since September 2008, this science center encompasses 864,000 square feet of interior exhibition space and an outdoor exhibition area spread out over 77 acres. The center includes nine permanent exhibition halls, four science theaters, an Exploration Park with more than 60 outdoor exhibits, and an Academic Exchange Center/Scientist's Club with conference facilities and guest rooms.

The Guangdong Science Center encompasses 864,000 square feet of interior exhibition space.

Photo courtesy the Guangdong Science Center



- **Gwacheon National Science Museum**, Gwacheon, Gyeonggi-do, Korea. Built by the Gyeonggi Province and the Korean Ministry of Education, Science, and Technology, at a cost of more than U.S.\$375 million, this 533,696-square-foot facility celebrated its grand opening in November 2008, after seven years of construction. A planetarium, celestial observatory, insectarium, ecological park, outdoor exhibition area, and more are located beyond the museum's walls on the 60-acre science campus.

- **Thanksgiving Point Institute**, Lehi, Utah. This 312-acre museum complex and community gathering place is home to a small-scale working farm, themed gardens, and the Museum of Ancient Life, which features 60 fully articulated dinosaur skeletons, 50 interactive exhibits, and a 3-D large-format theater. A capital campaign is underway to build a \$20 million science/children's museum, set to open in 2011.

SUSTAINING MEMBERS

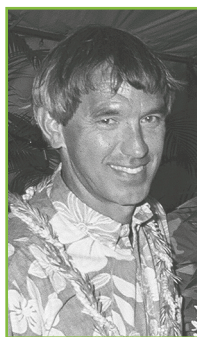
- **Bill Peters Consulting**, Calgary, Alberta, Canada
- **Billings Productions Inc.**, McKinney, Texas
- **Design Island Associates, Inc.**, Orlando, Florida
- **Unified Field, Inc.**, New York City. ■

Master Navigator to Deliver ASTC 2010 Keynote

Charles Nainoa Thompson, executive director of the Polynesian Voyaging Society (PVS), will deliver the keynote address at the 2010 ASTC Annual Conference. Thompson is a master of non-instrument navigation (wayfinding). Hosted by the Bishop Museum in Honolulu, October 2–5, ASTC 2010 will address the theme “Ho‘okele—To Navigate: Science Centers as Wayfinders to New Horizons.”

The first Hawaiian since the 14th century to practice wayfinding on long-distance ocean voyages, Thompson began his study under master navigator Mau Piailug of Satawal, Micronesia, in the early 1970s. He later played an integral role in the design, construction, sailing, and navigation of PVS's double-hulled voyaging canoe, *Hokule'a*. In 1985–87, he took the canoe on a voyage of more than 16,000 nautical miles, from Hawaii to New Zealand and back. In both Hawaii and Polynesia, he has led a revival of traditional arts associated with voyaging. He directed a 1995 long-distance voyage in which three Hawaiian canoes from PVS joined with five other traditional Polynesian canoes. He is now developing a program designed to teach Hawaiian children about Polynesian voyaging traditions and conservation principles, along with modern scientific knowledge.

Early bird registration for ASTC 2010 lasts until July 19. Under these special rates, ASTC members pay \$540 and nonmembers pay \$660. ASTC members buying four full conference registrations receive a fifth full registration at half price. Visit www.astc.org/conference.



Charles Nainoa Thompson. Photo courtesy the Bishop Museum

Surrounded by Science

On March 3–5, the Center for Advancement of Informal Science Education (CAISE), with support from the U.S. National Science Foundation (NSF), hosted the biennial Informal Science Education (ISE) Summit in Washington, D.C. The nearly 450 participants in the ISE Summit—which took the theme “Surrounded by Science”—included principal investigators of NSF grants and others engaged in strategic issues across the ISE field.

Summit plenary speakers included Tom Kalil, deputy director for policy at the White House Office of Science and Technology Policy; Neil deGrasse Tyson, director of the Hayden Planetarium in New York City and host of *NOVA scienceNOW*; and Bruce Lewenstein, co-chair of the U.S. National Research Council (NRC) Committee that produced the 2009 consensus report *Learning Science in Informal Environments: People, Places, and Pursuits*.

Building on the momentum from the NRC report, CAISE initiated a nationwide effort to focus attention on ISE's contributions to science, technology, engineering, and math learning outside of school, including the infrastructure that supports this learning and the policies that advance and constrain opportunities in ISE. Attendees were encouraged to participate in robust discussions and identify key issues for the ISE community to address.

Also at the summit, federal agencies highlighted collaborative efforts and underscored their support of ISE. The summit also featured the unveiling of *Surrounded by Science: Learning Science in Informal Environments*, a new book published by the NRC that builds on the findings of the 2009 report.



Saul Rockman (left) of Rockman et al and Jamie Larsen of TERC sign up to participate in roundtable discussion groups formed during the ISE Summit. Photo by Christine Ruffo

Noyce Leadership Fellows Announced

In conjunction with ASTC, the Noyce Foundation, and the U.S. Institute of Museum and Library Services (IMLS), the Noyce Leadership Institute announced the third cohort of Noyce Leadership Fellows in March. Through their Fellowships, 18 senior level managers from science centers and related institutions will increase their capacity to lead effectively and advance innovation in their institutions and communities.

Congratulations to the 2010–2011 Fellows (in bold) and their sponsors:

- **Betsy Adamson**, Patrick Lopez, Explora, Albuquerque, New Mexico
- **Sharon Ament**, Michael Dixon, Natural History Museum, London
- **Blake Andres**, Linda Abraham-Silver, Great Lakes Science Center, Cleveland, Ohio; David Abbot, George Gund Foundation
- **Concetta Bencivenga**, Laura Foster, Please Touch Museum, Philadelphia
- **Julie Bowen**, Jennifer Martin, TELUS World of Science, Calgary, Alberta, Canada
- **Sam Dean**, Thomas C. Rockwell, Exploratorium, San Francisco
- **Kirsten Ellenbogen**, Eric Jolly, Julie Johnson, Science Museum of Minnesota, St. Paul
- **Kim Gladstone Herlev**, Asger Høeg, Experimentarium, Hellerup, Denmark
- **Judy Gradwohl**, Smithsonian National Museum of American History; Richard Kurin, Smithsonian Institution, Washington, D.C.
- **Michal Jacob**, Bryce Seidl, Pacific Science Center, Seattle
- **Kimberlee Kiehl**, COSI, Columbus, Ohio; Joe Heimlich, Ohio State University
- **Lara Kimber**, Charlie Trautmann, Sciencenter, Ithaca, New York
- **Guy Labine**, Jim Marchbank, Science North, Sudbury, Ontario, Canada
- **Ellen McCallie**, Samuel Taylor, Carnegie Museum of Natural History, Pittsburgh
- **Diane Miller**, Doug King, Saint Louis Science Center, Missouri

- **Steve Snyder**, Troy Collins, Franklin Institute, Philadelphia
- **Raymond Vandiver**, Nancy Stueber, Oregon Museum of Science and Industry, Portland
- **Charlie Walter**, Van Romans, Fort Worth Museum of Science and History, Texas.

Cosmic Serpent

On February 8–12, 59 Cosmic Serpent Fellows representing tribal museums and science centers in California, Hawaii, Nevada, and Oregon gathered in Lakeside, California, for a week-long workshop focusing on bridging indigenous and Western science paradigms. Led by the Indigenous Education Institute and University of California, Berkeley, Space Sciences Laboratory and supported by ASTC and the Smithsonian National Museum of the American Indian, the California regional workshop was hosted by the Barona Band of Mission Indians. It followed earlier workshops held in New Mexico (southwest region) and Washington (northwest region). Follow-up workshops will take place later this year. For more information, visit www.cosmicserpent.org or contact Laura Huerta Migus at lhuertamigus@astc.org.

The Global Marathon

The Global Marathon For, By, and About Women in Engineering and Technology, centering on the theme “Launching Tomorrow,” took place March 10–11. The 2010 marathon kicked off from the Adler Planetarium in Chicago with Sally Ride, the first U.S. woman in space, as keynote speaker, and introductions by marathon co-chairs Leslie Jones of Motorola, Inc., and Nan Mattai of Rockwell Collins. Programming proceeded around the globe and concluded with a live webcast on the social and business benefits of bringing women into engineering. Archived programming will be available at www.eweek.org/EngineersWeek/GlobalMarathon.aspx?ContentID=44. ■

Calendar

MAY

- 5 National Lab Day.** *Details:* www.nationallabday.org
- 5–7 CASC Annual Conference.** “Audacity.” Hosted by the Montréal Science Centre, Canada. *Details:* www.canadiansciencecentres.ca/conferences.htm
- 6–8 InterActivity 2010.** “Invest Early, Inspire Growth.” Association of Children’s Museums. Hosted by Minnesota Children’s Museum, St. Paul. *Details:* www.childrensmuseums.org
- 7 Space Day.** *Details:* www.spaceday.com
- 18 International Museum Day.** “Museums for Social Harmony.” *Details:* <http://icom.museum/imd.html>
- 23–26 American Association of Museums Annual Meeting.** “Museums Without Borders.” Los Angeles. *Details:* www.aam-us.org/am10

JUNE

- 3–5 Ecsite Annual Conference 2010.** Hosted by DASA, Dortmund, Germany. *Details:* www.ecsite.eu

JULY

- 21–23 Big Event 2010.** “Parallel Worlds.” Centre for Life and CultureLab, Newcastle upon Tyne, United Kingdom. *Details:* www.big.uk.com/bigevent
- 29–31 Visitor Studies Association 23rd Annual Conference.** “Building Shared Agendas.” Phoenix, Arizona. *Details:* www.visitorstudies.org/index.php?page=conference

SEPTEMBER

- 20–25 23rd Annual Theatre in Museums Workshop.** Hosted by the Children’s Museum of Indianapolis. *Details:* Patricia Daily, 317/334-3819, patricia@childrensmuseum.org

OCTOBER

- 2–5 2010 ASTC Annual Conference.** “Ho’okele—To Navigate: Science Centers as Wayfinders to New Horizons.” Hosted by the Bishop Museum, Honolulu, Hawaii. *Details:* www.astc.org/conference



The Bishop Museum's Hawaiian Hall includes a sperm whale skeleton and a traditional Hawaiian grass house. Photo by Nathan Kam

LAYERS OF MEANING—When the **Bishop Museum**, Honolulu, updated its *Hawaiian Hall*, many visitors had their first glimpse of several uniquely Native treasures. One of these—brown curly koa woodwork, once unseen behind white painted walls—sets a tone for the displays in the gallery, which reopened to the public on August 8, 2009.

The 16,500-square-foot hall's \$21 million, three-year renovation enabled the museum to bring the exhibition up to modern conservation standards, display more of its collection of 1.2 million Hawaiian artifacts, and tell the story of Hawaii with a true Native emphasis. Charles Reed Bishop founded the museum in 1889 to house the collection of Hawaiian artifacts owned by his late wife, Princess Bernice Pauahi Bishop, the last legal heir of Hawaii's Kamehameha Dynasty.

The team incorporated modern lighting, climate controls, and electrical wiring into the volcanic-stone structure. The designers planned a first floor, *Kai Ākea*, the world of precontact Hawaii and its legends and religion; a second floor, *Wao Kanaka*, representing life and work amid land and nature; and a third floor, *Wao Lani*, where visitors meet the *ali'i* (chiefs) and experience Hawaiian history from insiders' perspectives. Interpretive techniques include touchscreens featuring materials from the museum's archives.

Key artifacts include a 50-foot sperm whale skeleton and a *hale pili* (traditional Hawaiian grass house), restored with help from local students, staff, and community volunteers.

Financial support was provided by the J.M. Long, Vera M. Long, Geist, Cooke, Strong, and Atherton Foundations; the Office of Hawaiian Affairs;

Kamehameha Schools; the State of Hawai'i; Bank of Hawaii Foundation; A&B Foundation; Frear Eleemosynary Trust; Hawai'i Community Foundation; and many private donors. Partners included Mason Architects, Inc.; planning and design firm Ralph Appelbaum Associates; and project manager Heath Construction Services.

The Bishop Museum will host the 2010 ASTC Annual Conference, October 2–5; www.astc.org/conference.

Details: Donalyn Dela Cruz, public affairs director, donalyn@bishopmuseum.org

BLOWING IN THE WIND—Visitors casually crossing Eaglesham Moor, East Renfrewshire, Scotland, might startle at the sight of dozens of turbines turning in the breeze. That is, unless they are aware of the Scottish government's plan to garner half the country's power from renewable energy—mostly from wind—by 2020. Whitelee Windfarm is Europe's largest onshore wind farm and the site of an intriguing science center–community partnership.

As of September 2009, **Glasgow Science Centre**, Scotland, began managing and operating Whitelee Windfarm Visitor Centre, a brand new exhibition center under the auspices of the wind farm's operator, Scottish Power Renewables. (See the November/December 2009 issue of *ASTC Dimensions*.) The center sits just 20 minutes from Glasgow city center, amid the Whitelee Access project, a 52-mile recreation zone with ample opportunity to observe local wildlife.

Scottish Power Renewables worked with Glasgow Science Centre on planning and design for the visitor center.



Whitelee Windfarm Visitor Centre is managed and operated by Glasgow Science Centre.

Photo courtesy Glasgow Science Centre

By Diana Cohen Altman

The company recruited the science center to serve as the official interpretive partner in welcoming the public.

The center's hands-on activities focus on the logistics of building a wind farm, asking questions such as: Where is the best place to put the turbines? How many blades would you give them? The facility's "learning hub" features educator-led sessions for primary and secondary school students.

Hypostyle Architects built the U.S.\$4.6 million visitor center. Partners include the East Ayrshire Council, East Renfrewshire Council, Forestry Commission, Royal Society for the Protection of Birds, Scottish National Heritage, Scottish Water, and South Lanarkshire Council.

Details: Sharon Lyons, press office, sharon.lyons@glasgowsciencecentre.org

A SCIENCE CENTER RETURNS—On October 10, 2009, **Imagination Station**—formerly known as **COSI Toledo**—reopened on the Toledo, Ohio, riverfront.

Situated on the site of the former Portside Festival Marketplace, COSI Toledo welcomed 2.5 million visitors over 10 years, beginning in 1997. It won the prestigious National Medal for Museum and Library Service from the U.S. Institute of Museum and Library Services in 2005. In 2007, it closed due to financial difficulties.

Less than a year later, residents of Lucas County, Ohio, approved an operating levy for the science center, enabling the facility to reopen in 2009. To mark the center's rebirth, staff held a renaming contest. Out of the 2,000 responses, 11 people suggested "Imagination Station."

The 100,000-square-foot Imagination Station retains many of COSI Toledo's longtime favorites, such as the BOYO, which lets visitors bounce in the air like a human yo-yo. New exhibits include the Hurricane Chamber, where visitors can experience gale-force, tropical storm, and Category 1 hurricane-force winds, and the Giant Lever, where visitors can test their strength to



After \$1.5 million in renovations, Imagination Station opened October 10, 2009, on Toledo's downtown riverfront. Courtesy Imagination Station

offset the lever's mechanical advantage.

The science center's 300 exhibits are organized into five Learning Worlds: *Science Studio*, which features frequently changing hands-on activities; *Mind Zone*, which explores illusions and sound; *Water Works*, which includes water and erosion tables and weather exhibits; *Little KIDSPACE*, designed for children ages five and under; and a traveling exhibition gallery. A new Learning World, *Energy Factory*, is scheduled to open in the first half of 2010. Educational materials for the exhibits are aligned to academic content standards in both Ohio and Michigan.

Portions of the \$1.5 million in renovations were designed by **Roto Studio** and funded by the Ohio Cultural Facilities Commission. Other major donors included BP, First Solar, and Buckeye CableSystem.

Details: Anna M. Kolin, communications and public relations manager, kolin@imaginationstationtoledo.org

EXPLORING ECOSYSTEMS—Few museums have the real estate or resources to undertake a two-story, 45,000-square-foot permanent exhibition. The **California Science Center** in Los Angeles positioned *Ecosystems*, which opened March 25, as a priority in its ongoing 25-year master plan. Phase II, which unveils both *Ecosystems* and an expanded *World of Life* gallery, nearly doubles the center's interior exhibition space.

Eight exhibition "zones" draw visitors into *Ecosystems*, where they receive

instant cues to the multisensory nature of the exhibits. In the Desert area of the Extreme Zone, for example, a 3,500-gallon flow of water—representing a flash flood—interrupts the quieter sounds of the desert every 10 minutes. Nearby, live tortoises, lizards, and scorpions represent some of the residents of this particular ecosystem.

Some of the zones particularly appeal to children. The 24-foot-long transparent acrylic tunnel through the 188,000-gallon kelp habitat in the Forest Zone beckons young visitors. Highlights of the Rot Room include flesh-eating beetles and time-lapsed images of decay. In the Family Discovery Room, young children can explore the familiar habitat of the home and learn about its residents, including humans, pets, and pests.

The exhibition also includes the River Zone, the Island Zone, the Global Zone, and the L.A. (Los Angeles) Zone. Messages of connectedness of species and adaptation are woven throughout.



In the kelp tank at *Ecosystems*, a diver swims amid more than 1,500 live fish, kelp, and other marine life found off the Southern California coast. Photo by Leroy Hamilton

As of February 2010, the center had raised \$136.3 million of the targeted \$165 million to support the exhibition's construction. Five community and business leaders—Wallis Annenberg, G. Bradford Jones, Melanie Lundquist, Margo Leonetti O'Connell, and John Sussman—are leading the campaign, which includes the support of individuals, foundations, and corporations.

Details: Diane Perlov, senior vice president for exhibits, dperlov@cscmail.org ■

In the March/April 2010 issue of *ASTC Dimensions*, some information was missing from a Spotlight item on Around the Americas. Around the Americas is an ocean environment project organized by Pacific Science Center, Seattle, and Sailors for the Sea, in partnership with the University of Washington Applied Physics Lab, the Joint Institute for the Study of the Atmosphere & Ocean, the Massachusetts Institute of Technology Sea Grant College Program, and the U.S. National Aeronautics and Space Administration. Around the Americas is supported by lead grants from the Tiffany & Co. Foundation, the Rockefeller Family, and Unilever. Also, in a People item in the March/April 2010 issue, the name of a museum was listed incorrectly. Joe Keiper is now executive director of the Virginia Museum of Natural History, Martinsville. We regret the omission and the error.

Grants & Awards

The Center for History of Physics, American Institute of Physics, awarded a \$9,920 grant to the **Schenectady Museum & Suits-Bueche Planetarium**, Schenectady, New York. The grant will support the preservation of archival photographs and the standardization and conversion of archive files, as well as the creation of 23 finding aids related to the museum's General Electric collections. Grants were also awarded to Cornell University and the University of Chicago.

The **Fort Worth Museum of Science and History**, Texas, was honored with the Fort Worth Chapter of the American Institute of Architects' 2009 Community Award. The award recognizes organizations that have helped to promote an appreciation of architecture in the community. The museum, which opened its new facility in November 2009, represents a co-mingling of the architectural styles of Texas and Mexico.

ThincDesign, an exhibit design firm based in New York City, received the 2009 China's Most Successful Design Award for the Johnson & Johnson Olympic Pavilion at the 2008 Olympics in Beijing. ■

William Y. Brown resigned as president and CEO of the Academy of Natural Sciences, Philadelphia, to become president and director of Woods Hole Research Center, Falmouth, Massachusetts, effective February 1. Brown had also served as president and CEO of the Bishop Museum, Honolulu. **Edward Daeschler**, the Academy's vice president of systematic biology and library, and associate curator and chair of vertebrate zoology, has assumed the role of acting president while a nationwide search takes place.

Chris Cable, former director of the Imaginarium (now the Anchorage Museum and Imaginarium Discovery Center), Alaska, accepted the position of executive director of the Mobius Science Center, Spokane, Washington. Cable will be focusing on constructing a new facility and preparing it for operations.

At the Discovery Museum, Bridgeport, Connecticut, executive director **Linda Malkin** stepped down from her position to pursue an advanced degree in education. Malkin joined the museum as its lead science instructor in 1991. Museum trustee **Jeffrey Bishop** is serving as acting executive director.

In December 2009, **Ka'iu Kimura** was named interim executive director of the 'Imiloa Astronomy Center of the University of Hawaii at Hilo. She replaces **Peter Giles**, who had served as executive director since 2005. Kimura began her work at 'Imiloa in 2001, researching Native Hawaiian content. Since then, she has served as the center's experience coordinator and associate director. Kimura was selected as an ASTC Diversity & Leadership Development Fellow in 2006 and a Center for Advancement of Informal Science Education (CAISE) Fellow in 2008. She is the first former Diversity Fellow to attain an executive directorship.

On March 1, **Jennifer Stancil**, former executive director of the Girls, Math & Science Partnership (GMSP), Carnegie Science Center, Pittsburgh, became executive director of educational partnerships at WQED Multimedia, Pittsburgh, a flagship PBS station. Before leading GMSP, Stancil had been director of exhibit and group programs at Exploris, Raleigh, North Carolina, and manager of research, evaluation, and concept development at McWane Science Center, Birmingham, Alabama.

Katie McCarthy joined ASTC on March 15 as its administrative assistant. A recent graduate of the University of Virginia with bachelor of arts degrees in history and Spanish, McCarthy has worked as a guide and interpreter at historic house museums in Charlottesville and Newport News, Virginia. She succeeds **Christina Jones**, who is now a program assistant at the U.S. National Science Foundation.



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