

ED12C-06 1520h

Frigid air and frozen oceans: Educational outreach opportunities in Arctic ocean-ice-atmosphere research

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Arctic research provides a marvelous venue for educational outreach activities. The polar regions, with snow and ice, months-long winter nights and summer days, and marine mammals such as seals, whales, and polar bears, has an intrinsic sense of adventure and interest. This interest provides an entry point for educational outreach activities, but does not guarantee success. Arctic researchers studying ocean-ice-atmosphere interactions have used a myriad of techniques for educational outreach activities: web sites, classroom visits, lectures, news articles, and e-mail correspondence from the field. One such web site, <http://arcsoaii.hpl.umces.edu/outreach.htm>, has been developed as a clearinghouse for researchers to share ideas, strategies, and techniques. For K-12 outreach, developing an ongoing effort with several classroom visits over the school year, is particularly effective. Classroom visits with brief lectures, replete with pictures, followed by an experiment or activity make it relatively straightforward to convey the enthusiasm and excitement of polar research. A more difficult task, however, is to integrate outreach activities into the curriculum. Collaborating with teachers is essential to achieve this integration. In public lectures, it is productive to first capture the audience's attention by describing what it is like to work in the polar regions, then discuss the science. It is important to distill the science to one or two key concepts and present them clearly and concisely. A recurring theme was that not only were outreach activities fun and satisfying, but they also enhanced the researchers understanding of the material.

ED12D MCC: 3012 Monday 1600h

Astrobiology Education: Bridging the Gap Between Scientists and Educators (joint with B, P)

**Presiding: D M Scalice, NASA
Astrobiology Institute; K Wilmoth,
NASA Astrobiology Institute**

ED12D-01 1625h

Real Science for Real Science Teachers: Providing Astrobiology Science Content and Contemporary Pedagogy for Today's Educators Online

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As teachers strive to improve the way science is taught in the classroom, many are turning to the interdisciplinary science of astrobiology as a way integrate inquiry effectively in the science classroom. However, it is generally recognized that teachers do not often have easy access to understandable and usable cutting-edge science to enrich their science lessons. Through the generous support of the NASA Astrobiology Institute (NAI), middle and high school teachers have the opportunity to learn current and provocative scientific results within the context of astrobiology as well as receive training in pedagogically sound methods of incorporating astrobiology appropriately in the classroom. In Astrobiology for Teachers, a 15-week on-line distance learning course co-sponsored by NAI, the National Science Teachers Association (NSTA) Professional Development Institute, National Teachers Enhancement Network (NTEN), Montana State University, and the Department of Astronomy at University of Arizona, teachers engage in a virtual classroom facilitated by an integrated teaching team of educators and scientists using a standards-based, inquiry curriculum. The collaborative nature of the course encourages, demonstrates, and enhances a professional exchange among scientists

and educators which, in turn, fosters implementation of innovative science teaching in today's classroom.

URL: <http://shiraz.as.arizona.edu>

ED12D-02 1630h

The Challenges of Collaboration Across Professional Cultures

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I currently work as a cultural anthropologist researching and facilitating collaboration among members of a scientific "virtual institute." The NASA Astrobiology Institute (NAI) is focused on establishing a "culture of collaboration" that encourages and supports productive exchange among those representing a variety of disciplines who are pursuing key questions in the field of astrobiology. Within the context of NAI, interdisciplinary collaboration is important not only between those with expertise in the specific sciences that are part of the astrobiological research arena. Also very important is collaboration between these scientists and the educators who are striving to bring deeper awareness of and knowledge about astrobiological research findings to students of all ages and to the general public. As a member of this panel, I will offer an anthropological perspective on the diverse challenges that are associated with bridging across disciplinary, as well as geographical and institutional boundaries, and discuss the steps that are necessary to the development and maintenance of an effective culture of collaboration. Specific emphasis will be on the challenges that must be addressed in order to create effective collaborative relationships between those immersed in different professional cultures.

ED12D-03 1635h

Educators Experiencing Research - Benefits for the Classroom

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I have been involved with two Planetary Society geology expeditions looking for evidence of asteroid impacts. We worked in Belize and Italy with teams of international scientists from various scientific fields. Through the REVEL program, I spent two weeks onboard the RV Atlantis studying hydrothermal vents off the coast of Washington. I worked with an interdisciplinary team of scientists and graduate students and was involved in designing my own research project. As an educator I have designed activities for my students which were based on these research experiences. My students became aware of the type of science taking place in this "cutting-edge" research. I have learned to work in a team and have encouraged my students to work in that manner as well. The contacts that I have made have provided sources of information, borrowing equipment and other research opportunities. This research experience also supports my high school research science program.

ED12D-04 1640h

Scientist - Educator Partnerships

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Science is the quest for knowledge about the natural world, and scientists are often characterized as driven by curiosity and the desire to discover, traits they share with children exploring the world through youthful eyes. In contrast, formal science education at the pre-college and college levels frequently distills the joy of scientific research and discovery into a body on known facts, laws, and disciplinary studies, losing the excitement of doing science. When scientists partner with teachers and other educators, there is an opportunity for engaging students and the public with scientists and their research projects. Further, scientists provide expertise to create up-to-date and accurate materials for use in classrooms, science centers, and youth groups. Scientists also see engagement with teachers, students, and the public through science centers as a means of growing the next generation of scientists to continue the work. Often this process is facilitated by science education professionals who work at the interface between the worlds of scientific research and formal and informal education. The partnership between the research scientist and the science education professional can result in improved science education for a broad community of teachers, students and the public.

ED12D-05 1645h

NASA Astrobiology Institute Scientist/Educator Bridges

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NASA has engaged in many educational programs and projects, and one major focus of the Office of Space Science's priorities in establishing education and public outreach (E/PO) programs has been the inclusion of scientists in those efforts. However, the construction of scientist/educator teams remains a major challenge in NASA education efforts. The NASA Astrobiology Institute (NAI) seeks to build bridges between these two professions in ways that are respectful of the expertise of each in bringing astrobiology content to K-12 classrooms. Several of the NAI's Lead Teams, collaborative interdisciplinary research groups pursuing core questions in astrobiology and providing education and training, include teachers and other experts in education to focus their E/PO efforts while also integrating the unique scientific expertise of their teams. This approach is not without its challenges and difficulties. Communication, accuracy, inclusion, funding, and the larger science education reform efforts are among them. There is tremendous work to be done in the arena of winning mutual respect and inclusion of both scientists and educators in providing NASA content to K-12 audiences. NAI is engaged in a series of attempts through the venues of both science and education conferences where such understanding may be built. This panel discussion represents one of these efforts.

URL: <http://nai.arc.nasa.gov>

ED12D-06 1650h

The Role of Scientists in Science-Educator Partnerships

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Vital to meeting the need for improved science education is the involvement of scientists in collegial partnership with science educators in both formal and informal settings. This is especially true in Astrobiology where the multi-disciplinary nature of the realm provides both educational opportunities and challenges. This paper will address barriers and pathways to successful scientist participation in educational partnerships through a collection of concrete examples of astrobiologists in education.

URL: <http://www.spacescience.org>

ED12E MCC: 3012 Monday 1700h

Bringing Extrasolar Planets to Teachers, Students, and the Public (joint with P, PA)

**Presiding: E K DeVore, SETI
Institute; A Gould, Lawrence Hall of
Science, University of California,
Berkeley**

ED12E-01 1700h INVITED

Discovering New Worlds

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Since 1995, more than 100 planets have been discovered orbiting nearby stars. I will present an overview of what we've learned and speculate about exciting discoveries on the horizon. Many classroom projects have been developed to teach astronomy at the middle school through high school level. I will highlight a few favorite projects that provide a good foundation for understanding key concepts. Examples of projects using data from our website will also be presented.

URL: <http://exoplanets.org>

ED12E-02 1715h INVITED

Sun-Earth Day 2004: Venus Transit

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The NASA Sun-Earth Connection Education Forum annually promotes an event called Sun-Earth Day. For Sun-Earth Day 2004 SECEF has selected the transit of Venus as the theme. Opportunities are available to prepare for the viewing of this event. The event last occurred in 1882, so no one alive today has ever witnessed the transit of Venus. Through parallax measurements, it allowed astronomers to define, for the first time, a fairly accurate number for the A.U. and therefore, the distance to all the other known planets. The website <http://sunearth.gsfc.nasa.gov/sunearthday> has been developed to provide the necessary resources and opportunities for participation in Sun-Earth Day. This is the fourth year that we offer new and exciting space science. This year in particular the content area crosses all of space sciences offering activities and resources for every classroom and museum event. The goal is to involve as much of the student population and the public in this event as possible and to help them understand the immense importance and excitement surrounding this and previous transits. Through engaging activities focused on US and world history, technology, math, and astronomy, classrooms and museums can create their own event or participate in one of the opportunities we make available. Comparisons of Venus with the Earth and Mars, calculations of the distances to nearby stars, and the use of transits to identify extra-solar planets will all add to the excitement of this cosmic occurrence.

URL: <http://sunearth.gsfc.nasa.gov/sunearthday>

ED12E-03 1730h INVITED

Kepler Education and Public Outreach: Finding Earth-sized planets

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Astronomers are discovering Saturn size extrasolar planets, and have already sparked broad public interest. But can smaller planets - Earths - be found? This is a powerful and exciting question that can motivate student learning and public interest in the Kepler search for habitable planets. The Kepler Mission Education and Public Outreach (EPO) program capitalizes on the excitement of discovering Earth-size planets in the habitable zone, stimulating student learning and public interest in astronomy and physics. Kepler is a NASA Discovery mission, selected in December 2001, with launch and the search for extrasolar Earths commencing in 2007. During the first year, we expect Kepler to rapidly detect large planets similar to 51 Peg and smaller Earth-size planets in Mercury-like orbits. By the fourth year, we anticipate the discovery Earth-size planets in habitable zones. The goals and plans of the Kepler EPO program, which began in October 2002, are to: - build public interest during development, - to engage students and the public throughout the initial four-year mission and beyond if an extended mission is conducted, - increase public awareness and understanding of the Kepler Mission - involve scientists and contractors in EPO efforts, - establish collaborations with planetarium programs and science museums, - build on existing programs and networks that maximize the leverage of NASA EPO funding in this project and optimize the impact of EPO. These goals and plans embodying key principles set forth in NASA's Partners in Education and Implementing the OSS Education/Public Outreach Strategy. Details of our planned EPO projects and products are given in this paper.

URL: <http://www.lawrencehallscience.org/kepler/>

ED12E-04 1745h INVITED

PlanetQuest: Engaging the Public and Students in NASA's Search for New Worlds

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NASA's Navigator Program consists of four ground-breaking missions that span a twenty-five year time horizon. Two space-based and two ground-based missions will contribute to the overall goal of detecting and characterizing Earth-like planets around stars other than the Sun. The Keck Interferometer began its science mission in 2002, and the Large Binocular Telescope Interferometer will become operational in 2006, while the two space-based missions, the Space Interferometry Mission and the Terrestrial Planet Finder, will launch in 2009 and 2015 respectively. The science operations and analysis of all missions will be supported by the Michelson Science Center, operated by the California Institute of Technology. Navigator Public Engagement initiatives (which can also be found under the heading of "PlanetQuest") span the areas of formal education, informal education, and general public outreach. Two initiatives-improving astronomy instruction at community colleges, and the "Night Sky Network: Engaging Amateur Astronomy Clubs"-stand out as significant new investments for Navigator, and may serve as platforms for the participation of more NASA missions in the future. Other programs involve creating activities for "girls in science," continuing to support minority university research experiences, and developing museum exhibits, a planetarium show and other visualizations. The core values of all Navigator E/PO initiatives include involving scientists and engineers, creating effective partnerships, reaching underserved populations, and evaluating and measuring program impact.

URL: <http://planetquest.jpl.nasa.gov/>

ED21A MCC: 3012 Tuesday 0800h

Enhancing K-12 Earth Science Education Through Partnership I (joint with OS, PA)

Presiding: M J Smith, American Geological Institute; A E Benbow, American Geological Institute; R Brame, Wright State University

ED21A-01 0800h

A Partnership to Align Digital Resources to Educators' Needs

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The Digital Library for Earth System Education (DLESE) is a community-led, NSF-funded effort to promote access to high-quality digital resources for teaching and learning about the earth. It is an operational library, with over 20,000 web visits a month and nearly 5000 resources available to educators and learners. As the library enters a new operational phase that targets widespread use in K-12 and undergraduate settings, DLESE has partnered with the United States Geological Survey (USGS), the University of California at Berkeley (UCB) Museum of Paleontology, the California State Science Teachers Association (CSTA),

and several California school districts. These partners are initiating a pilot program intended to ensure that resources in the library align with the needs and curricula of K-12 teachers. This partnership represents a major advance in DLESE's utility to the K-12 teaching community and affords a number of advantages to each partner. The school districts benefit from materials that meet their unique curricular needs. The USGS and UCB Museum of Paleontology are able to integrate teacher needs into the design of their materials and promote wider use of their resources. DLESE gains a focused user group to participate in the user-centered design of new services and to support onsite evaluation of the library's educational impact. Finally, the overall project provides a vehicle to evaluate the effectiveness of these partnerships and apply successful practices to more general efforts.

URL: <http://www.dlese.org>

ED21A-02 0815h

Building Partnerships Between Research Institutions, University Academic Departments, Local School Districts, and Private Enterprise to Advance K-12 Science Education in Texas

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The University of Texas at Austin Institute for Geophysics (UTIG) is engaged in six K-12 education and outreach programs, including two NSF-sponsored projects-GK-12: Linking Graduate Fellows with K-12 Students and Teachers and Cataclysms and Catastrophes-Texas Teachers in the Field, Adopt-a-School, Geoscience in the Classroom, and UT's Science and Engineering Apprenticeship Program. The GK-12 Program is central to UTIG's effort and links the six education projects together. While the specific objectives of each project differ, the broad goals of UTIG's education and outreach are to provide high-quality professional development for teachers, develop curriculum resources aligned with state and national education standards, and promote interaction between teachers, scientists, graduate students, and science educators. To achieve these goals, UTIG has forged funded partnerships with scientific colleagues at UT's Bureau of Economic Geology, Marine Science Institute and Department of Geological Sciences; science educators at UT's Charles A. Dana Center and in the Department of Curriculum and Instruction in the College of Education; teachers in six Texas independent school districts; and 4empowerment.com, a private education company that established the "Cyberways and Waterways" Web site to integrate technology and education through an environmentally-based curriculum. These partnerships have allowed UTIG to achieve far more than would have been possible through individual projects alone. Examples include the development of more than 30 inquiry-based activities, hosting workshops and a summer institute, and participation in local science fairs. UTIG has expanded the impact of its education and outreach and achieved broader dissemination of learning activities through 4empowerment's web-based programs, which reach ethnically diverse students in schools across Texas. These partnerships have also helped UTIG and 4empowerment to secure additional funding for other education projects. Finally, UTIG has helped sustain educational innovation locally through informal partnerships with the Texas Education Agency, which oversees the public education system of Texas, the Texas Regional Collaboratives for Excellence in Science Teaching, a state-based science education alliance, and UTeach, a program for pre-service teachers at UT Austin.

URL: <http://www.ig.utexas.edu/outreach/index.htm>

ED21A-03 0830h

Collaboration and Inquiry: Cornell University Partnerships with Rural School Districts

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Cornell University's location provides valuable opportunities for university-community collaboration. Schools in the area tend to be rural, with limited access to resources. Two projects in place at Cornell