

A critical component of NASA Education and Public Outreach (E/PO) programs is to educate K-12 classrooms teachers in science content, inquiry-based methods of science teaching, and exemplary curriculum materials. Typical NASA E/PO programs accomplish this through workshops at teacher conventions, short courses at colleges and universities, teacher camps during the summer, etc.. These programs are extremely valuable, but unfortunately they have a low ratio of number of teachers reached to time spent by E/PO professionals in developing and organizing the programs. We have addressed this problem in two ways. First, in partnering with organizations that already conduct extensive teacher professional development (PD) programs, such as the Lawrence Hall of Science, we can reduce the amount of time spent in preparing for our own programs. Second, we target our PD programs for teachers and administrators who are committed to conducting their own PD programs for their colleagues. In this way we can highly leverage the limited resources of a given E/PO program to impact far more teachers, and hence students, than could ever be reached personally by individual E/PO professionals.

ED41D-1193 0830h POSTER

The Teacher As Scientist: A Role Model for Inspiring the Next Generation of Explorers

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NASA GSFC Education is directly involved with scientists in studies of ice and snow as they seek to gain insight into the effects of snow and ice on the Earth's weather and climate. In parts of the world the water equivalent in the snow has significant cultural and economic consequences. Better techniques for remote determination of water content in the snowpacks depend on the in situ validation of satellite remote sensing. These in situ measurements and supporting lab studies are used by those who support the NASA efforts, and evaluate avalanche hazard are the same measurements and techniques that we teach in our teacher as scientist education program held annually at Lake Placid, New York - the home of the 1932 and 1980 winter Olympics. We developed this program called HOW (History of Winter) in conjunction with scientist Peter Wasilewski, GSFC Laboratory for Extraterrestrial Physics. The program brings together teachers and scientists (the latter having 55 expeditions to the Polar regions and numerous years of Lake Ice studies in their backgrounds) to broadly decipher the history of winter embedded in the measurable record of snowfall and details in lake ice. The concept is to have scientists create the mindset and framework for teacher scientists who can then facilitate the motivation of student scientists via an inquiry based structure. Additionally, we strive to have students view their science teachers not only as teachers, but also as scientists who are actively engaged in research projects in order to provide a stimulus to the students to not only consider teaching as an exciting career, but also science itself. This session will describe how the teachers are directly involved annually in the science role during a 7 day campaign in February, and then follow up with their students upon returning to the classroom. The structure of the program and protocols will be described.

URL: <http://education.gsfc.nasa.gov>

ED41D-1194 0830h POSTER

Spatial Analysis of Geohazards using ArcGIS—A web-based Course.

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As part of the Environmental Systems Research Incorporated (ESRI) Virtual Campus program, a course was designed to present the benefits of Geographical Information Systems (GIS) based spatial analysis as applied towards a variety of geohazards. We created this on-line ArcGIS 8.x-based course to aid the motivated student or professional in his or her efforts to use GIS in determining where geohazards are likely to occur and for assessing their potential impact on the human community. Our course is broadly designed for earth scientists, public sector professionals, students, and others who want to apply GIS to the study of geohazards. Participants work with ArcGIS software and diverse datasets to display, visualize and analyze a wide variety

of data sets and map a variety of geohazards including earthquakes, volcanoes, landslides, tsunamis, and floods. Following the GIS-based methodology of posing a question, decomposing the question into specific criteria, applying the criteria to spatial or tabular geodatasets and then analyzing feature relationships, from the beginning the course content was designed in order to enable the motivated student to answer questions. For example, to explain the relationship between earthquake location, earthquake depth, and plate boundaries; use a seismic hazard map to identify population and features at risk from an earthquake; import data from an earthquake catalog and visualize these data in 3D; explain the relationship between earthquake damage and local geology; use a flood scenario map to identify features at risk for forecast river discharges; use a tsunami inundation map to identify population and features at risk from tsunami; use a hurricane inundation map to identify the population at risk for any given category hurricane; estimate accumulated precipitation by integrating time-series Doppler radar data; and model a real-life landslide event. The six on-line modules for our course are Earthquakes I, Earthquakes II, Volcanoes, Floods, Coastal Geohazards and Landslides. Earthquake I can be viewed and accessed for no cost at <http://campus.esri.com>.

URL: <http://harbert.geology.pitt.edu>

ED41D-1195 0830h POSTER

The Bridge: Integrating Ocean Science Data in the Classroom

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The Bridge is a growing collection of the best marine education resources available on-line. It provides K-12 educators with a convenient source of accurate and useful information on global, national, and regional marine science topics, and gives researchers a contact point for educational outreach. There are many ways a researcher can become involved in education, from working directly with students to helping develop educational materials. The Bridge facilitates the connection between researchers and teachers by integrating scientific data into a ready-to-use classroom activity. These activities, or Data Tips, focus on a different ocean science topic each month during the school year. Through the Bridge Data Tips, students participate in the scientific process and researchers share their data with a unique audience. Bridge Data Tips that incorporate geophysical ocean science research data will be highlighted in this poster.

URL: <http://www.marine-ed.org/bridge>

ED41E MCC: 3012 Thursday 1020h

The Benefits and Challenges of Education and Public Outreach Efforts Associated With Scientific Research Programs II (*joint with OS, P, SA, SH, SM, C*)

Presiding: D Alexander, Rice University; C Morrow, Space Science Institute, University of Colorado

ED41E-01 1020h

Bringing Ionospheric Exploration to Pre-College Classrooms: Meeting the Challenges of EPO for the CINDI Mission

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Early next year, the Air Force will launch a new atmospheric suite of ionospheric instruments, CINDI (Coupled Ion Neutral Dynamic Investigation), on board a C/NOFS (Communications/Navications Outage Forecast System) satellite. Finding a way to successfully bring the science of CINDI to non-technical audience, both inside and outside of the classroom, has presented some unique challenges for the CINDI EPO

team. CINDI will provide critical information toward better understanding how variability within the ionosphere affects radio communications and navigation. Exciting students, their teachers, and the public about a mission which will return no pictures, and which explores a region of the terrestrial atmosphere that is typically neglected in formal education (and with which the general public is unfamiliar) is difficult, despite the direct impact the ionosphere can have on the functioning of our modern society. We will present the strategies we are employing to make the science of CINDI interesting, relevant, and understandable to a general audience, and to integrate ionospheric exploration into the framework and requirements of existing secondary science curricula and education standards.

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

ED41E-02 1035h

Experiences of an Educator/Scientist Team

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Since 1997, the NASA Langley research team focused on the problem of the Earth's Radiation Budget and the impact of clouds thereon has been developing an offshoot: a team of educators has become involved as well. This educator team originated from the convergence of a research need with an education need. An educator indicated that she was interested in connecting her students' in-class science activities to NASA, as a motivating factor. The research team had a use for numerous and widely-dispersed ground observations of clouds. The immediate result was the CERES S'COOL Project (<http://asd-www.larc.nasa.gov/SCOOOL/>) which currently involves K-12 cloud observers in 62 countries, and which is continuing to grow. Once established, this educator/scientist team has led to other possibilities as well. We have now joined the GLOBE program (www.globe.gov) to obtain more and better ground observations of contrails. And we are initiating a new project to make NASA Earth Science Enterprise data about the Earth accessible for use by K-12 students and teachers. This paper will discuss both benefits and challenges of these various activities, from the point of view both of the educator team and the research team.

ED41E-03 1050h INVITED

The Stanford Solar Observatory Group E/PO Program

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As PI for the SOHO/MDI and SDO/HMI investigations and a Co-I in the NSF CISM STC program I have had the opportunity to help in the formulation and development of a multifaceted education and public outreach program. Our E/PO effort began with a web page and press relations but has grown to include the development of an inexpensive spectrometer with supporting materials, poster development and distribution, and a series of webcasts in collaboration with NASA. The present program, with the support of a dedicated E/PO team, includes the development of a solar planetarium program, and a space weather monitor that can be made available through traditional distribution methods. In collaboration with the Stanford Haas Center for Public Service we are also developing a university course that will teach the essentials of science education as part of a lifetime commitment to public service. The development of the Stanford solar E/PO program and involvement of science professionals in that program will be discussed. (The Michelson Doppler Imager (MDI) is an instrument on the Joint ESA & NASA Solar and Heliospheric Observatory (SOHO) mission. The Helioseismic and Magnetic Imager (HMI), is an instrument on the NASA Solar Dynamics Observatory (SDO) mission which is under development. The Center for Space Weather Modeling (CISM) led by Jeff Hughes at Boston University is an NSF Science and Technology Center.)

ED41E-04 1105h

Scientists and Educators in Sync: Exploring the Strengths of Each through a Collaborative Educational "Umbrella" on Space Weather

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Scientists and educators have much to offer formal and informal science education forums (and each other) when brought together in balanced collaboration. New educational opportunities from NASA and NSF have made it easier to develop these collaborations, effectively allowing for the establishment of educational "umbrellas" whereby several separately funded programs focused on a single theme are overseen by a single working group. Here, we explore one such collaboration on space weather developed by CU's Laboratory for Atmospheric and Space Physics, in collaboration with NOAA's Space Environment Center, the Fiske Planetarium, the Space Science Institute and teachers from local school districts. The goal of the collaboration is to develop a new planetarium show, associated curricula and teacher workshops and guidebooks, as well as distance learning programming through the NASA Center for Distance Learning. One hallmark of this collaboration is the recognition that both scientists and educators bring important research-based perspectives to the table - Scientists are primarily responsible for the scientific integrity of the programming; Educators offer effective (tested) educational models for implementing student and teacher experiences. Both bring creativity, ingenuity and innovation to this dynamic environment. Sustainability is enhanced by integrating components and activities into a cogent whole, and efforts are perceived as even more worthwhile since most aspects of this program will be available for national distribution over the next several years.

ED41E-05 1120h

Education/Public Outreach, and IDEAS grant in support of the NASA HEX sounding rocket mission launched March 2003 in Alaska

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Education/Public Outreach materials were developed in conjunction with K-12 classroom teachers for the NASA sounding rocket Horizontal E-Region Experiment launched in March 2003 from Poker Flat Research Range in Alaska. The science coordinator for the Yukon-Koyukuk school district and HEX principal investigator Mark Conde of the Geophysical Institute of the University of Alaska Fairbanks also carried out a NASA funded IDEAS grant in which middle school students made observations and measurements of the chemical releases which were the backbone of the HEX measurement program. Live From the Aurora, a national program sponsored by several agencies including NASA and NSF, involving live television interactions between rocket scientists and students overnighting at four museums also took place in the same launch window. I will discuss the problems encountered in developing and getting information about cutting-edge science, out in time-frames so they were useable by teachers and students, and some of the fun things that happened while working with national television media programs.

ED41E-06 1135h INVITED

NASA's Office of Space Science Small Grants Programs for Education and Public Outreach

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Over the past six years, NASA's Office of Space Science has implemented what may well be the largest single program in astronomy and space science education ever undertaken. An important part of the overall program have been the small grants programs for education and public outreach (E/PO). These offer a way for many scientists not directly involved in major OSS missions to contribute to education and public

outreach efforts. This paper provides an overview of the small E/PO grants programs associated with the Guest Observer programs for the Chandra X-Ray Observatory and Hubble Space Telescope, the Initiative to Develop Education through Astronomy and Space Science (IDEAS) program and the Research Opportunities in Space Science (ROSS) program. Characteristics of successful proposals are discussed along with representative examples of scientists participation in current projects in the areas of formal education, museum exhibits, planetarium show, and public outreach programs.

ED41E-07 1150h

Bridging the Gap Between Ocean Science and Education: Creating Effective Partnerships With Informal Science Education Centers

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Many scientists would describe an effective E&O partnership as one that did not take up too much of their time. The California Center for Ocean Sciences Education Excellence (CA COSEE), educators at the Ocean Institute (OI), Dana Point, and researchers at the Scripps Institution of Oceanography (SIO) have collaborated to develop a highly efficient, productive and rewarding approach to crafting scientist/educator partnerships. These efforts represent a new model for facilitated collaboration between informal science education and research partners. Each partner brings unique elements to this collaboration. The Ocean Institute's recently funded Sea Floor Science Exhibition represents an innovative approach to exhibits and programming for K-12 students and the public. The exhibits and programs are firmly grounded in the needs of the formal science education community (i.e. standards based), designed to be constructed/created on extremely short time frames (months), convertible for both public display and programming needs and easily updated. Scripps researchers, as well as those from other institutions, provide briefings on their ongoing research work, loan or donate equipment and instrumentation both for use and display, and in some cases provide research experiences for OI staff and students. CA-COSEE acts as the catalyst, identifying and engaging researchers from disciplines that are consistent with OI exhibit and program goals, serve as a liaison between newly introduced scientists and educators and facilitate the incorporation of E&O components in scientists research proposals, including funding for future exhibits. Using the example of the newest Sea Floor Science exhibit, "Slopes, Slides and Tsunamis!", we will describe the role each partner has played in creating this research based exhibit and program, the chronology of the process, and how this approach will provide the basis for a long-term, sustained partnership between the researchers and science educators.

ED41E-08 1205h

SPECTRA Teachers' Workshops: A Collaboration Between a NASA Laboratory and a Small University

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During the summer of 2003 we offered the first week-long SPECTRA (SPace telescope Educational Collaboration introducing Teachers to Research in Astronomy) Teachers' Workshop. This workshop was the result of a collaboration between physics faculty at the University of La Verne and scientists at Jet Propulsion Laboratory (JPL). It was funded by a Space Telescope Science Institute (STSI) Education and Public Outreach grant associated with four Hubble Space Telescope (HST) observing projects involving three JPL astronomers. The main focus of the workshop was to introduce local high school teachers to current research

topics in astronomy and teach them how to incorporate the HST into their curricula. In addition to the workshop itself, a SPECTRA web site was created as a resource for secondary physical science teachers. We will describe the philosophy, format and contents of the workshop and elaborate on our experiences during its planning and execution. The feedback we received from the teachers who participated in 2003 will also be discussed. It is our intention to incorporate what we have learned during this first experience into the workshops that will be offered during the summer of 2004.

URL: <http://www.ulv.edu/~natsci/physics/workshops/index.shtml>

ED42A MCC: Level 2 Thursday 1330h

The Next Generation: Research Projects of High School-Aged Geoscientists Posters

Presiding: J Karsten, AGU; C Katsu,
Fairfield Area School District; K
Grove, San Francisco State University

ED42A-1196 1330h POSTER

Sex, Status, and Sand: California Academy of Sciences' Teen Interns Examine Trends of the Pacific Mole Crab (*Emerita analoga*) at Ocean Beach, San Francisco

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Student interns from the California Academy of Sciences' Careers in Sciences program monitored the Pacific mole crab (*Emerita analoga*), or sand crabs, in collaboration with the Farallones Marine Sanctuary Association. These small crustaceans live in the swash zone of the sandy beach habitat. Sand crabs are important in the food web, and therefore their status can help indicate the health of the larger environment. The interns helped the Gulf of the Farallones National Marine Sanctuary by monitoring the abundance and distribution of sand crabs at Ocean Beach in San Francisco, California. Students set up transects perpendicular to the shoreline, collected 10 samples along the transect, measured the carapace length, determined the sex of each crab, and checked for the presence of eggs. Students monitored June through September, 2003. Trends examined included differences in the gender ratio, size frequency, and distribution along the beach. Students also compared their data to other student data taken from other sites in San Francisco and Marin counties during 2001-2003 from the online database at <http://www.sandcrabs.org>. Using comparisons, interns were able to better understand the processes and significance of studying marine species. Implementation of the project was invaluable in aiding the interns in their understanding of the natural sciences and the role of monitoring habitats in environmental health.

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

ED42A-1197 1330h POSTER

Sustainable Seas Student Intertidal Monitoring Project at Duxbury Reef in Bolinas, CA

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The Sustainable Seas Student Monitoring Project at the Branson School in Ross, CA has monitored Duxbury Reef in Bolinas, CA since 1999. In cooperation with the Farallones Marine Sanctuary Association, goals include: 1) To monitor the rocky intertidal habitat and develop a baseline database of density and