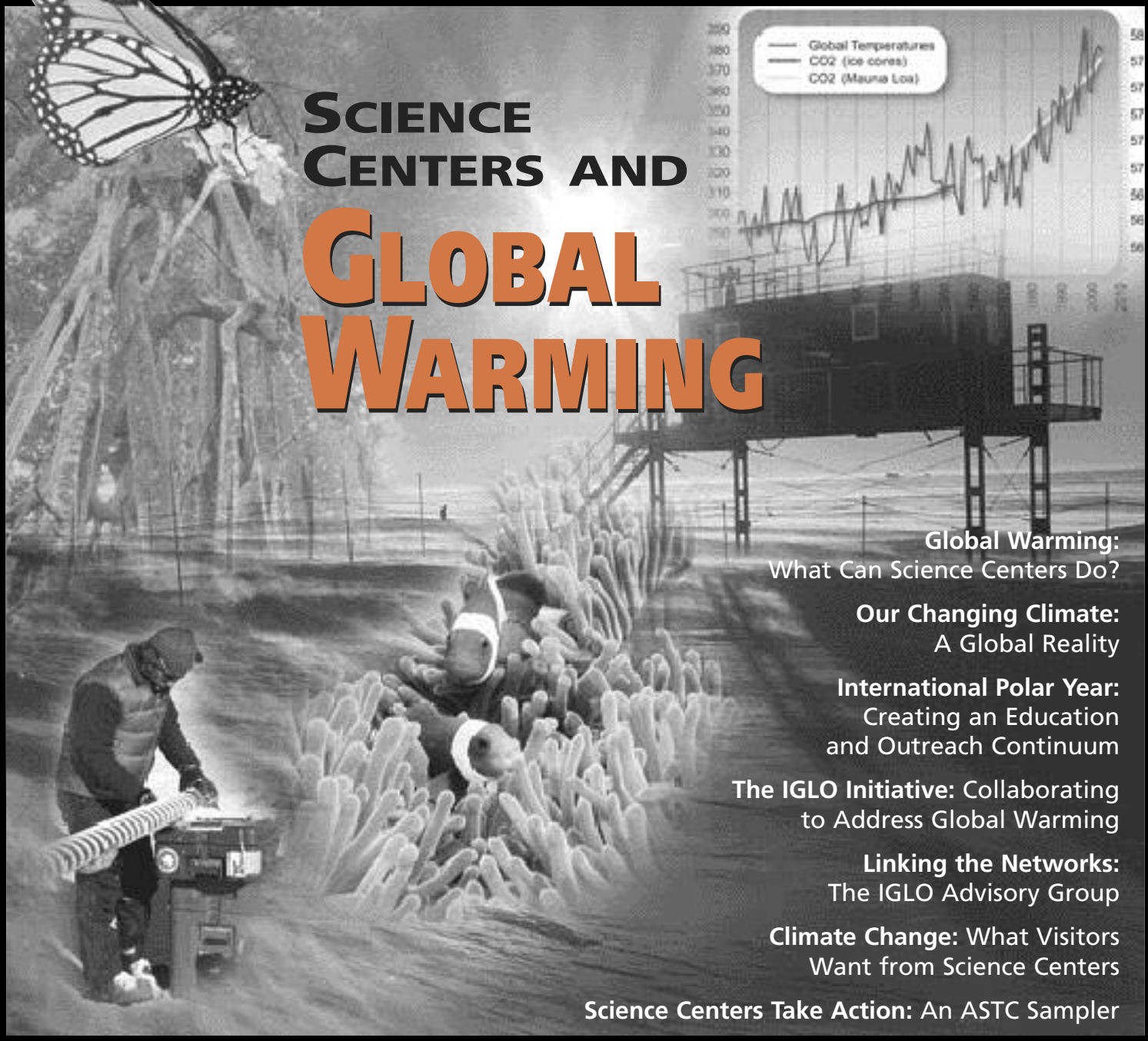
ASTC Dimensions

Bimonthly News Journal of the Association of Science-Technology Centers

November/December 2006

EARTH IN TRANSITION:



SCIENCE CENTERS AND GLOBAL WARMING

Global Warming: What Can Science Centers Do?

Our Changing Climate: A Global Reality

International Polar Year: Creating an Education and Outreach Continuum

The IGLO Initiative: Collaborating to Address Global Warming

Linking the Networks: The IGLO Advisory Group

Climate Change: What Visitors Want from Science Centers

Science Centers Take Action: An ASTC Sampler

ASTC Dimensions

Bimonthly News Journal of the Association of Science-Technology Centers

IN THIS ISSUE

November/December 2006

The start of the International Polar Year (IPY) in March 2007 marks the start of a major new undertaking for the science center community as well. ASTC's "International action for GLObal warming" initiative (IGLO), an officially endorsed component of the IPY, will bring museums worldwide into partnership not only with IPY education and outreach efforts, but also with the International Polar Foundation, the World Ocean Network, UNESCO, and more. As scientists document the effects of rapidly increasing temperatures and greenhouse gas concentrations on Earth's key Polar Regions, museum visitors will have a chance, through IGLO, to follow the research, participate in public debate, assess the impact of human activity, and take action locally, nationally, or internationally.

Features

Departments

Cover: *The International Polar Year 2007–2008 will highlight the effects of climate change around the globe.* Photos (clockwise from top right): Global Average Temperature and CO_2 Concentrations, 1880–2004/Woods Hole Research Center, www.whrc.org; Geophysical Observatory, Neumeyer Station, Astrid Richter/Alfred-Wegener-Institut; Great Barrier Reef, Evergreen/UNESCO; ice core removal, Emily Stone/National Science Foundation; UjungKulon National Park (Indonesia), Evergreen/UNESCO; monarch butterfly, Carlye Calvin/University Corporation for Atmospheric Research

ASTC Dimensions (ISSN 1528-820X) is published six times a year by the Association of Science-Technology Centers Incorporated, 1025 Vermont Avenue NW, Suite 500, Washington, DC 20005-6310, U.S.A. *ASTC Dimensions* is printed on 45 percent recyled paper with environmentally friendly inks.

ASTC Dimensions is intended to keep member institutions apprised of trends, practices, perspectives, and news of significance to the science center field. All ASTC members receive five free copies of each issue as a benefit of membership. Individual subscriptions are also available: For employees of ASTC-member institutions, the annual rate is US$35; $45 outside the United States. For all others, the price is $50; $60 outside the United States. Send name, address, name of institution, and payment in U.S. dollars to ASTC, 1025 Vermont Avenue NW, Suite 500, Washington, DC 20005-6310, U.S.A., Attn: ASTC Dimensions. For more information or to order bulk subscriptions, call 202/783-7200 x140, or e-mail pubs@astc.org. ALTERNATIVE FORMATS AVAILABLE ON REQUEST.

To submit news items and ideas for articles, contact Carolyn Sutterfield, editor, 202/783-7200 x130; e-mail csutterfield@astc.org. For editorial guidelines, visit *www.astc.org*.

Global Warming:
What Can Science Centers Do?

By Jeffrey Kirsch and Erik Jacquemyn

In February 2005, then ASTC president Per-Edvin (Pelle) Persson urged the Board of Directors to take action to create "international cooperative programs that will establish good practices in science communication, sound implementation of scientific innovation, and the use of science as a tool for understanding, development, and peace." Arguing that ASTC, as the sole global science center network, is well suited to lead such an effort, Pelle recommended dedicating a new staff position to the project and taking up a suitable science-and-society issue, such as AIDS, the unauthorized dissemination of nuclear material, or global warming, as the focus.

ASTC's International Advisory Board, meeting in Rio de Janeiro in advance of the 4th Science Centre World Congress, endorsed Pelle's suggestions. Noting the evidence from direct observation and supercomputer-based analyses indicating that the planet, influenced by human activities, might be undergoing a climatic shift, and recalling ASTC's history of related programming, beginning with the *Greenhouse Earth* exhibition in 1990, they put forward climate change as a first topic.

A conceptual plan emerged for an agenda of collaborative programs, events, and resources to be overseen by a new ASTC Director of International Relations. In October 2005, the Board of Directors approved the position and the topic, linking the project to the planned 2007–2008 International Polar Year (IPY). New director Walter Staveloz, hired in January 2006, began immediately to build a network of partners for what became known as IGLO (International action on GLObal warming). This issue of *ASTC Dimensions* is a direct result of those actions.

From our perspective, ASTC could not have chosen a more pertinent topic. In the search to understand climate change, all of science and mathematics comes into play. Everyone on Earth is involved in the seemingly inexorable temperature increases observed in our atmosphere, land, and seas. Scientists no longer debate whether something unusual is happening—or whether the biosphere will undergo profound changes as a result (see "Our Changing Climate," page 4). But what can science centers do?

IPY opens the door. With its international teams of field scientists and computer scientists, this research and education initiative promises a new data-based context for global action. IGLO offers a means to engage both students and the general public in IPY's scientific process, as well as in the debates and issues that will follow as new data emerges.

Science centers should grab this opportunity to raise public awareness and participation. Already, the public has heard from those who believe that sufficient data on climate change has not been, and may never, be collected; that the new computer models are too uncertain a basis for determining if anthropogenic gases and pollutants lie at the core of the problem; and that, if global warming is happening, it may be due solely to natural causes.

Perhaps, a few more extinct species and minor climatic adjustments from now, subsequent generations will breathe a collective sigh of relief without our having done anything at all. Perhaps not. But can we afford to gamble the future on that view?

What science centers offer is neutral ground for presenting an alternative. We can remind our visitors that human actions generate positive global consequences as well as negative ones. In the recent past, nations have agreed to cease testing nuclear weapons in the atmosphere; to preserve Earth's protective ozone layer by banning chlorofluorocarbons from indiscriminate use; and to control the amount of smog-making pollution emanating from vehicles and power plants. What might the world community accomplish, we can ask, if we took the current environmental "signs" as reason enough to address climate change cooperatively?

The time is ripe. In 2005, the landmark Kyoto Treaty went into effect, signed by 140 nations, despite official U.S. objections. In 2006, people who could hardly be called "activists" lined up to see *An Inconvenient Truth,* the film featuring Al Gore's compelling presentation on the effects of rising CO_2 levels. *Time* and *Newsweek* ran cover stories on global warming. At the St. Petersburg G8 summit in July, strategies for addressing climate change were high on the agenda. And in the bellwether state of California, governor Arnold Schwarzenegger recently struck a deal with the legislature to cap the state's greenhouse-gas emissions. "We have the science. We see the threat," Schwarzenegger said, "and we know the time for action is now."

Around the world, it is clear that people and nations are preparing to do something about climate change. In that global process, respected authorities are needed to help educate and engage the public. If not science centers, who? If not now, when? ■

Jeffrey Kirsch is executive director of the Reuben H. Fleet Science Center, San Diego, California, and chair of the IGLO Education Committee. Erik Jacquemyn is CEO of Technopolis, Mechelen, Belgium, and an ASTC board member. Together, they chair ASTC's International Advisory Board.

Our Changing Climate:

A Global Reality

By Robert W. Corell

Earth's climate is changing, with the global temperature now rising at a rate unprecedented in the experience of modern human society. Although some historical changes in climate have resulted from natural causes and variations, the strength of the trends and the patterns of change in recent decades, scientists agree, come primarily from increased emissions of carbon dioxide and other greenhouse gases.

The Intergovernmental Panel on Climate Change (IPCC), a joint effort of the United Nations Environmental Programme and the World Meteorological Organization, stated in its *Third Assessment Report* (2001) that "there is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities" (*www.ipcc.ch*).

According to the IPCC, the scientific community projects an acceleration of these climatic trends during the 21st century, caused primarily by continuing increases in concentrations of greenhouse gases in Earth's atmosphere. The concentration in the atmosphere of carbon dioxide (CO_2), the most dominant greenhouse gas, has increased from preindustrial levels (late 1800s) of 270 ppmv to the current level of almost 390 ppmv—a 40+ percent increase in less than 150 years—with a mid-range concentration of CO_2 projected by IPCC to reach more than 600 ppmv by 2100.

Through global and regional assessments and the preponderance of scientific literature, the scientific community has documented the consequences of the changing climate and its attendant impacts on societies and the planet's environmental envelope. These climate changes are being experienced particularly intensely in the Arctic. In *Impacts of a Warming Arctic* (December 2004), the Arctic Climate Impact Assessment (ACIA) has documented that over the past four decades Arctic average temperatures have risen at almost twice the rate of global averages—with regions like Alaska experiencing increases of five to eight times the global average (*www.acia.uaf.edu*). The peninsular region of Antarctica is experiencing similar temperature changes.

Greenhouse gas emissions are projected to bring wide-ranging changes and impacts across the planet. The changing climate has already reduced the extent of sea ice in the Arctic by about 25 percent since 1979, with projections from the ACIA for a potential total loss of summer sea ice in the next 50 to 100 years. Such changes are likely to have devastating consequences for polar bears and ice-dependent seals, as well as the local people for whom these animals are a primary food source. On the other hand, reduced sea ice is also likely to increase marine access to the region's resources, expanding opportunities for shipping and possibly for offshore petroleum extraction.

The melting of high-latitude and high-altitude glaciers, particularly in the Arctic, is one factor contributing to a sea-level rise around the globe that, when combined with the expansion of warming oceanic waters, is projected to be upwards of 1 meter by the end of this century. One meter of sea level rise will impact hundreds of millions of people worldwide. These changes provide an early indication of the environmental and societal significance of global warming.

Such scientific findings are essential elements as nations face decisions about how to reduce the risks of climate change on all scales, from local to global. The following are some of the effects of climate change predicted by the IPCC, ACIA, and the scientific community:

- *Climate change will exacerbate water shortages in many water-scarce areas of the world.*
- *Climate change is projected to increase threats to human health, particularly among lower income populations.*
- *Ecological productivity and biodiversity will be altered by climate change.*
- *Marked increases in cyclonic storm intensity (e.g., hurricanes) will raise socioeconomic costs.*
- *Populations that inhabit small islands and/or low-lying coastal areas are already at risk of severe social and economic effects from sea-level rise and storm surges.*
- *The impacts of climate change will fall disproportionately on developing countries and poor persons within all nations, exacerbating inequities in health status and access to adequate food, clean water, and other resources.*

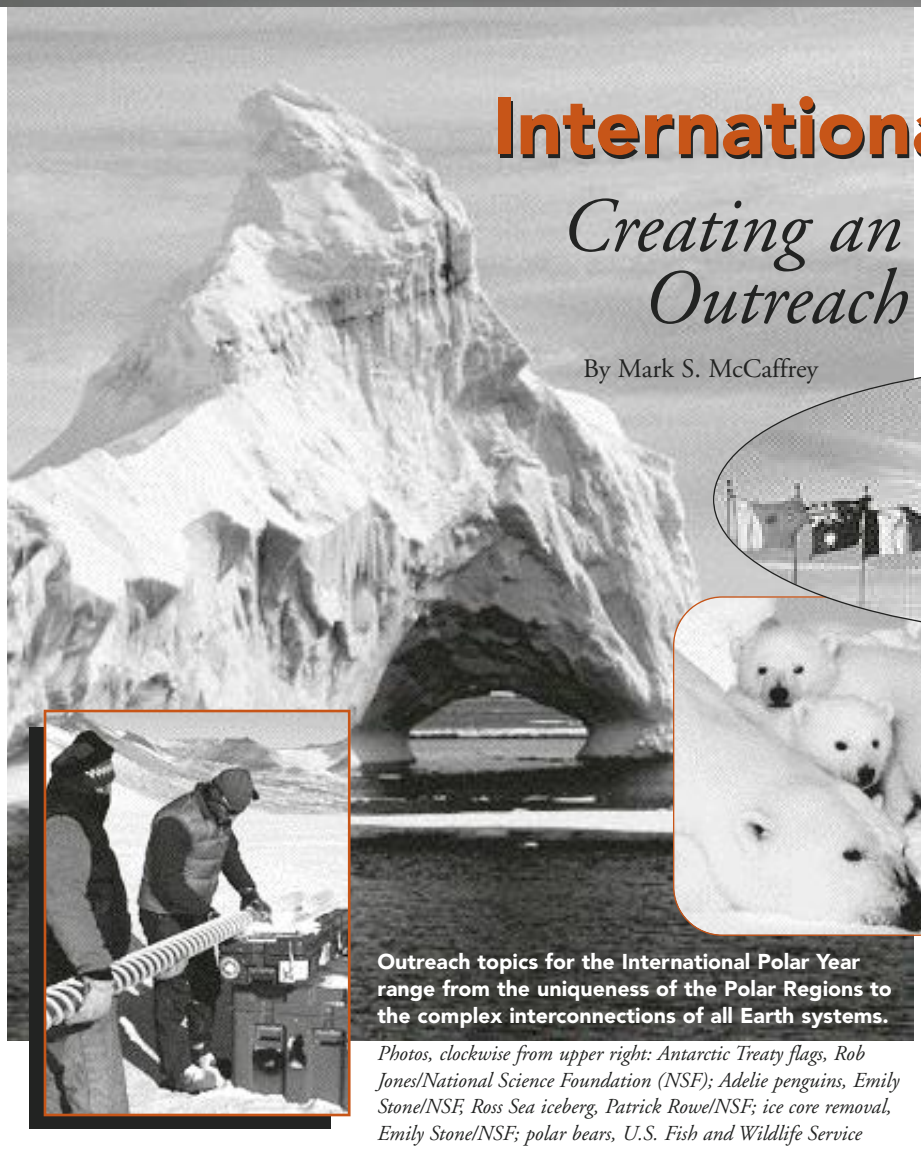
As the pace and extent of climate change and its impacts increase, it will become more important for societies throughout the world to be aware of these changes and to consider their impact in evaluating what actions should be taken to respond. ■

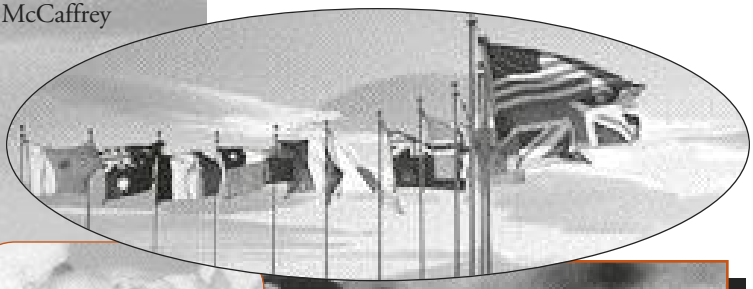
Robert W. Corell, senior fellow in the Atmospheric Policy Program of the American Meteorological Society (AMS), is chair of ASTC's IGLO Scientific Committee. He served previously for 12 years as assistant director for geosciences at the National Science Foundation.

International Polar Year:

Creating an Education and Outreach Continuum

By Mark S. McCaffrey





Outreach topics for the International Polar Year range from the uniqueness of the Polar Regions to the complex interconnections of all Earth systems.

Photos, clockwise from upper right: Antarctic Treaty flags, Rob Jones/National Science Foundation (NSF); Adelie penguins, Emily Stone/NSF, Ross Sea iceberg, Patrick Rowe/NSF; ice core removal, Emily Stone/NSF; polar bears, U.S. Fish and Wildlife Service

In any scientific undertaking, education, outreach, and communication (EOC) are part of a continuum that ranges from images and short snippets of information on one end to unfiltered raw data on the other. Anyone who sets out to convey the import of research projects must understand the needs of the specific audiences addressed—be they interestedstudents, middle-school science teachers, decision makers, regional communities, or the general public—and be prepared to adapt communications as appropriate for each group.

The International Polar Year 2007–2008, running in actuality from March 2007 to March 2009, will involve hundreds of projects and thousands of scientists and interdisciplinary support teams. It will leverage billions of dollars in infrastructure and prior research. And it will showcase brilliant science and highlight such timely, complex topics as the rapid melting of glaciers and icepacks, the experience and insights of the Arctic's 4 million residents, and the role of carbon in the climate system.

IPY organizers—the International Council for Science (ICSU) and later the World Meteorological Organization—saw from the start that success would depend on communicating activities and findings to a broad audience. They recalled how during the International Geophysical Year of 1957–58 (which was also the third International Polar Year), extensive newspaper and television coverage was influential in arousing public interest in the Polar Regions. IGY outreach helped to build support for the 1961 Antarctic Treaty, which protects the southern continent for nonmilitary, scientific research.

"The Polar Regions provide a powerful context for teaching and learning, attracting a wide and diverse audience," declares the ICSU's *Framework for the International Polar Year 2007–2008*. "The education, outreach, and communication strategy for the IPY must address the question 'Why are the polar regions and polar research important to all people on Earth?'"

To that end, all formally endorsed IPY research projects will be required to address EOC goals, and the IPY calendar will include a series of nationally and internationally coordinated programs designed to engage public interest in and support for the project's work.

Building IPY's EOC community

An integrated EOC campaign doesn't just happen. Over the past two years, a

series of workshops has helped to build the IPY community and explore ways to maximize EOC impact.

The first, organized by Robin Bell and Stephanie Pfirman of Columbia University's Lamont-Doherty Earth Observatory, was held in Washington, D.C., in June 2004. "Bridging the Poles: Linking Education with Research" brought together polar researchers, science educators, and other polar enthusiasts to develop an interdisciplinary approach to communicating IPY activities. Participants recommended that EOC efforts build on the strength of polar research by focusing on three elements: "a sense of place for researchers, educators, students, and the general public; pride of place for Arctic residents, especially indigenous Alaskans; and a sense of connectedness [and] relevance." (A full report is available online at *www.ldeo.columbia.edu/res/pi/polar_workshop*.)

Continuing the momentum, a second workshop, "Poles Together," was held in Boulder, Colorado, in July 2005. Organized by the University of Colorado's Cooperative Institute for Research in Environmental Science (CIRES), with in-kind support from NOAA, the workshop drew more than 100 participants. Among them were researchers, teachers, and representatives from U.S. federal agencies (NOAA, NSF, USGS, and NASA) and from the International Antarctic Institute in Hobart, Australia; the International Polar Foundation (see page 8); and the Swedish, Dutch, and German national IPY committees.

The core of the workshop was its breakout discussions. One idea for popular communication that emerged was identifying and addressing common misconceptions about the Polar Regions, such as the differences between Arctic and Antarctic geography, the real effect of Earth's axial tilt, and the main reason why polar bears don't eat penguins. Other recommendations included developing a framework for polar literacy—with key concepts and messages that could help in correlating IPY activities and polar science to education standards and benchmarks—and identifying alternative sources of funding for EOC projects, should national funding prove insufficient. (See a full report and evaluation at *http://cires.colorado.edu/education/k12/ipyoe*.)

Early this year, a third session—the Integrated Collaborative Education (ICE) workshop—was held in cyberspace. More than 200 individuals from around the world participated online between March 17 and 31, using web-conferencing tools developed and facilitated by the College of Exploration, a nonprofit educational consultancy. The goal was to develop a framework for polar literacy that could be linked with related ocean and environmental literacy programs.

Participants came up with 10 themes they considered integral to such a framework:

- *the uniqueness of the Polar Regions*
- *the complex interconnections of Earth systems*
- *global climate change*
- *the importance of the Polar Regions to science*
- *the history and culture of the Polar Regions*
- *"places of extremes"*
- *new models of land ownership/stewardship, international collaboration, and cooperation*
- *the need and opportunity to study holistically*
- *"what we don't know" (i.e., the spaces between disciplines and the gaps in our knowledge)*
- *people and stories.*

This work was not completed during ICE, but a start was made toward correlating each concept with its related misconceptions, naive understandings, and intended understandings, as well as science education standards and links to everyday life. (A summary report of the ICE workshop is available at *http://coexploration.net/ipy*.)

What IPY outreach might look like

How does all of this translate into actual activities? A hallmark of IPY's EOC efforts will be the customization of information and educational approaches. Here, for example, is the way EOC for one particular IPY research project—say, a study of sea ice formation or of caribou migrations—might get broken down for different audiences:

- A media summary of the research goal and methods could help a classroom teacher see at a glance whether the project is relevant to her students.
- A blog by graduate students in the field could help students in the classroom engage with the field project.
- A "who, what, where, when, why, and how" description in nontechnical language could help an exhibit designer or curriculum developer develop strategies for contextualizing the data.
- Mapping the science of the project to relevant science standards and frameworks, taking into account common misconceptions, could help scientists calibrate their communication with nontechnical audiences.
- A database of high-definition video clips could be used by journalists, students, teachers, and exhibit developers.
- Reviewing and annotating existing activities and background materials and linking them with standards and curriculum could have benefits far beyond the formal education realm.

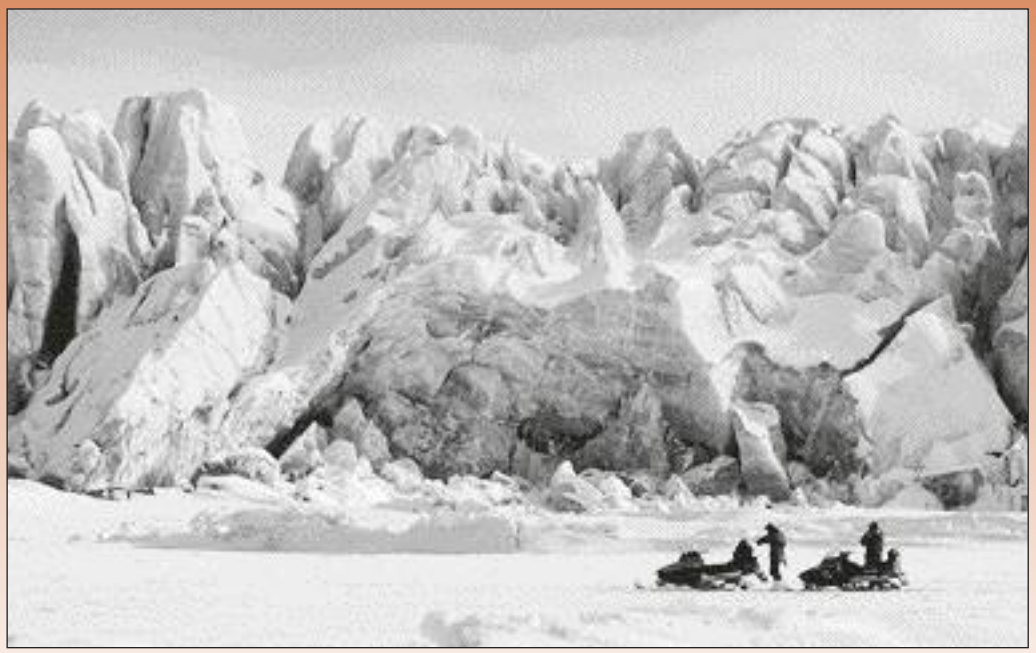
As of this writing (September 1), we are not yet certain which IPY projects will be funded, but the EOC subcommittee is working to identify synergistic opportunities. We have begun to leverage relationships with existing networks, such as ASTC, the National Science Teachers Association, and AAAS, and with funded exhibitions and scientific expeditions. By coordinating all of IPY's EOC efforts, we hope to enable and ensure maximal impact of the vast array of project information and data. ■

Mark McCaffrey is science communication specialist at CIRES Outreach and Education, Boulder, Colorado, and a member of the IPY International Programme Office's Education, Outreach, and Communications subcommittee. For updates on IPY, visit www.ipy.org/start.

The IGLO Initiative:

Collaborating to Address Global Warming

By Walter Staveloz



An Arctic research team visits the Comfortless Glacier in Norway's Svalbard archipelago.
Photo by Anne Hormes/Alfred-Wegener-Institut

Few noticed in 2003 when the initiators of the 2007–2008 International Polar Year listed "melting ice and snow" as an important issue for their upcoming research initiative. Even last year, when ASTC chose global warming as the theme of its first international project, none of the parties involved expected the topic to be quite so timely.

But now, with the IPY almost upon us, global warming is everywhere in the news. Each day we read about more effects of climate change on our planet. The Polar Regions have emerged as the "canary in the coal mine," alerting us to the fact that global warming is speeding up and proving more consequential than predicted. As Robert W. Corell notes (see page 4), researchers now think that the Arctic Ocean may be totally ice free in summer within 50 to 100 years—with dire consequences for local animal and human populations.

As the IPY prepares to focus public attention on the Polar Regions and their relationship to Earth's climate as a whole, the time is ripe for science centers to launch a major new campaign. The goal of "International action for GLObal warming" (IGLO), ASTC's new initiative, is not only to raise public awareness about global warming on a local basis, but also, through a series of events and activities coordinated with other science center networks and related nonprofit organizations, to draw museum audiences worldwide into a discussion of how human actions affect climate change and how humans might alter those actions.

The power of many

The great strength of science centers is our expertise in designing and developing interactive, inquiry-based programs and exhibitions around a particular topic. Historically, a number of ASTC members have done significant work in the areas of climate change and global warming. IGLO offers an opportunity to see this work extended and used effectively on an international basis.

But the initiative also challenges science centers to enter new territory. In IGLO, institutions are invited to become proactive—by mobilizing their communities to engage in activities that raise public consciousness about the realities of climate change, and by joining with other science center *(continued on page 9)*

IGLO's International Dimension

International leaders welcoming the IGLO initiative include, left to right, David Carlson, director of the IPY's International Programme Office; Alain Hubert, founder of the International Polar Foundation; and Philippe Vallette, co-founder of the World Ocean Network.

Photos courtesy, l. to r., International Polar Year, International Polar Foundation, and World Ocean Network.

By Carolyn Sutterfield

Many groups will be working together under the umbrella of the International Polar Year to support IPY's education and outreach objectives. In addition to coordinating activities with the IPY International Programme Office, ASTC will engage in collaborations with the other IPY-endorsed organizations described below.

IPY International Programme Office

Coordination and oversight of events during the International Polar Year, March 2007–March 2009 (see page 5), are being handled by the IPY International Programme Office (IPO), based at the British Antarctic Survey, in Cambridge, England.

The director of the IPO is David Carlson. An American trained as an oceanographer, Carlson headed the Atmospheric Technology Division of the U.S. National Center for Atmospheric Research (NCAR), in Colorado, from 1994 to 2003. Early in 2006, he traveled to Washington, D.C., to discuss with ASTC executive director Bonnie VanDorn and director of international relations Walter Staveloz how science centers and museums might participate in the IPY.

ASTC subsequently submitted a proposal asking that IGLO be designated an official IPY activity. That proposal was formally endorsed in September by the ICSU/WMO Joint Committee for the International Polar Year 2007–2008.

"IGLO is a great project, and its decision to focus on action for global warming is absolutely right for IPY," says David Carlson. "We will invite IPY-endorsed outreach and scientific programs to integrate their efforts with the worldwide IGLO activities wherever this makes sense for all parties."

Details: *www.ipy.org/international/programme-office*

International Polar Foundation (IPF)

Established in 2002 by the Belgian explorer Alain Hubert, the IPF is a nongovernmental organization with headquarters in Brussels and branches in France, Switzerland, the United States, and the United Kingdom. The IPF's primary mission is "to communicate and educate on Polar research as a way to understand key environmental and climate mechanisms." The organization also promotes intelligent responses to related issues, such as sustainable development.

The IPF has a variety of operational platforms and communication tools. On its scientific web site, *www.sciencepoles.org*, it publishes articles and features on polar science and research findings. Its educational web site, *www.educapoles.org*, offers innovative tools and international teaching projects in cooperation with institutes, universities, governments, and other NGOs.

IPF publications include an interactive CD-ROM, "Polar Regions & Climate Change," available in English, French, Dutch, German, Italian, and Spanish; *The Migration of the Ibanes*, a comic book created in partnership with WWF Switzerland and the University of Geneva that seeks to draw young readers' attention to issues of climate change, environmental management, and sustainability; and a special polar research edition of *RTD Info*, the European Commission's quarterly magazine on European research.

Upcoming IPF projects associated with IPY include a 2,700-mile crossing of the Arctic, from Siberia through the North Pole to the southern tip of Greenland, by Alain Hubert and expedition partner Dixie Dansercoer. Running from February to June 2007, this "Arctic Arc" will focus attention on research in the high latitudes just as the international scientific community is assembling the Arctic Ocean

Observing System to study regional climate change.

During the 2006–2007 school year, the IPF's *ClimaTIC* project, intended to raise students' awareness of climate change and sustainable development solutions, will feature educational tools, exchanges between scientists and reporters, and activities and small research projects to conduct at school. The organization will also distribute a series of educational Arctic and Antarctic puzzles to schools.

More long-term projects include building the Princess Elisabeth station, a new Belgian research base in Dronning Maud Land, Antarctica, that will be the first "zero emissions" station on the continent, and construction of the Polaris Climate Change Observatory in Brussels, scheduled to open in 2009.

Welcoming ASTC to a long list of global partners, IPF education and outreach officer Gautier Chappelle says, "The IPF is particularly proud to be a partner of the developing IGLO network for International Action on Global Warming."

Details: *www.polarfoundation.org*

UNESCO

ASTC's partner at UNESCO (the United Nations Educational, Scientific, and Cultural Organization) is the science policy division. After a 2000 UNESCO summit in Budapest called for renewed focus on science communication to the public, this division instituted the World Science Day for Peace and Development, an event held annually on November 10.

Partnering with UNESCO will help make IGLO and ASTC known to research communities and teachers around the world; it will allow participation in the project beyond our own visitor audiences and provide opportunities to address underserved and local communities with the same tools. UNESCO will suggest researchers from developing countries who can contribute to online presentation of current climate change and polar research, and IGLO will organize demonstration events during the 2007 and 2008 World Science Days.

Details: *www.unesco.org/science/wsd_about.shtml*

World Ocean Network (WON)

Earth's oceans are interconnected, forming one huge global ocean covering 72 percent of the planet's surface. The mission of the World Ocean Network, established in 2002 and based at Nausicaa, France's Centre National de la Mer in Boulogne-sur-Mer, is to inspire a greater sense of responsibility among individuals and society worldwide for preserving a healthy and productive ocean and making sustainable use of its resources.

The first WON members were aquariums, but the organization now includes a variety of institutions and groups devoted to raising public awareness of marine and environmental issues and promoting effective management and conservation of our planet's resources. These range from zoos and natural protected areas to environmental and educational NGOs, research institutes, and natural history and science museums. Every year, in coordination with The Ocean Project, WON celebrates World Ocean Day on June 8 with a variety of public events and communications.

"It is impossible to explain climate change without mentioning the ocean, which plays a major role in climate function and in maintaining the planet's equilibrium and ecosystems," says WON co-founder and co-chair Philippe Vallette, "WON considers the objectives of IGLO to be similar to its own."

WON has agreed to disseminate IGLO information to its members, extending the project's reach far beyond the science center field.

"In cooperation with IGLO," Vallette says, "climate change and the ocean could be the theme of World Ocean Days 2007 and 2008. This would become an occasion for IGLO participants and WON to take joint action on a global scale, raising public awareness and inspiring people to act for the future of the Blue Planet."

Details: *www.worldoceannetwork.org* ■

(continued from page 7) networks around the world in large-scale demonstrations of our communal power to make a difference.

If we are successful, not only will museum audiences learn how to make better choices related to energy and the environment on an individual basis, but decision makers will also be better informed about the actions that citizens expect them to take on behalf of the planet. Science centers will have emerged on a worldwide platform as recognized leaders in public engagement with science.

It is not necessary to repeat here all of the details of IGLO; these are available on the project's web site, *www.astc.org/iglo,* and described elsewhere in this issue. Rather, I will focus on five elements that represent the initiative's potential.

Webcasts from threatened sites

There is more to climate change, of course, than just melting ice. Recent predictions by University of Bristol researchers, published in the August 16 edition of *The Guardian,* include

- total loss of the world's forests in less than 100 years
- lower rainfall in parts of West Africa and Central America, raising the prospect of drought
- floods in tropical parts of Africa and South America
- the spread of malaria over larger zones of Africa
- important changes to local food supplies as species respond to warming by migrating to new zones.

IGLO intends to draw attention to a wide range of global warming effects, from coral bleaching to starving polar bears to severe weather conditions across the planet. To that end, ASTC has asked the other major science center networks (See "Linking the Networks: The IGLO Advisory Group," page 11) to join us in organizing highly visible events at locally threatened sites, one for each continent, that illustrate the impact of climate change on nature and human populations. These activities, possibly involving distinguished regional members of IGLO's

Honor Committee, will be covered live on the Web so that science centers worldwide can organize additional events around the occasion.

As an additional gesture of international cooperation, the networks will help students in different regions to exchange documentation of the observations they have made about the changing environment.

The family archive project

In the 18th century, the Venetian artist Canaletto used a camera obscura to make drawings of city scenes he wanted to paint; as a result, his works are highly accurate representations of Venice at that particular time. A modern Italian researcher, by comparing Canaletto's paintings with current photographs of the city, has been able to document how much Venice has subsided over the last 300 years.

In the United States, Boston University biology professor Richard Primack has been working with local citizens to find dated photographs of identifiable spots in the Boston area that can help build a climate history of the region. The results of that work will soon be published in the *American Botanical Journal*.

IGLO intends a similar project. Participating museums will invite local citizens to dig into their archives in search of reliably dated photographs that show a recognizable landscape feature and then to take a new photo of the same spot, preferably on the same date, and bring both photos to the science center. Although this is not a controlled experiment, the collective archive could become a focus of both scientific study and personal discussion, helping to foster a sense of emotional connection to the topic of climate change.

Public debates

Public debates are an essential part of any program designed to engage the public with a politically significant science topic. In Europe, debates held at London's Dana Centre and Paris's la Cité des Sciences et de l'Industrie have been supported by such government entities as the EU science commission, DG Research, and Britain's Science & Society program.

In the United States, the Adler Planetarium & Astronomy Museum recently presented a series of public forums at various locations in metropolitan Chicago that brought together informal learning institutions, universities, corporations, and professional groups to create a continuing community dialogue about the prospects for global climate change.

As part of the IGLO "toolkit" (see below), we plan to create a guide for debates on global warming. This publication will include articles chosen by IGLO's science committee, international research reports, tips on how to choose panelists, suggestions on questions to be addressed, and ideas for how to involve local media in reporting the event. An exciting goal would be to arrange a common date on which citizen debates on climate change might be held in science centers around the globe, with results to be reported to all participants.

The toolkit

As noted above, many science centers are already addressing the topic of climate change. Examples include *Go Polar*!, a recent program at South Carolina's EdVenture Children's Museum that provided direct contact with scientists in the field. Sweden's Teknikens Hus, with support from the European Union and in collaboration with local partners, has developed a comprehensive education guide (in Swedish and English) on climate change (see Resources, page 19). Other examples appear elsewhere in this issue.

Last May, IGLO's Education Committee began gathering ideas like these into a matrix of activities and products that can be replicated and used by all ASTC members to engage diverse audiences. For more details, see "The IGLO Toolkit: One-Stop Shopping for Climate Change Science," page 18.

Young scientists in Antarctica

As the culmination of IGLO, we plan, in cooperation with our network partners, to select 25 youngsters, five per continent, who will spend five days in a research center at the South Pole.

Among the young scientists' goals will be to observe researchers at work, to identify direct links between that work and climate issues, and to inform the researchers about IGLO's work during IPY. But their main charge will be to testify about what they have seen to audiences in the outside world.

The first opportunity for this will come during the 2008 ASTC Annual Conference in Philadelphia, where we will present a special webcast from the South Pole. Conference participants will be able to engage in dialogue with the youngsters and the researchers on the spot, as well as (we hope) with attending representatives of the IPY organizing committee.

Assessing IGLO's success

IGLO is an ambitious initiative, and the extent of our efforts will depend on the level of funding we are able to achieve. That effort is now under way on a local, national, and international basis.

Assuming that we attract support for a major global effort, how will we know if IGLO has succeeded? One indicator would be the number of related public events held by science centers. Another would be the extent to which the media covers IGLO activities. Success will include stimulating discussions at the 2008 Science Centre World Congress in Toronto and a show of interest from the formal education community.

Above all, the success of IGLO will mean better public understanding of climate change and stronger commitment by individuals to help solve the problem. In the end, it is what our audiences tell us they have learned from us about global warming that will translate into new directions for our field and new hope for our planet. ■

Walter Staveloz (wstaveloz@astc.org) is ASTC's director of international projects. He was formerly executive director of Ecsite, Europe's science center network.

Linking the Networks:
The IGLO Advisory Group

By Colin Johnson

Although IGLO is an ASTC initiative, led by Walter Staveloz from the Washington, D.C. office, the success of the project ultimately depends on collaborations among science centers worldwide—both within and outside ASTC.

Making that happen is the job of the IGLO Advisory Group (IAG), which includes representatives from the other four major science center networks: ASPAC (Asia/Pacific), Ecsite (Europe), Red-POP (Latin America), and SAASTEC (Southern Africa), as well as a representative from the Ontario Science Centre, host of the 5th Science Centre World Congress (5SCWC), to be held in Toronto, Canada, in June 2008.

The IAG is charged with harnessing this network of networks as a means for pooling experience, ideas, and enthusiasm. The group has already "met" in May, June, and August 2006, using the e-chat facility of the ASTC Connect platform. As of September 1, our main business has been to

- ensure the flow of information to and from the members of the regional science center networks
- report on regional network activities, especially those than can lead to ideas for the IGLO Toolkit (see page 18)
- suggest distinguished persons who might be approached to serve on the IGLO Scientific or Honor committees
- develop plans for worldwide representation at conference sessions on IGLO, both at the ASTC Annual Conference and at 5SCWC
- help to build and maintain the visibility of the IGLO initiative among national and international stakeholders
- form liaisons to connect local or national IPY activities with IGLO activities planned by science centers and museums.

Some IAG projects are described here. For updates on member institutions and activities, visit *www.astc.org/iglo/advisorygroup.htm.* Notes of IAG meetings and other organizational information can be found in the IGLO Forum of ASTC's online learning center, ASTC Connect, *www.astc.org/astc_connect/.* (Note: Registration required; contact Walter Staveloz at wstaveloz@astc.org.)

Colin Johnson, former CEO of Techniquest, Cardiff, Wales, U.K., is the chair of IAG. He is a past member of ASTC's Board of Directors and former co-chair of the International Advisory Board.

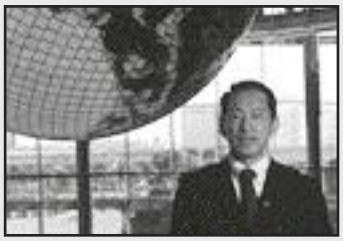
ASPAC Warms to IPY Challenge

The Asia-Pacific region occupies significant parts of two hemispheres. One of the most geographically and culturally diverse parts of the Earth's surface, this area stands to be significantly affected by global climate change. It is not surprising, therefore, that members of ASPAC, the Asia-Pacific Network of Science & Technology Centres, are warming to the challenge of IPY.

Significant thinking is under way within individual institutions, looking at what they might do as part of the global effort and what the ASPAC region organizations might do together. The 2006 ASPAC conference, held in Perth, Australia, last May, provided an opportunity for a collective brainstorming session. Many ideas emerged, including exhibitions, global science experiments, outreach programs, and regional resource materials.

Reaching youngsters in countries and communities likely to be affected by climate change offers great potential for educational programming. Listening to local stories of the impacts of sea-level rise, or the retreat of glaciers, or the bleaching of corals, or the impact of typhoons told through the eyes of schoolchildren will have a big impact. IPY will also figure significantly during the 2007 ASPAC Conference in Tokyo.

Within individual countries there is the challenge of trying to develop national initiatives involving a range of organizations. In Australia, different government research agencies and universities are engaged in scientific research in Antarctica, but trying to find out who is doing what during IPY is a significant challenge. Questacon has been trying to identify key national players, work out how it can embed a climate change dimension into every aspect of the center's work, and also see how it can coordinate some international activity by hosting a reception for all of the ambassadors and high commissioners from Antarctic Treaty organizations in Australia.



Miraikan director and former astronaut Mamoru Mohri, a member of IGLO's Honor Committee, hopes to visit Japan's Antarctic SOYA base during IPY.
Photo courtesy Miraikan

Mamoru Mohri, the former Japanese astronaut who is now director of Miraikan in Tokyo, has joined the IGLO Honor Committee, where his unique perspective will be of great value. Mamoru is hoping to visit the Japanese Antarctic SOYA base during IPY. Other science centers are considering how they can link up with people on the ground in Antarctica to offer visitors the opportunity to experience some of the challenges of scientific research in a hostile environment.

ASPAC has initiated a *Project IGLO Newsletter* to share information between institutions and keep everyone in touch with how the overall project is developing.—*Graham Durant, director, Questacon–The National Science Centre, Canberra, Australia, and ASPAC Project IGLO Coordinator*

SAASTEC Conference Will Promote IGLO

Science centers are a fairly new concept in Southern Africa, but we strongly believe that they are platforms to debate science and technology issues that affect people's everyday lives. At the 2006 SAASTEC Conference, hosted by Unizul Science Centre in Richards Bay, South Africa, November 29–December 1, delegates will have three opportunities to consider the implications of climate change for Africa and for the world as a whole.

Plans as of September 1 included the following:

1. *A plenary session describing the IGLO project and getting members and African partners involved.* Other Southern African experts should be able to contribute to this. South Africa is rich with a variety of scientists in the fields of environmental science, and we believe that their input will be of great benefit to the rest of the world.

2. *Debate on the social responsibility of science centers.* South Africa is a country with great diversity and a rich history. With so many of its social imbalances still unaddressed, we believe that hosting the SAASTEC Conference in this part of the world will provide a valuable source of debate and dialogue. The participation of the International Programme Committee of the 5th Science Centre World Congress and other international delegates will mean a more in-depth look at the issue.

3. *Presentation on Cities for Climate Protection (CCP).* Established in 1993 by the international nonprofit ICLEI (Local Governments for Sustainability), the CCP Campaign works with more than 650 localities worldwide to improve urban management and address economic, environmental, and social concerns.

South Africa's St. Lucia Wetlands National Park, one of 162 UNESCO natural heritage sites worldwide, is threatened by climate change. *Photo courtesy Evergreen/UNESCO*

The Richards Bay local government is part of this project. On the doorstep of this coastal and industrial city are located one of UNESCO's World Heritage Sites, the St. Lucia Wetlands, and one of the world's largest game parks, the uMfolozi-Hluhluwe Game Reserve. During the conference, the city's mayor will speak on government's role in the CCP project and its larger implications.—*Michael Peter, vice president, Southern African Association of Science & Technology Centres*

Ecsite Addresses Fossil-Fueled Transportation

Ecsite's PENCIL project (Permanent EuropeaN resource Centre for Informal Learning) comprises a series of pilot programs at science centers that involve schools, students, teacher associations, research laboratories, educational authorities, and education and science communication specialists in finding new ways to conduct science education.

As one of the elements of PENCIL, the Deutsches Museum, in Munich, Germany, is piloting a series of activities and programs that address the effect of fossil-fuel-powered vehicles on Earth's climate. The goal of the project, called *Traffic and Climate Change,* is to communicate about

- Earth's climate systems,
- the role that motorized vehicles play in influencing climate,
- the responsibility that people bear for this, and
- the options that we, as individuals, have to alter our transportation system.

Traffic and Climate Change is a threefold program aimed at secondary schools of all types. It includes visits to two museum galleries ("Environment" and "Traffic"), as well as a role-playing session in which participants explore individual options for influencing climate change. Teachers, pupils, and scientists work together to create a meaningful and scientifically correct museum experience with outreach potential.

A companion bilingual (German and English) web site has been developed within the Deutsches Museum's online New Technologies Center, *www.deutsches-museum.de/dmznt/klima/index.html*. Here visitors can learn more about the science behind climate research, as well as the history and future implications of climate change. This Internet site can be used as a teaching tool or preparatory material in advance of or after a visit to the museum.—*Catherine Franche, executive director, Ecsite* ■

Earth's five climate systems of air, water, ice, land, and the biosphere are represented by globes in the Environment Gallery, part of a PENCIL project at Germany's Deutsches Museum. *Photo courtesy Deutsches Museum*

Climate Change:
What Visitors Want from Science Centers

By Shelly E. Ryan

Since climate change is often misrepresented in the popular media and its causes denied by certain political factions, it should come as little surprise that a significant portion of the general U.S. population assigns a relatively low priority to the issue.

A survey conducted in 2004, *The PIPA/Knowledge Networks Poll*, found that three in four Americans believe that global warming is a real problem, but the majority interviewed were divided on whether the issue is truly pressing or can be dealt with gradually through low-cost steps. When respondents were asked how much they had heard about climate change, 14 percent stated "a great deal," 48 percent had heard "some" about it, and 38 percent said they had heard "not very much" or "nothing at all."

In order to obtain a first-hand account of people's understanding of climate change and whether they believe science museums should be covering the subject, and to compare my findings with other visitor research and public environmental opinion polls, I conducted visitor surveys in early 2005 at the following California museums: Lindsay Wildlife Museum in Walnut Creek; Chabot Space & Science Center in Oakland, California Academy of Sciences in San Francisco; and the Monterey Bay Aquarium in Monterey. In all, I interviewed 70 museum visitors. Survey participants were chosen randomly, and only adults were questioned.

Visitor survey findings

All interviewees had heard the terms "climate change" or "global warming." When asked to define those terms, a little less than one-half (40 percent) stated that climate change is human-induced and entails the release into the atmosphere of carbon dioxide and other greenhouse gases. A little over one-third (36 percent) made general statements about weather changes, but did not mention that humans are a causative factor. Somewhat less than one-quarter of respondents believed that ozone depletion is the cause of global warming (a common misconception), and the remaining persons weren't sure what the terms meant. Almost three-quarters of interviewees had not seen climate change information at any museum.

Among the questions asked were these two rated queries: *How important do you think it is for science museums to have information on climate change?* and *How interested would you be in seeing information on climate change in a museum?* On a scale of 1 to 10 (with 1 lowest and 10 highest), almost all gave a score of 5 and above (93 percent and 94 percent respectively), while close to three-quarters gave scores of 8 and above (69 percent and 67 percent respectively).

Asked why these ratings were given, about two-thirds (62 percent) stated that people need to know about the subject; almost one-quarter (20 percent) believed that museums are in a position to help the public understand what they can do to remedy the problem. A similar number felt that since [climate change] is a scientific topic, science museums should educate the public about it and explain how it is relevant to their lives. (Note: This last issue was addressed at the final three museums surveyed, having grown out of answers received at the first one.)

Of those interviewees who gave an interest score of 5 and above in seeing climate change material at a museum, just about three-quarters wanted to see exhibits only, a little less than half were interested in programs only, and less than one-quarter were interested in only going to lectures. Almost one-third were enthusiastic about both exhibits and programs. Other permutations of presentation venues received less than 10 percent of votes.

Study conclusions

Survey results gave me a broad sense of the knowledge and beliefs that respondents had about global warming. Even though all interviewees had heard of climate change, less than half had more than a modest understanding of it. (This finding correlates with data from front-end visitor research done by Ellen Giusti for the American Museum of Natural History's 1992 exhibition *Global Warming: Understanding the Forecast*, as well as from other surveys.)

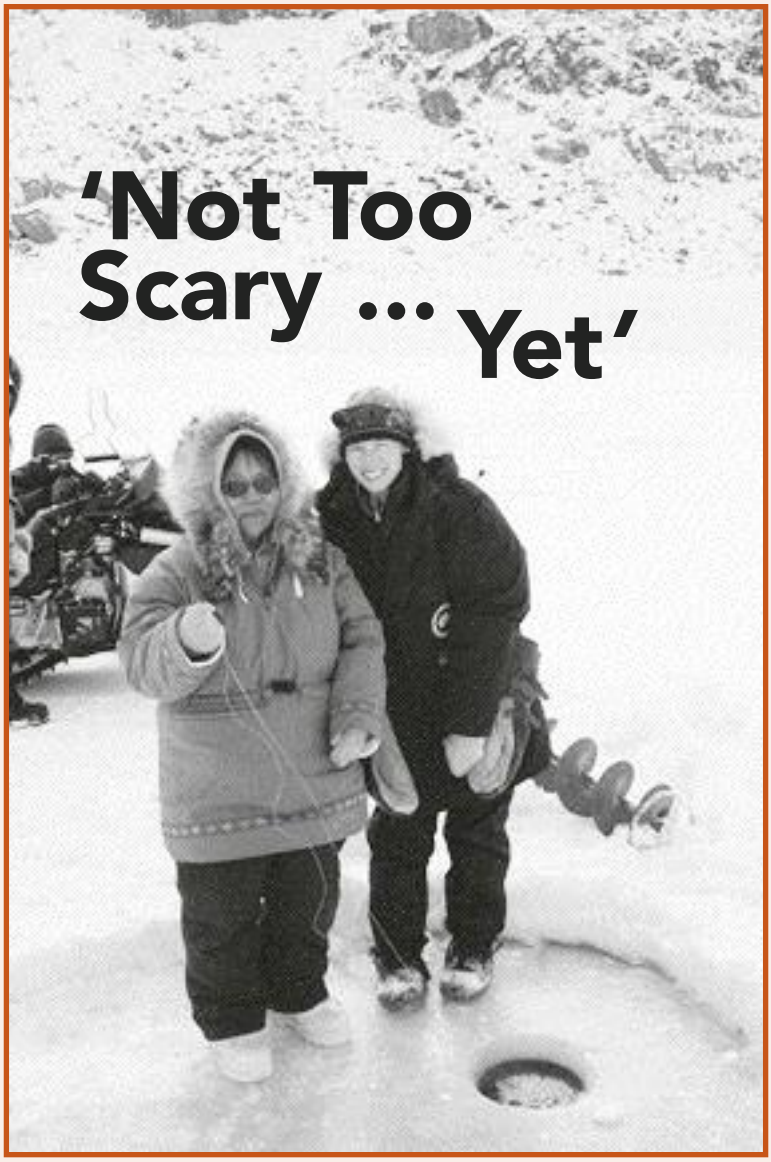
The combination of little knowledge of global warming or exposure to climate change information in a museum, plus a high percentage wanting museums to cover the topic, strongly points to a gap in science museum programming, and suggests that the museum-going public is open to receiving such information.

Museum patrons seemed to realize that global warming presents a threat, even if they weren't quite sure how. Since science museums routinely address environmental topics, interviewees believe such institutions are a logical venue for its presentation. ■

Adapted with permission from Promoting Environmental Stewardship Through Exhibitions: The Challenges of Representing Global Warming in Science Museums, *the author's 2005 master's thesis for the Department of Museum Studies, John F. Kennedy University, Berkeley, Calif. Downloadable in pdf (70 pp.) at* www.aspacnet.org/apec/case_studies/challenging_topics.html.

From the Field:

'Not Too Scary ... Yet'



Kalluk Angutikjuak and Shari Gearheard (right) fish for char at Walker Arm, Baffin Island, 2006. *Photo courtesy Shari Gearheard*

By Shari Gearheard

For more than a decade I have had the privilege to work with Inuit communities in Nunavut, Canada, documenting Inuit observations of climate and environmental change.

After conducting my research for five years in Clyde River, I moved my family to this small community on Baffin Island. Living in Clyde since 2004 has profoundly changed my understanding and appreciation of life in the North, and has put into context many of the observations and concerns I have documented with Inuit.

For example, my husband and I travel frequently with friends out on the land. Weather and ice conditions are constant topics of conversation, and our Inuit companions are eager to instruct us in the fine arts of weather observation, *qamutiik* (sled) packing, survival skills, and ice travel. Discussions on the ice, or over maps and tea, tell us where we need to avoid thin ice or cracks, where rivers are too strong, or polar bears too many. Increasingly, these lessons include some variation of the phrase, "It would usually be like..., but nowadays...."

Both my formal research and my life in the North have shown me that the environment here is no longer what Inuit, the people who know this place best, expect. The names of some seasons no longer apply, hunters' gear lists have changed in anticipation of getting stranded in bad weather, and Elders expert in weather forecasting are no longer comfortable with giving predictions.

One Clyde River Elder, Apak Qaqqasiq, told me during an interview in 2006, "These changes in the environment that we are observing are not too scary ... yet."

Some of his statement points to the extremely adaptable nature of Inuit, and some of it to an uncertain future. For now, the Inuit I work with—and I myself—will keep observing and documenting, as one aspect of trying to understand the changing Arctic. ■

Shari Gearheard is a research fellow with the Cooperative Institute for Research in Environmental Sciences (CIRES) at the University of Colorado, Boulder. She lives and works in Clyde River, on Baffin Island, Nunavut, Canada.

Science Centers Take Action:

An ASTC Sampler

Compiled by Carolyn Sutterfield

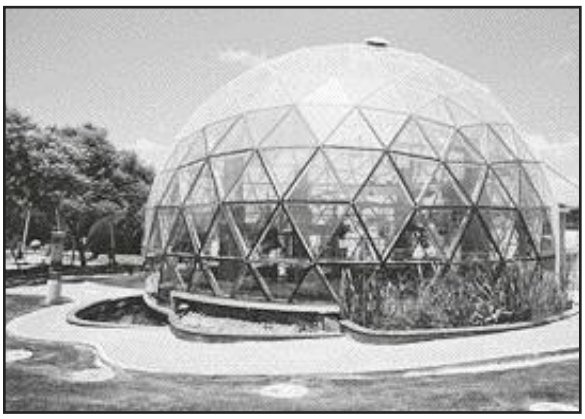
The following is a selection of recent and ongoing projects at ASTC-member institutions related to climate change, global warming, and the International Polar Year.

Ecosphere: Clore Garden of Science

To help the public better understand ecological processes and global warming, staff at the Clore Garden of Science, an outdoor science center in Rehovot, Israel, have developed a new educational facility, the EcoSphere. This steel-and-glass geodesic dome houses indoor and outdoor pools, exhibits, workstations dealing with ecology and environment, and a variety of life forms illustrating biological and ecological processes.

Project planning was done in collaboration with the department of Environmental Studies and Energy Research at the Weizmann Institute of Science. Science topics include global warming, water pollution, energy resources, and more—all with an emphasis on solutions to these global challenges. The EcoSphere can host audiences ranging from organized classroom groups to teachers, research students, and individual visitors.

Exhibits deal with the very small percentage of drinkable water vs. total global water supply, the nature of natural light, phototropism, diaphototropism, soil, and weather. Interactive workstations allow visitors to explore photosynthesis, water and terrestrial plants, interrelationships of biological systems with the surrounding environment, nature under stress, and water and groundwater. Educational programs associated with the stations strive to nurture a sense of responsibility for the planet and an appreciation of ecology.



The EcoSphere houses pools, exhibits, and workstations dealing with ecology. *Photo courtesy Clore Garden of Science*

Ends of the Earth: Science North

To mark the International Polar Year, Science North, in Sudbury, Ontario, Canada, will open its new traveling exhibition, *Ends of the Earth: From Polar Bears to Penguins*, on March 1, 2007. The exhibition (web site: *www.sciencenorth.ca/endsoftheearth*) focuses on current polar science, presenting the work of leading researchers in polar bear biology, cold physiology, arctic whale research, and penguin behavior.

The 600-square-meter (6,000-square-foot) exhibition uses interactive exhibits and multimedia theater presentations to engage visitors with natural history, animal and human adaptation, and current science. Visitors can play the Specimen Quiz to learn about the unique adaptations of arctic animals, measure their own physiological responses to cold, and even walk and slide like a penguin. Stories of human endurance are told in the Explorers Tent Theatre, where visitors relive the expeditions of Amundsen, Peary, Scott, and Shackleton that challenged the poles at the start of the 20th century.

Polar science is the focus of a new traveling exhibition. *Photo courtesy Science North*

After a six-month run in Sudbury, *Ends of the Earth* will begin its international tour next September. In the United States, the exhibition is scheduled to open May 15, 2008, at the Fernbank Museum of Natural History, Atlanta, Georgia.

Environmental Programming: Petrosains

Since its inception, Malaysia's Petrosains: The Discovery Centre *(www.petrosains.com.my)* has offered yearly programs on World Water, World Food, and World Environment, as well as annual Earth Days, at its Petronas Twin Towers site in Kuala Lumpur and its PlaySmart satellites in Penang and Langkawi.

Inspired by the IGLO initiative and coinciding with the creation of Petrosains' new "Centre of Learning" department, the science center will focus its environmental programming on global climate change during the International Polar Year. In 2007, the museum will host Malaysian Antarctic Research Program scientist Azhar Hussin

Petrosains staff develop a "Greenhouse Effect in a Jar" activity. *Photo courtesy Petrosains*

in a residency intended to enhance public understanding of his climate-related research in Antarctica, the Arctic, and Southeast Asia.

Building on the momentum of the *Clean Air for Our Cities* exhibition created by Petrosains' parent company, Petronas, with the Malaysian Department of the Environment, the science center is developing plans to create a mini exhibition on climate change. During morning roll calls, Petrosains staff have already begun sharing science facts and questions about the causes and effects of climate change as part of their expanding IGLO activity.

Linking Formal and Informal Education: Northeast Science Center Collaborative

In 1999, a group of research scientists, environmental leaders, and informal science educators formed a partnership to educate the public about the effects of climate change on communities and ecosystems in the northeastern United States.

The Northeast Science Center Collaborative, comprising the New England Science Center Collaborative and the Connecticut Science Center Collaborative, combines the latest findings of internationally recognized research and academic institutions with the interpretive expertise of informal education institutions. For the latter, the collaborative *(www.sciencecentercollaborative.org)* offers support in addressing a complex contemporary issue. For the former, it provides ready-made opportunities to work with institutions that present science issues in lively and engaging ways. NESCC is sponsored by Clean Air–Cool Planet, a Portsmouth, New Hampshire-based nonprofit.

To date, the group's 61 members have developed exhibits, educational programs, and outreach projects for more than 7 million museum visitors. Among these are a Climate Change Backpack; a multimedia planetarium show, "Breathing Space," developed by the Christa McAuliffe Planetarium; a continuing series of "Meet the Scientists" workshops and programs; and "Greening Our Science Centers," a program designed to track, quantify, and reduce energy use and greenhouse gas emissions in members' facilities.

Clean Air–Cool Planet program assistant Cheyenne Wright, left, demonstrates elements of the Climate Change Backpack to Carbon Coalition staffers Toby Ball and Jessie Davie. *Photo courtesy Clean Air-Cool Planet*

Climate Exhibition to Go: La Cité des Sciences

In 2003, la Cité des Sciences et de l'Industrie, Paris, opened a new exhibition, *Climax: Healing the Planet*, that projected climate trends forward into the year 2100 to help visitors appreciate the complex mechanism of climatic equilibrium. Now la Cité has put the contents of the exhibition onto a DVD-ROM, *Climax, Planet Climate,* for use as a 1,500-square-foot multimedia exhibition, a multimedia conference, and/or an interactive kiosk presentation.

Components of *Climax,* a climate change exhibition created by la Cité des Sciences, Paris, are now available on DVD-ROM. *Photo by CSI/JP ATTAL*

Available in French with English or Spanish subtitles (*www.cite-sciences.fr/catalogue/climax_en.html*), the DVD is organized in three "acts": a 23-minute introductory film, *Plunged into Visions of the Future*; an opinion forum, in which visitors can compare their own opinions with those of selected scientists, economists, and politicians; and a simulation game that lets the visitor control a climate machine to alter the human activities implicated in global warming.

Bering Sea Blog: Liberty Science Center

From May 23 to 29, 2006, Liberty Science Center exhibit developer Karen de Seve was on board the U.S. Coast Guard ship *Healy* in the Bering Sea to gather footage and details for *Breakthroughs,* an upcoming exhibition at the Jersey City, New Jersey science center. Scientists aboard the *Healy* were researching how climate change affects deep-sea predators like walruses, gray whales, seals, and crabs. In a daily blog, de Seve recorded accounts of her journey, interviews with the research team, and information about the ship. Her postings, along with images, film footage, and a *Scientific American* podcast about her experience, are archived at *http://beringsea.blogspot.com/.* ■

Liberty Science Center exhibit developer Karen de Seve filming aboard the USCG ship *Healy.* *Photo courtesy Karen de Seve*

U.S. Agencies in Support of IGLO

By David Herring, Frank Niepold, and Joel Halvorson

The evidence is clear. Archives of both satellite and surface-based measurements reveal that Earth's average surface temperature has risen by about half a degree Celsius in the last century, and that the rate of temperature rise has increased over the last two decades.[1]

There is an observable correlation between Earth's rising temperature and the thickness and extent of Arctic sea ice, which has reached record lows for the last four consecutive years (2002–2005).[2] Greenland's massive ice sheet is losing ice at rate much faster than scientists had predicted, adding 0.56 mm per year to an already rising sea level.[3]

This loss of land and sea ice is a symptom of a larger problem. Although today's climate scientists cannot predict exactly what the results of global warming will be through the 21st century, there is consensus that the consequences will be profound if humanity's "uncontrolled experiment" on Earth's climate system continues unchecked. But are these findings and concerns being communicated effectively to the public?

A July 2006 report by the Pew Research Center for the People and the Press *(http://people-press.org)*, "Little Consensus on Global Warming: Partisanship Drives Opinion," suggests that the American public is unsure about the seriousness of global warming. Not only is opinion divided along political party lines, but there is also growing disparity between Americans' assessment of the seriousness of the issue and the assessment of citizens in other nations. A list of Americans' policy priorities suggests that they may not understand how intimately intertwined are the causes and effects of global warming with items they rate as higher priorities. For instance, both Republicans and Democrats rated "energy policy," "environment," and "education" ahead of "global warming"; yet the issues overlap.

Beyond the Pew report, the authors' firsthand experience in teaching and communicating with the public about subjects surrounding climate change suggests there is widespread misunderstanding as to how addressing one or more of those issues will also likely help society to better address the others.

In November 2004, NASA's Goddard Space Flight Center and the Maryland Science Center jointly hosted an "Earth Explorers Institute" in Baltimore. The weeklong workshop included about 50 participants, from NASA, NOAA, and some 30 different ASTC member institutions. Its purpose was to explore opportunities for participants to cooperatively develop and share programming aimed at promoting the public's Earth system science literacy. In response to the institute, NASA funded four action plans, one of which was the formation of an ongoing Earth-Sun Museum Alliance (ESMA).

ESMA is an inclusive learning network and community of best practice that is already bearing fruit, including

- a data workshop, hosted by New York's American Museum of Natural History, in which participants received hands-on instruction on how to access and work with NASA and NOAA satellite remote-sensing data
- an ongoing series of teleconference presentations by NASA and NOAA scientists to help ESMA institutions keep abreast of new Earth science results and data sets
- a public forum series on global climate change, hosted by Chicago's Adler Planetarium & Astronomy Museum *(www.adlerplanetarium.org/ClimateForums)*
- a citizen science experiment designed by the Maryland Science Center to teach visitors how to measure ultraviolet radiation exposure at Earth's surface using low-cost handheld devices, and then compare their data to NASA satellite measurements of UV.

Information about these and other ESMA projects is available online at the NASA Informal Science Education portal, *http://informal.jpl.nasa.gov/museum/index.cfm* (registration required).

During the three upcoming international years of science—the 2007–2009 International Polar Year, the 2007 International Heliophysical Year (*http://ihy2007.org*), and the 2007–2008 Electronic Geophysical Year *(www.egy.org)*—ESMA expects to play a major role with IGLO, ASTC's international cooperative initiative. ■

David Herring is program manager for Education and Outreach in the Earth Sciences division at NASA Goddard Space Flight Center, Greenbelt, Maryland; Frank Niepold is Climate Education Fellow at NOAA Climate Education, Silver Spring, Maryland; and Joel Halvorson is educational technology fellow at the Science Museum of Minnesota, St. Paul.

1. "Temperature Trends in the Lower Atmosphere: Steps for Understanding and Reconciling Differences." U.S. Climate Change Science Program, 2006. Available at *www.climatescience.gov/Library/sap/sap1-1/finalreport/default.htm*.
2. "Satellites Continue to See Decline in Arctic Sea Ice in 2005." U.S. National Snow and Ice Data Center, 2005. Available at *http://earthobservatory.nasa.gov/Newsroom/NasaNews/2005/2005092820527.html*.
3. "Greenland's Ice Loss Accelerating Rapidly, Gravity-Measuring Satellites Reveal." University of Texas-Austin, 2006. Available at *http://earthobservatory.nasa.gov/Newsroom/MediaAlerts/2006/2006081022858.html*.

The IGLO Toolkit:

One-Stop Shopping for Climate Change Science

By Charlie Trautmann

The IGLO Toolkit is being developed as a versatile series of ready-to-use resources that can support science centers worldwide as they work to inform the public about the causes and effects of global warming and suggest ways that people, individually and collectively, can get involved. Museum staff will be able to access the resources online and download materials or instructions free.

The project is being coordinated by the IGLO Education Committee, an international volunteer group composed of senior science center staff. Our goal is to disseminate current and accurate information on the science while minimizing the need for staff to research basic content or develop educational resources themselves.

Each toolkit element will be cross-referenced by type and target audience, so that users can select an audience and choose the most appropriate way to reach it. Elements now under consideration include hands-on activities, exhibits, demonstrations, contests, media, teacher resources, workshops, lectures, events, and science fairs. Target audiences include children in various age groups, adults, the general public, teachers, community groups, museum professionals, the press, program sponsors, and scientists.

Suppose, for example, your center decides to develop global warming programs for three target audiences: "general public," "adults," and "teachers." You might select a type of resource for each of those audiences, such as "Hands-on Activity," "Lectures," and "Teacher Resources," respectively. Within each of these categories, you could then choose from one or more items in the toolkit, download the resources free of charge, and prepare the activities for delivery to the target audience at your museum.

At the time of this writing (September 2006), the IGLO Toolkit was under active development. Earlier this year, the IGLO Education Committee held brainstorming meetings in Barcelona, Spain, and Washington, D.C., and assembled a list of more than 100 potential resources to include from various sources. (For a sampling, see the sidebar below.) The project is scheduled for 75 percent completion by the start of the International Polar Year in March 2007 and will be augmented as new resources are contributed.

To that end, we are actively seeking additional contributions for the toolkit, with a particular emphasis on items that support learning among a broad range of cultures. We invite anyone with potential resources to review the brief descriptions already posted on the IGLO web site, *www.astc.org/iglo.* New items directed to project director Walter Staveloz *(wstaveloz@astc.org)* will be added to the list as they are received and reviewed. ■

Charlie Trautmann, executive director of the Sciencenter in Ithaca, New York, is a member of the ASTC Board of Directors and secretary of the IGLO Education Committee.

Sample IGLO Toolkit Resources

Global Warming Discovery Kit: **A Family Activity**
Designed by Claire Pillsbury and other members of the IGLO Education Committee, the portable kit contains six simple, self-guided discovery activities on the science behind global warming that families visiting a museum can do together on-site. Examples include harnessing solar energy with a photovoltaic cell to power a motor, solving a "Carbon Cycle" puzzle, or comparing the temperature rise of thermometers placed beneath white and black paper in sunlight or under a heat lamp. The kit, which uses hardware-store-type materials, can be easily replenished by staff or volunteers as needed. A free download on the IGLO web site provides a list of materials, ready-to-laminate visitor instructions, and a guide for museum educators on how to assemble the activities and package them for self-guided visitor use.

Climate Change, Here and Now: **Adult Programming**
This interactive program, intended primarily for adults in an auditorium or amphitheater setting, consists of a 10- to 15-minute educator presentation, followed by a guided discussion. The presentation, developed by members of the IGLO Education Committee in collaboration with climate researchers, draws on current scientific data to provide background on the history and science of global warming and to stimulate discussion around public policy issues and personal actions.

Citizen Debate: **Adult Programming**
In the tradition of the European DeCiDe project (*www.playdecide.org*), which addresses controversial science topics through low-tech, game-like activities for

multiple players, IGLO participants will develop a "citizen debate" kit on climate change and public policy.

***Earth & Sky Podcasts:* Multimedia Resources**
Short, factual, and well-documented reports on global warming themes are available for download from this National Public Radio series' web site: *www.earthsky.com*.

***Science Bulletins:* Multimedia Resources**
Earth science is one of the focuses of this ongoing series of short multimedia presentations from the American Museum of Natural History (*http://sciencebulletins.amnh.org*).

***Online "Experiments":* Teacher Resources**
NASA Goddard's online Earth Observatory (*http://earthobservatory.nasa.gov*) includes an Experiments section where educators can find a choice of activities based on remote sensor datasets. The "Global Warming" experiment invites users to view short movies about the science of climate change and then participate in either a team investigation or a downloadable interactive computer game.

***Water and Sustainability:* Exhibits**
Technical plans for 15 hands-on activities from *Water and Sustainable Development,* an exhibition about global warming currently under development by CosmoCaixa for the 2008 International Exposition in Zaragoza, Spain, will be made available through the toolkit to IGLO participants. ■

NASA's Earth Observatory web site features a variety of resources for educators.

Global Warming Resources

The following is a sampling; many more resources are available on the IGLO web site, www.astc.org/iglo.

READINGS

• Abbasi, Daniel. *Americans and Climate Change: Closing the Gap Between Science and Action.* New Haven, Conn.: Yale School of Forestry & Environmental Studies, 2006.
• Brook, Edward J. "Atmospheric Science: Tiny Bubbles Tell All." *Science,* Vol. 310, No. 5752 (25 November 2005).
• Giusti, Ellen. "Global Warming: Understanding the Forecast." American Museum of Natural History, October 1993.
• Houghton, Sir John. *Global Warming: The Complete Briefing. 3rd Edition.* Cambridge, U.K.: Cambridge University Press, 2004.
• Intergovernmental Panel on Climate Change (IPCC), *Third Assessment Report: Climate Change 2001*. Online at *www.ipcc.ch.*
• Moser, Susan, and Lisa Dilling, "Making Climate Hot—Communicating the Urgency and Challenge of Global Climate Change." *Environment,* December 2004.
• Petersson, Tord, ed. *Grasping Climate.* Lulea, Sweden: Teknikens Hus and Norrbottens Energikontor AB, 2005. Downloadable in pdf (72 pp.), in English or Swedish, *www.graspingclimate.net/.*
• Ramberg, Jenny-Sayre, et al. "Mission, Message, and Visitors: How Exhibit Philosophy Has Evolved at the Monterey Bay Aquarium." *Curator,* Vol. 45, No. 4 (April 2003).
• Ryan, Shelly. *Promoting Environmental Stewardship Through Exhibitions: The Challenges of Representing Global Warming in Science Museums.* Master's thesis, Department of Museum Studies, John F. Kennedy University. Berkeley, Calif.: August 2005. (See page 13.)
• Trenberth, Kevin. "Climate: Uncertainty in Hurricanes and Global Warming." *Science,* Vol. 308, No. 5729 (17 June 2005).
• Weart, Spencer R. *The Discovery of Global Warming.*Cambridge, Mass: Harvard University Press, 2003.

WEB SITES

Ask Dr. Global Change
http://gcrio.custhelp.com/cgi-bin/gcrio.cfg/php/enduser/home.php
The U.S. Global Change Research Information Office offers an online service to answer questions about climate change.

Global Climate Change Forums
www.adlerpodcast.com/GCCF
In four public forums hosted last spring by Chicago's Adler Planetarium & Astronomy Museum, scientists addressed what is currently known about climate change, the status of Earth's ozone shield, human "footprints" in the environment, and how we can meet future energy needs without jeopardizing the planet. Podcasts and PowerPoints are available here.

Global Warming Facts & Our Future
www.koshland-science-museum.org/exhibitgcc/index.jsp
Created to accompany an on-site exhibition at the Marian Koshland Science Museum, Washington, D.C., this interactive site enlists the authority of the National Academies to examine the role of human impact on climate change.

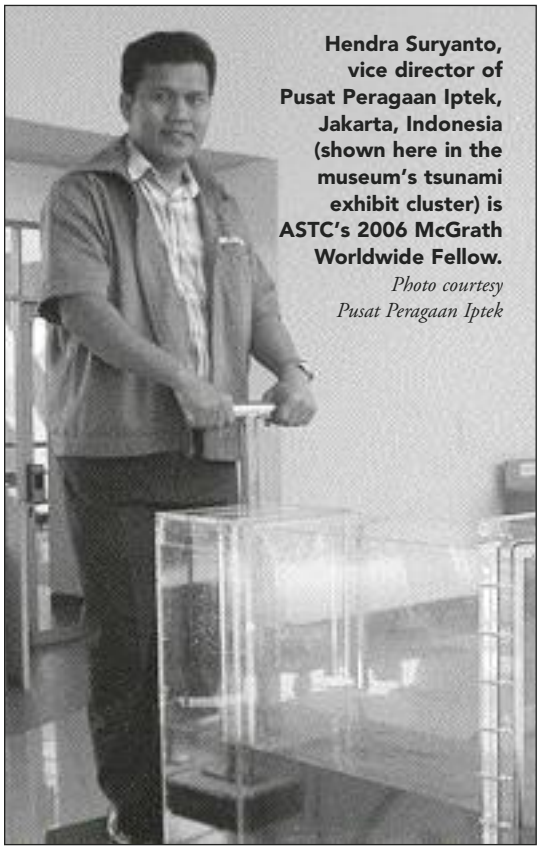
IGLO: International action on GLObal warming
www.astc.org/iglo/
The central site for the ASTC initiative, with links to partners, activities, calendars, resources, and more.

Interactive Atmospheric Data Visualization
www.cmdl.noaa.gov/ccgg/iadv/
This NOAA site offers visualizations of greenhouse gas concentration data gathered at monitoring stations worldwide.

Intergovernmental Panel on Climate Change
www.ipcc.ch
Established by the World Meteorological Organization and the U.N. Environmental Programme, the IPCC assesses scientific, technical, and socioeconomic information relevant to the understanding of climate change, its potential impacts, and options for adaptation and mitigation.

Pew Center on Global Climate Change
www.pewclimate.org/
Basic and current information on climate change science is presented in multiple languages, along with links to U.S. government agency web sites.

Real Climate
www.realclimate.org
Winner of a 2005 *Scientific American* Science & Technology Award, this site features "climate science from climate scientists" in four languages. ■



Hendra Suryanto, vice director of Pusat Peragaan Iptek, Jakarta, Indonesia (shown here in the museum's tsunami exhibit cluster) is ASTC's 2006 McGrath Worldwide Fellow.
Photo courtesy Pusat Peragaan Iptek

Indonesia Sends McGrath Fellow to Louisville

The Lee Kimche McGrath Worldwide Fellowship, established in memory of ASTC's first executive director, enables a representative from a member museum outside the United States to attend the ASTC Annual Conference. The fellowship provides free conference registration and a grant of $1,500 toward travel expenses.

This year, our McGrath Worldwide Fellow is Hendra Suryanto, vice director of Pusat Peragaan Iptek (Science & Technology Center Indonesia), Jakarta, Indonesia.

Suryanto oversees exhibits and educational programming at the 11-year-old science center, which is an agency of Indonesia's State Ministry for Research and Technology. Under his direction, the museum is developing new exhibits on volcanoes and earthquakes—topics of great public interest in Indonesia, which was hard hit by the 2004 tsunami—as well as new educational programming. Suryanto is also responsible for helping to launch science centers in other provinces of Indonesia. The government is calling for eight new centers to open by 2011.

In Louisville, Suryanto hopes to expand his institution's international contacts, gain valuable experience and knowledge, and solicit feedback on existing Pusat Peragaan Iptek programs from conference attendees. He is also interested in new partnerships. "A lot of countries now have full attention to advancing science centers and to creating an international linkage for sharing benefits among them," Suryanto says. "These are opportunities that can be used for our development programs."

If you are attending ASTC 2006, please join ASTC's board and staff in welcoming Hendra Suryanto. Those wishing to make a donation in support of future McGrath Fellows may contact Bonnie VanDorn, bvandorn@astc.org.

Climate Change and Sustainability at ASTC 2006

A number of sessions at the 2006 ASTC Annual Conference in Louisville, Kentucky, will focus on global warming, the IGLO initiative, and the growing "green" movement among science centers. Watch for the following as you plan your schedule:

• On Friday, October 27, NASA, NOAA, and the Science Museum of Minnesota will conduct an all-day preconference workshop, "Presenting the Science behind Global Warming," at the Bernheim Arboretum and Research Forest. Participants will discuss the current state of climate science and work on building the IGLO Toolkit and establishing a timeline of IGLO activities.

• On Saturday, October 28, at 4 p.m., exhibit designers and builders will share products, design solutions, and lessons learned in the "Green Exhibits Showcase."

• Three sessions on Sunday, October 29, address the question of individual and collective "footprints" on our planet. At 12:30 p.m., "Are You Really Going Green?" will explore how to plan and develop a low-energy-use building. At 2:30 and 4:30 p.m., "Human Impact on Climate: What We Did and What We Can Change: Parts 1 and 2" will feature presentations on atmospheric chemistry and the relationship between climate change and human societies.

Dimensions Discussion Forums Launched

The first-ever online discussion forum based on an issue of *ASTC Dimensions* was hosted on ASTC Connect (*www.astc.org/astc_connect*) in September. Led by moderators Jim Spadaccini, principal of Ideum, and ASTC's Wendy Pollock, nearly 40 participants located as far apart as Australia and the Netherlands engaged in lively discussions, including two real-time videochats, around topics raised by the July/August 2006 issue on the Internet's new social technologies.

As of this writing, a second forum, focusing on astronomy education, the theme of the September/October 2006 issue, was scheduled to begin October 4, with authors participating. Katy Garmany, an astronomer from the National Optical Astronomy Observatory in Tucson, Arizona, had agreed to moderate. Look for news of future *ASTC Dimensions* forums on ASTC Connect, in the biweekly INFORMS e-news-letter, or on the ISEN listserv *(www.astc.org/profdev/listserv.htm).*

Consensus Conference to Convene

On December 4 and 5, ASTC will host a two-day meeting in Kansas

City, Missouri, to examine how science centers and museums can increase participation in the sciences by the current generation of underserved youth.

Approximately 25 invited participants—including youth program staff and administrators from ASTC-member institutions, professionals in urban education, and out-of-school program leaders—will join representatives of funding organizations, federal agencies, and ASTC constituent organizations to examine the educational needs of underserved youth and the attributes of programs that foster academic achievement.

Participants will incorporate that understanding into the context of science center programs and develop guidelines for designing and implementing strong programs for the target population.

The consensus guidelines will be available on the ASTC web site and disseminated at the 2007 ASTC Annual Conference. The meeting is being funded by grants from the American Honda Foundation and Agilent Technologies.

Time to RAP

ASTC RAPs (Roundtables for Advancing the Professions) are small-group weekend intensives that provide an intimate forum for museum professionals to network, learn together, and expand their knowledge base. Hosted by ASTC-member institutions worldwide, these one- or two-day workshops have covered a wide range of topics—from camp-ins and youth programs to information-technology trends and outdoor science parks. (For details on the program, launched in April 2001, see "Advancing Each Other: Lessons from the ASTC RAPs," *ASTC Dimensions,* September/October 2003.)

ASTC is now putting together the RAPs schedule for 2007. If your institution would like to participate, please contact Wendy Hancock at whancock@astc.org. ■

Calendar

NOVEMBER

8–11 **Museum Computer Network Conference.** "Access to Assets: Return on Investment." Pasadena, California. *Details:* www.mcn.edu

15–17 **Astronomy from the Ground Up.** Regional NSF-funded workshop for informal science educators. Boston, Massachusetts. *Details:* www.astrosociety.org/afgu

29–Dec. 1 **2006 SAASTEC Conference.** Hosted by Unizul Science Centre, Richards Bay, South Africa. *Details:* www.saastec.co.za

JANUARY 2007

19–21 **Science and Society: Closing the Gap.** A free conference for science communicators; space limited. Boston, Massachusetts *Details:*www.scienceandsocietyconference.com

FEBRUARY 2007

18–24 **National Engineers Week (U.S.).** *Details:* http://www.eweek.org

MARCH 2007

8–18 **National Science & Engineering Week (U.K.).** Coordinated by the BA. *Details:* www.the-ba.net/nsew

9–11 **ASTC RAP Session.*** "The Ultimate Science Show Discussion." Hosted by Heureka, the Finnish Science Centre, Vantaa, Finland. *Details:* Lea Tuuli, lea.tuuli@heureka.fi

APRIL 2007

1–30 **Mathematics Awareness Month.** *Details:* www.mathaware.org

11–14 **Museums & the Web 2007.** San Francisco, California. *Details:* www.archimuse.com/mw2007

MAY 2007

10-12 **Interactivity 2007.** "Embracing Diversity in Your Town Square." Association of Children's Museums annual meeting. *Details:* www.childrensmuseums.org

13–17 **American Association of Museums Annual Meeting.** Chicago, Illinois. *Details:* www.aam-us.org

18 **International Museum Day.** Sponsored by the International Council of Museums (ICOM). *Details:* www.icom.org/imd.html

31–June 2 **Ecsite Annual Conference.** Lisbon, Portugal. *Details:* www.ecsite.net

JUNE 2007

7–9 **CASC Annual Conference.** Hosted by TELUS World of Science–Edmonton, Alberta. *Details:* www.canadiansciencecentres.ca/conferences.htm

8 **World Ocean Day.** Sponsored by the World Ocean Network and The Ocean Project. *Details:* www.worldoceannetwork.org

OCTOBER 2007

13–16 **ASTC Annual Conference.** Hosted by the California Science Center, Los Angeles. *Details:* www.astc.org/conference/future.htm

** For information on ASTC RAPs, visit* www.astc.org/profdev/. *For updated events listings, click on 'Calendar' at* www.astc.org.

Spotlights

By Christine Ruffo

Large windows provide an abundance of natural light at Discovery Center of Springfield.
Photo courtesy Discovery Center of Springfield

GREEN GROWTH—How is your electricity generated? What are your floors made of? How did you get to work today? With sustainable practices in plain view, the newly expanded facility at the **Discovery Center of Springfield,** Missouri, serves as an exhibit itself, encouraging visitors to "live green."

The 30,000-square-foot expansion opened in September. Every aspect of its construction process was planned to reduce energy and water consumption, beginning with the debris from the previous structure, of which more than 80 percent was recycled. Strategic placing of some window groupings, facing northwest in a "saw tooth" pattern, improves the quality of natural light in the new building and reduces solar heat gain. Recycled materials are found throughout, from the "fly ash" used in the concrete mix to the rubber flooring.

Two 4,400-gallon cisterns built into the structure (and visible to visitors) collect rainwater to supply toilets and the irrigation system. On the roof, a garden reduces runoff into storm sewers, and photovoltaic cells harness solar energy that will provide 5 to 7 percent of the center's electricity. Bicycle racks and reserved carpool spaces have been added to the parking lot, and a new employee shower accommodates staff who bike to work. All of these features and more are pointed out on interpretive panels.

Hands-on exhibits also highlight energy efficiency. In the Energy Exchange gallery, visitors can tinker with a solar-powered fan and a hand-cranked radio, build dams that power small turbines, or convert human energy into electricity in a giant "hamster wheel." A computer kiosk allows visitors to monitor the sunlight absorbed and the energy generated by the center's solar panels. Additional spaces include classrooms, a multipurpose room, and offices—all equipped with sensors to turn off lights when the rooms are unoccupied.

Discovery Center has applied for LEED certification and hopes to be awarded Gold status, the second-highest rating. Funding for the $6 million expansion was provided by the J.E. and L.E. Mabee Foundation, the C.W. Titus Foundation, the William T. Kemper Foundation, the Musgrave Foundation, and other public and private contributions.

Details: Emily Fox, CEO, efox@discoverycenter.org

PREPARING FOR THE WORST—What if a natural disaster happened in your community? Would you be ready? *Disasterville,* a new 10,000-square-foot permanent exhibition at **MOSI,** Tampa, Florida, puts visitors at the center of such catastrophic events as earthquakes, storms, and wildfires—explaining the science behind these occurrences and demonstrating behaviors that can help to minimize their impact. Says vice president of exhibits Dave Conley, "We want guests to appreciate that preparation now will save lives and reduce property damage in the future."

The exhibition begins with an introduction to the Earth's weather systems. Visitors can select imagery based on NASA and NOAA data sets, including water surface temperatures and 2005 storm systems, to be projected onto a 36-inch globe. An accompanying interactive map shows which areas of the United States are most affected by different natural perils.

Visitors experience the winds of a Category 1 hurricane in *Disasterville*.
Photo courtesy MOSI

Next, four immersion theaters equipped with computer-generated imagery (CGI) screens let visitors see, feel, and hear the destructive force of nature. Walls and floors shake in Earthquake; sirens wail as the sounds of the storm grow in Tornado; a howling wind blows through Hurricane; and heat builds as smoke seeps through cracks in the walls in Wildfire.

Hands-on exhibits allow visitors to determine the flood risk for their ZIP code; step into a wind tube simulating a Category 1 hurricane; examine a new car destroyed by hail; and develop their own family emergency plans. Accompanying the exhibition is Bay News 9 WeatherQuest, a one-hour immersive program that lets participants assemble stories and research for their own emergency weather broadcasts.

Disasterville, which opened August 5, is presented in collaboration with the Institute for Business & Home Safety and local news channel Bay News 9. Other major funders for the $3 million project include the National Science Foundation, Wildland/Urban Interface Work Group, State Farm Insurance, RBK Architects, Paul J. Sierra Construction Company, and the Walter Family Foundation.

Details: Dave Conley, vice president of exhibits, dconley@mosi.org

OUTDOOR FUN—Exploration begins before visitors even walk through the door at **Ontario Science Centre,** Toronto, Canada. On September 20, the center unveiled its transformed front entrance, now a 56,000-square-foot outdoor exploration plaza, *Teluscape.* The exhibition, named for the sponsoring TELUS Corporation, encourages visitors to question landscapes in order to discover new, sometimes surprising, features of their surroundings.

Steve Mann's Funtain interactive fountain centers the new Teluscape outdoor exhibit area. *Photo courtesy Ontario Science Centre*

Teluscape juxtaposes the natural environment of nearby Don Valley with the urban Toronto landscape, combining native trees and a wetland with walkways, installation art, and interactive exhibits. The centerpiece of the exhibition is FUNtain, a flute-like, interactive fountain and sound sculpture designed by local artist Steve Mann, which is played by interrupting streams of water. Visitors can also create their own light shows with fiber optic reeds and sculptural LED tree sculptures "planted" amid the plaza's natural landscaping.

A science activity challenges visitors to determine whether a nearby pond is a storm-water management area, a natural ecosystem, or both. Other elements include a constantly changing water maze, a river walkway, and programming space that seats 350 people.

Teluscape is part of the Ontario Science Centre's $47.5 million (Canadian) *Agents of Change* initiative, which also includes KidSpark (opened in November 2003) and the Weston Family Innovation Centre (first phase opened in March 2005; second in July 2006). TELUS contributed $10.1 million to the project.

Details: Anna Relyea, associate director, strategic communications, anna.relyea@osc.on.ca

WELL-ROUNDED—What secrets do circles hold? At **Children's Discovery Museum of San Jose,** California, visitors can explore the elegant use of circles in nature and in human culture through time in a new 2,000-square-foot permanent exhibition, *Secrets of Circles.* Opened August 1, the trilingual (English-Spanish-Vietnamese) exhibition features 18 hands-on exhibits for children aged 3 to 10, each unveiling a different secret.

The first "secret"—that every point on the edge is the same distance from the center—is demonstrated as visitors use different-sized compasses to create their own circles. Other secrets are revealed as children spin sticks from a central point or touch a digital "ripple" table that simulates dropping a pebble in water. To explore the role of circles in machines, visitors can compare dragging a brick on a flat platform to pulling it on wheels and build their own gear contraptions to power a music box dancer, a clock, or a drill. They can try to move a giant truck tire from the inside. Finally, they can discover the circles in the environment, as they build an arch bridge and explore a marketplace filled with circular items from around the world, including pulleys, baskets, and a Vietnamese round boat.

The museum applied green principles in constructing *Secrets of Circles.* Natural materials include bamboo, a rapidly renewable resource, and bamboo plywood, made with toxin-free adhesives. A traveling version of the exhibition will be available in May 2007. Major funding for the $1.7 million project was provided by the National Science Foundation ($1.2 million), Fujitsu, and KPMG.

Details: www.cdm.org ■

A visitor to *Secrets of Circles* builds his own gear-powered machine. *Photo courtesy Children's Discovery Museum of San Jose*

Grants & Awards

The **Carnegie Science Center,** Pittsburgh, Pennsylvania, received $1 million from the Buhl Foundation to fund the purchase and installation of high-definition, fulldome digital technology for the Henry Buhl Jr. Planetarium.

Chabot Space & Science Center, Oakland, California, received a $49,550 grant from the City of Livermore's Altamont Education Advisory Board to help train the science center's college interns in waste management and recycling.

The **Museum of Science,** Boston, announced receipt of its largest single, individual gift ever—$20 million from the Gordon Foundation established by Sophia and Bernard M. Gordon—in support of the museum's National Center for Technological Literacy (NCTL). Engineer and inventor Bernard Gordon is the founder of Analogic Corporation. The money will be used to build the new Sophia and Bernard Gordon Wing, which will serve as the national headquarters for NCTL, and to support development of interactive programs to inform and motivate future engineers, including a new permanent engineering exhibition. The science center will also rename its multimedia presentation area for breaking science news the Gordon Current Science & Technology Center.

The **Orlando Science Center,** Orlando, Florida, received $385,000 from the Orange County Arts & Cultural Affairs Advisory Council to begin initial development of a dedicated children's museum inside the existing science center complex. Approximately 10,000 square feet of exhibit space will be allocated to the new "museum within a museum," which will have a strong preschool development focus.

The following U.S. ASTC members have recently received funding from the National Science Foundation:

- The **University of Pittsburgh Center for Learning in Out-of-School Environments** (UPCLOSE): $311,268 to redevelop its web site, *www.informalscience.org,* to include multimedia elements, an expanded research database, and an improved search function.
- The **New York Hall of Science** (NYHOS), Queens: $317,929 for a partnership among the City College of New York (CCNY), the science center, and the City University of New York Center for Advanced Study in Education to integrate NYHOS's Science Career Ladder program with the CCNY science teacher preparation program. ■

People

Beverly Sheppard joined the Institute for Learning Innovation, Annapolis, Maryland, as executive director on July 31. **John Falk,** her co-author on the recently published *Thriving in the Knowledge Age* (AltaMira, 2006), remains as Institute president. Sheppard was CEO and president of Old Sturbridge Village, Sturbridge, Massachusetts, from 2002 to 2006. Prior to that, she served as deputy director and acting director of the Institute of Museum and Library Services, Washington, D.C.

On August 15, **Loren A. Behr** assumed his duties as executive director of the Lindsay Wildlife Museum, Walnut Creek, California. Since 2003, Behr had been executive director of the Columbia Memorial Space Science Learning Center, a new science museum scheduled to open in late 2007 in Downey, California. Previously, he worked at the Children's Museum of Denver, the Chicago Children's Museum, and the California Academy of Sciences, San Francisco. He replaces **Eunice Valentine,** who left the museum to take a position with the Volunteer Center of Sonoma.

David Leverton resigned his position in August as CEO of Science Alive! The New Zealand Science Centre, Christchurch, to return to Canada and his work with David Leverton and Associates. **Neville Petrie** is serving as acting CEO until a replacement is hired.

The Museum of Nature & Science, Dallas, Texas, has appointed **Anne C. Haskel** as chief development and public affairs officer. Haskel was most recently director of external affairs at the Holocaust Memorial Foundation of Illinois. She previously worked at the Field Museum, Chicago, and the Solomon R. Guggenheim Museum, New York.

The Museum of Science, Boston, announced the appointment of **Andrea Durham** as director of the Nanoscale Informal Science Education (NISE) Network. Previously, Durham served as manager of exhibit projects at the museum.

ASTC welcomed two staff members to the Washington, D.C. office this fall. Former employee **Sheryl Thorpe** rejoined the Meetings and Conferences department as conference and exhibit hall coordinator, replacing **Gareth Rees.** And **Andrea Pereira** was hired as administrative assistant and receptionist, replacing **Shawon Briscoe.** Andrea previously worked for the National Oil Agency in Brazil and the Brazilian Embassy in Washington, D.C. ■

Association of Science-Technology Centers
1025 Vermont Avenue NW, Suite 500
Washington, DC 20005-6310
Address Service Requested

Non Profit Org.
U.S. Postage
PAID
Washington, D.C.
Permit No. 537