

The GSFC portion of the VC funding was applied to three main areas:

- **Science on a Sphere for Wallops Visitor Center**
- **Professional Development for Informal Educators: Sustaining the Earth to Sky NASA-NPS Partnership**
- **GeoDome Education Program for the Goddard Visitor Center**

Science on a Sphere

NASA Visitor Center
NASA's Wallops Flight Facility
Wallops Island, VA
Keith Koehler
757-824-1579

Program Description

Science on a Sphere is a NOAA developed exhibit that provides for displaying NASA and NOAA scientific data in unique fashion to students and the public. This inspiring presentation system will be used at the Wallops Flight Facility to educate students and expand their interests in NASA space and Earth science research.

Program Relevance to NASA

The Science on the Sphere brings the visitor, including students, a unique perspective on the developments in Earth and space science research and greater understanding of the Earth and universe around us. The use of this unique toll will not only increase a student's knowledge, but also encourage them to pursue careers in science, technology, engineering and math.

Program Benefits to Society

The sphere allows the presentation of science material in a format that is inspiring and easy to understand. It has excited thousands of students, and the public, across the nation in the scientific research conducted by NASA and NOAA. The NASA Visitor Center had just over 32,000 visitors, including 6,000 students, in FY2007. Partnering with local schools, universities, the US Fish and Wildlife Serve, US National Park Service, and the Marine Science Consortium, NASA expects the number of students and public reached to increase a minimum of five percent annually through FY2011.

Program Goals

The installation and operation of the Science on a Sphere at the NASA Visitor Center at Wallops aligns with the NASA Office of Education Measures, Projects and Data Elements for FY2007 item 2.4 "Student Involvement K-12." It will provide students with authentic first-hand opportunities to participate in NASA mission activities, thus inspiring interest science, technology, engineering and math disciplines and careers. K-12 student involvement encompasses a range

of activities including one-time, short-duration enrichment activities to longer-term or sustained learning opportunities.

Program Accomplishments

The Science on a Sphere is scheduled to be installed at Wallops Nov. 4 – 7, 2008. Training on the use of the Sphere will continue through November. Addition of the Sphere to the education opportunities at the NASA Visitor Center will be in December 2008.

Professional Development for Informal Educators: Sustaining the Earth to Sky NASA-NPS Partnership

Goddard Space Flight Center, Greenbelt, MD

Anita Davis

(301) 614-6669

PROGRAM DESCRIPTION

Earth to Sky is a NASA-funded partnership between NASA's Space and Earth Science disciplines and the National Park Service (NPS). The partnership actively fosters collaborative work between the science and interpretation/education communities of NPS and NASA, with the ultimate goal of enriching the experiences of millions of park visitors, by bringing NASA science into the context of the National Park experience. The partnership is expanding, and participants for this effort will include experienced interpretive staff, education specialists, and partners, from NPS and other federal/local agencies.

Interpreter rangers at National Parks, Refuges, and other natural and cultural sites create and provide informal and formal educational products and programs for the public, visiting school groups, and teachers. Individual rangers regularly reach thousands, and occasionally millions, of people with their products and programs each year. NPS interpretation methods exemplify NASA's concept of inspiring, exciting and engaging the public, with a proven informal education methodology.

The partnership centers around a series of professional development efforts aimed at informal educators in protected areas (principally National Parks, but expanding to include other areas as well). The professional development weaves NASA content with NPS informal education methodology, and uses best practices in professional development, and formative and summative evaluation to guide the program as it continues to expand and mature. Sustaining the Earth to Sky NASA-NPS Partnership will provide one workshop and several following distance learning events to a suite of experienced interpreters who in turn will train other interpreters and educators as well as create products for use in their park's public programming.

PROGRAM RELEVANCE TO NASA

A main role of NASA's education and outreach work is to support the agency's scientific efforts. This proposal directly addresses NASA's Strategic Subgoal 3A: Study planet Earth from space to advance scientific understanding and meet societal needs. NASA conducts the bulk of the research funded by the US Climate Change Science Program, yet most of the American public is unaware of the critical role NASA research plays in the world's understanding of the causes and consequences of climate change. Through a series of professional development efforts, we will educate informal and formal educators about NASA's approach to Earth Systems Science, specifically as it is applied to global climate change.

This project will interface with the public at three levels of the NASA Education Strategic Framework: Inspire, Engage and Educate. We will produce professional development for informal educators to improve their skill and competency in climate science using NASA's extensive research and mission activities as a basis; and contribute to NASA's Informal Education Resources, as participants develop multiple informal education products. By including education specialists in our professional development, we will extend our support of the portfolio to areas of Elementary and Secondary Education. In addition to interpreters and education specialists, this project is engaging leadership in the training programs of both agencies, which will serve to deeply embed NASA's science in both agencies' training infrastructure.

PROGRAM BENEFITS TO SOCIETY

The first *Earth to Sky* workshops were held in 2004, with 50 NPS interpreters in attendance. Every participant completed action plans for incorporating NASA content into National Park programs throughout the US; four years later we continue to learn of new ways those interpreters are building upon that event, creating public programming, written materials, displays and supporting formal education associated with National Parks. According to a NPS Social Science Program Report in 2003, interpretive rangers in National Parks reach one-third to one-half of all visitors. They are uniquely qualified to help the public understand the value of NASA's work, and how it connects to visitors' daily lives. We fully anticipate the upcoming workshop to achieve the same level of success as the initial events of 2004.

Two examples of participants efforts that are still occurring in 2008 *four years* after the initial workshop:

"Just about every National Park Service unit has a Junior Ranger program that involves completing a booklet and earning a badge or patch. Instead of doing a standard park Junior Ranger booklet, we have decided to highlight our space connections and design our booklet around "Lunar" Rangers. We think the combination of Astronauts, volcanoes and Park Rangers is a compelling story that will 'Inspire the next generation of explorers.'" –participant from Craters of the Moon National Monument

“There have been many beneficial spin-offs from the Earth to Sky workshop for Lassen Volcanic National Park, our education program and partnerships with NASA. NASA is doing research here in the park and I have linked it to our education program. This past year I piloted the first Astrobiology Intern program for high school students. The students have assisted Jennifer Heldmann with her site set up and observed Nathan Brawell at his site as well. Last week the students got the red carpet tour of Ames with Chris Mackay. We are developing a Junior Park Astrobiology program for students here at Lassen with the Dr. David Des Marais and his team from the Astrobiology Institute at Ames. I have been working with a local middle school that was selected to be a participant in NASA's Mars Student Imaging Project. SETI and the NSF will be hosting a two day field tour of Lassen with a group of graduate students. A “Spaceward Bound” at Lassen will take place this summer in partnership with the NASA, the park and CSU Chico. There have been numerous articles in the local papers about NASA and the student projects and programs here at Lassen.”

PROGRAM GOALS

Sustaining the Earth to Sky Partnership supports NASA's Education Framework Objective 3.1 Resources (Engage) Provide informal education support resources that use NASA, themes and content, and Objective 3.2 Professional Development for Informal Ed Providers (Engage) Provide opportunities to improve the competency and qualifications of science technology, engineering, and mathematics (STEM) informal educators.

The goal of this professional development effort is to advance NASA's capability to improve public understanding and appreciation of its science and technology, through professional development for some of our nation's most accomplished informal educators: National Park Service Interpreters. This will include pre-workshop training for facilitators, a five-day professional development workshop, interpretive program and products delivery, evaluation, and follow-up.

In FY 2008, *Sustaining the Earth to Sky Partnership* worked with our partner agency (NPS) to design and outline a professional development workshop, and began to engage NASA Education and Outreach staff in providing a suite of existing educational resources for participants. Internal and external partners are deeply involved in the organization of the workshop, helping us to refine our agenda, and provide a structure in which learning can be most effective. The workshop will bring relevant NASA content into the hands of participants, and expose them to the breadth of science that NASA conducts, especially with respect to Earth's changing climate. By fully engaging our partner agency we are better ensured of a successful outcome with the workshop and following distance-learning efforts. Much preparatory work is required, including pairing NPS facilitators with NASA scientists to help ensure that science presentations are delivered at an appropriate level for the audience. Our efforts in FY 2008 focused primarily upon the preparatory work.

PROGRAM ACCOMPLISHMENTS

In 2008 *Sustaining the Earth to Sky Partnership*

- Developed a core team of leaders for the workshop from within NPS and NASA
- Developed preliminary agenda topical outline for the workshop
- Recruited NPS facilitators for the workshop
- Begun recruiting NASA science speakers for workshop and following distance learning events
- Secured workshop sites (NPS training facility and NASA Goddard VC)
- Established dates for the workshop (January 26-30, 2009)
- Contracted project evaluator
- Further defined the role of the workshop facilitators who will also coach participants in development of their end products
- Coached a graduate student on development of his thesis, which will examine and guide the efforts of the project's facilitators and coaches
- Created official course announcement to be posted on Dept of Interior Learn as a NPS-NASA sponsored course
- Initiated advertising of the workshop at professional conference and via e-mail lists and NPS intranet
- Begun to expand the Earth to Sky community to include another agency (US Fish and Wildlife Service)

Annual Performance Goals were met as follows:

We strengthened the partnership between NASA and NPS Interpretation through co-development of the workshop and recruitment efforts for participants and facilitators.

Total disseminated to date: 5,010

- 712 mailed to individual educator requests
- 1,100 shipped to Marshall Space Flight Center
- 50 sent to Challenge Center in Tallahassee, FL
- 70 mailed to NASA Ames for Return to the Moon workshop
- 85 were disseminated at the Science Teacher's Association of New York State
- 348 disseminated at AMNH onsite professional development events
- 1,400 to the NASA Museum Alliance partners
- 100 mailed to Gheens Science Hall /Rauch Planetarium
- 500 DVD discs sent to CORE
- 100 given to ESMD
- 85 given to network of Educator Resource Centers (ERCN)
- 58 given to Aerospace Education Services Project (AESP)
- 52 distributed to NASA Explorer Schools (NES) sites and coordinators
- 350 sent to national conferences NSTA and ASTC
- 1000 Promotional, CMR approved, color flyers have been disseminated

GeoDome Education Program for the Goddard Visitor Center

Goddard Space Flight Center
Greenbelt MD
Carmel Conaty
(301) 286-7996

Program Description

GSFC purchased a GeoDome for GSFC Visitor Center and its partners in the twelve state region. The GeoDome is an immersive learning system that uses the data scaling software known as Uniview (<http://www.scalingtheuniverse.com>). The GeoDome version of this software is the first portable version in operation in the world. We will be operating a dome that mirrors the system found at the Hayden Planetarium and other leading centers around the world. GeoDome will provide the Goddard Visitor Center an outstanding complement to SOS The 6.5m Dome is portable and will also be deployed regionally in 2009. An education program will be developed annually that includes pre and post activities and evaluation. The pilot program will be conducted through Owens Science Center. Teacher trainings and long-term sustainability will be accomplished through existing educational staff and ERC. Existing NASA science websites will directly port onto the dome.

Program Relevance to NASA

The GeoDome will be used to inspire and educate the public about NASA's Earth and Space Science programs, missions and results.

The GeoDome Program is directly relevant to NASA Education Framework Objective: Student involvement K-12

Increase in the number of elementary and secondary student participants in NASA instructional and enrichment activities

As a current NASA relevant example of students participants in NASA enrichment activities, the GeoDome instructor can travel with students out to the edge of the WMAP, and when returning, they look at the most recent (with in 24 hours) NASA MODIS Global Mosaic of the earth, as they fly down to the rooftop of the school or museum they are visiting via 15M resolution Landsat imagery. If the lesson warrants, you might even look at current carbon monoxide distribution from MOPPIT, Sea Surface temperature from AVHRR, or chlorophyll concentration from Aqua/MODIS.

Program Benefits to Society

The GeoDome allows the presentation of earth and space science material in a format that is inspiring and easy to understand. The portability of the exhibit will allow access to groups that otherwise would not be able to experience a planetarium experience. The ability to Domecast, allows NASA scientists to directly interact with audiences from their desktop while the dome is anywhere in the world. The dome medium and data scaling ability allows educators to easily explain complex concepts.

On the data-streaming front, Uniview now has the ability to read "Web Map

Servicing” or “WMS” data servers as well as GIS data, and data stored in the now open standard “KML” format.

What is perhaps most compelling about all of this is that it is able to break through artificial scientific barriers, and put ALL topics in a proper contextual place and scale. Quite literally, you can seamlessly travel from 10^{20} down to 10^{-20} , and our audience can be PHD physicist or pre-scholars. Every one is able to view the same data, and learn at an age, and knowledge appropriate level. There is nothing about Cosmology as a topic that should make it out of reach of a 5th grader, except for our ability to provide proper visual reference. Once barriers are removed, there is no end to what people can learn, appreciate, and comprehend.

Program Goals

- Delivery of GeoDome and initial overview and training including best practices, delivery of their educational content and outreach products, and evaluation planning.
- Development of an annual education program beginning in 2009 around existing content that maps to Goddard and NASA’s priorities including pre and post materials and mapped to standards. The initial pilot will be conducted with Owens Science Center, which serves all Prince Georges County, MD public schools. This is a model that has been successfully implemented with the SOS at Goddard and we expect that as the GeoDome is deployable, the potential for impact is greater.
- The evaluation performed will follow the model that has been developed with our existing SOS educational programs.
- Once the education programs have been evaluated and approved they will be deployed to all dome users.
- Training of Goddard education staff, local teachers and regional ERC managers will be conducted.
- Increase in the number of elementary and secondary student participants in NASA instructional and enrichment activities for 2009 and beyond.

Program Accomplishments

GSFC Dome was initially deployed to the ASTC in Philadelphia in October 2008 and successfully conducted Domecast with GSFC Earth Scientists.

GeoDome was first installed in the Goddard Visitor Center October 27, 2008. Training was conducted the week of October 27th in the Goddard Visitor Center and included training on the operations of the dome and the Uniview software. Training on best practices and delivery of existing educational content and outreach products was conducted with GeoDome partners from the Minnesota Planetarium was conducted September 15-17, 2008.

The first education program for the GeoDome content development began in July 2008. An education module consisting of pre and post activities is being developed. GSFC Astrophysics scientists and education specialists are working

to develop programming. The first interactive program in development focuses on Dark Matter featuring, Hubble, Chandra and WMAP data findings and visualizations.

Professional development for partners and users is in development. The dome will be tested in November and December of 2008 and will be piloted and evaluated in 2009. Uses of the dome planned will include Fieldtrip to the Moon and Earth Science along with the Dark Matter Program.