New Advances in Deep Submergence Technology Using Remotely Operated Vehicles, High-Bandwidth Ship-to-Shore Satellite Technology, and Internet 2

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In August 2003, the authors carried out a major oceanographic research cruise to the Black Sea and Central Mediterranean aboard the R/V Kuroshio using underwater vehicles linked in real-time to scientists, engineers, and students ashore. Two vehicle systems, including an ROV and a towed vehicle, worked in tandem using multiple high-definition video cameras and sonar systems to investigate and sample a number of geological and archaeological sites. Scientists and engineers controlled the vehicles on a continuous basis in a shipboard command/central control center. From a menu of more than twenty video feeds and computer generated displays within the control center, twelve video streams from the vehicles below, including two high-definition camera feeds, and six audio channels were transmitted via a shipboard satellite-tracking antenna to a receiving site in the United States. From there the signals were sent to a processing center and then placed on Internet 2 and distributed to a number of participating universities across the country. Scientists and engineers at these universities were able to participate in real-time in shore-based control centers similar to the one at sea. Two-way audio communications made it possible for teachers and researchers aboard to have full access to the data streams aboard ship and gave them the ability to share the data with educators and students as well as request additional information and displays on demand. When new discoveries were made, scientists and engineers ashore could be networked into the decision-making process. This advanced communication infrastructure and the advanced technologies the researchers and engineers ashore the ability to participate in the cruise in real-time but also students, teachers, and public were able to participate via both Internet 2 and the conventional internet. These participants were situated at home, in schools, or at other educational venues across the country and had the ability to ask the project scientists and engineers questions while they carried out their research.
of the products. Each of these materials is available on the Aqua web site at http://aqua.nasa.gov, as are archived versions of the eight Aqua web casts. The web casts were done live on the internet and focused on the current, stunningly successful exploratory phase of the Naval Research Laboratory and NASA’s Sun-Earth connection."
ED51C-1212 0830h POSTER
NASA High Energy Space Science E/PO at SSU: Program Overview and Lessons Learned
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The NASA Education and Public Outreach (E/PO) Group at Sonoma State University is the lead institution for the E/PO of three high-energy space science missions: Swift, GLAST, and XMM-Newton. We have developed award-winning standards-based formal and informal educational activities (classroom exercises, interactive websites, posters, etc.) for these missions, with many more coming soon. Our primary goal is to engage the broadest possible portion of the electromagnetic spectrum, and the astrophysical objects that energy ranges can now present will be the goal of our program and our work.

This includes our collaborations with other groups, getting mission scientists involved on the projects, and the lessons learned in making effective E/PO products that actually get used by teachers. We will also include a broad overview of the NASA Educator Ambassador program, a support model that we have initiated to train top-notch educators from across the country to help us develop, test, and disseminate our products.

URL: http://epo.sanoma.edu

ED51C-1213 0830h POSTER
NASA Education and Public Outreach Initiatives at the MIT Center for Space Research
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Since its inception in 1999, the EPO office of the MIT Center for Space Research (CSR) has fostered direct participation of local scientists in educational initiatives such as teachers workshops and public tours of the Charles Rice Control Center. The role played by the CSR EPO office has grown significantly, thanks in part to the number of CSR grants associated with the Chandra and HETE missions. In the past year, the CSR Center for Space Research was involved in the office's EPO initiatives: more than 500 K-12 students, half from underrepresented groups, were included in formal education programs and informal education events; K-12 students and graduate researchers participated in research activities; and teachers and students engaged in the Outreach and Challenges the NSF programs face, and future prospects of the programs.

URL: http://mit.edu/epo

ED51C-1216 0830h POSTER
ED51C-1216 0830h POSTER
Supporting Research at NASA'S Goddard Space Flight Center Through Focused Education and Outreach Programs
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ED51C-1217 0830h POSTER
Building Successful Partnerships Between Scientists and Educators to Bridge Scientific Research to Education and Outreach Audiences at a National Research Laboratory
Susan Q. Foster1 (foster@ucar.edu; Roberta M. Johnson1, Sandra Henderson1, Linda Carbon1, Tere Eastrude1, Randy Ruszila1, Lisa Gardiner1, Caspar Ammann1, David Carlson2, Cecilia Delucia2, Allan Fried2, Tim Killeen2, Kristi Lauren1, Ramon Lopez1, Gan Lu1, Dan Marsh2, Linda Otto-Bleisner2, Art Richmond2, Dirk Richter2, Jeff Hughes3, Claudia Alexander3, Tamas Gombosi4; 5The University of Michigan, 1410 Space Research Building, Ann Arbor, MI 48109-2143, United States
6Passport to Knowledge/Geoff Haines-Stiles Productions, Inc. 27 Washington Valley Road, Morristown, NJ 07960, United States
7The scientific missions of National Center for Atmospheric Research (NCAR) and the University Corporation for Atmospheric Research (UCAR) community offer numerous opportunities to integrate content on atmospheric, climate, and related sciences into formal and informal public education programs. The UCAR Office of Education and Outreach currently coordinates a variety of partnerships with science PI’s catalyzing activities that include work-study experiences for the students and teachers, a laboratory, creation of EO resources for scientists to utilize when visiting K-12 classrooms; expansion of exhibits and educational materials, warehousing, and product distribution. For instance, outreach efforts on behalf of the University Corporation for Atmospheric Research’s Earth Observing Missions (EO/M) programs, as well as planetary and visualiz

ED51C-1214 0830h POSTER
Observing Occultations of Stars by Asteroids and by the Moon Teaches Astronomy and Discipline While Contributing to Astronomical Research
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NASA’s Sun-Earth Connection Research Program (HIAPER); the NASA-funded Earth System Science Partnership (ESSP); and the NSF-funded Antarctic Observing Network (AON) are among the many NASA-funded programs currently underway. These programs provide a variety of opportunities for scientists to contribute to the understanding of Earth’s atmosphere and climate system. One such opportunity is through the use of occultation observations. Occultation observations can be used to study the atmospheres of exoplanets and brown dwarfs, as well as the atmospheres of Earth-like planets. The data from these observations can be used to create high-resolution maps of the atmospheric composition and structure of exoplanets and brown dwarfs. This information can then be used to constrain models of planet formation and evolution.

The Young Engineers and Scientists (YES) Program is a community partnership between Southwest Research Institute (SwRI) and local science high schools in San Antonio, Texas (USA). It provides talented high school juniors and seniors a bridge between the classroom and the laboratory, enabling them to explore construction and real-world, research experiences in physical sciences (including physics, chemistry, and astronomy) and engineering. YES consists of two parts: 1) an intensive three-week summer workshop held at SwRI where students experience the research environment first-hand; develop skills and acquire tools for solving scientific problems; attend mini-courses and seminars on electronics, computers and the Internet, careers, science ethics, and other topics; and select individual research projects to be completed during the academic year; and 2) a community partnership between a SwRI mentor and a student that involves completing individual research projects under the guidance of their mentor. Mentors are SwRI scientists or senior graduate students. At the end of the year, students publicly present and display their work, acknowledging their accomplishments and providing career awareness to other students and teachers. YES has been highly successful during its first 10 years. YES graduate students have entered college, several have worked for SwRI, and three have attended SwRI graduate programs. These outcomes indicate the effectiveness of YES on their academic career development. A focal point of our YES Program is to gratefully acknowledge partial funding for the YES Program from a NASA RPG grant.

URL: http://youss.space.swri.edu/

Communicating Complex Concepts: A Guide For Scientists
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This essay argues the importance of identifying gaps in communication between the “information producers” and “information consumers.” These two continua are critical to the success of any communication. This essay identifies the specific gap that is the focus of the CINDI project: the gap between space scientists and the general public. The essay also outlines the plan for communicating CINDI’s research to the general public and describes the ongoing process of developing educational materials that will be used to reach the public.

URL: http://cindispace.utdallas.edu/

The Benefits and Challenges of Scientist-Educator Partnerships
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Scientists who are involved in NSF Science and Technology Centers, NASA missions, and informal science education are partnerships that are necessary to plan and implement significant education and public outreach (EPU) programs. This paper will begin with examining the cultural differences between scientists and educators that can inhibit the success of these partnerships. It will then turn to the common ground between scientific research and science education and educators that can open up opportunities to discover common ground in the way scientists practice science and the way science education reform is occurring. Finally, it will conclude that this common ground can be a useful way of focusing the talents and knowledge of scientists in support of science education.

URL: http://www.scienceservice.org
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35768177 Carrier Handbook of Air Conditioning System Design. Â The unit offers fan motor that can operate up to 4 speeds(Models M5CC028C & above only), thus provide choices of external static pressure for designing ducting system. In addition, a range of MCC-C model with optional specification of low external static pressure is also provided to cater for short duct application. Please refer to the technical specification of MCC model. â€¢ Self Diagnosis Features.