

National Aeronautics and Space Administration

## Voyages in Education and Public Outreach An Office of Space Science Newsletter

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Issue 3

### “Touch the Universe” brings Space Science to the Visually Impaired

DePaul University

To address the need for more space science resources for the visually impaired, a team consisting of an astronomer, a Braille book author, and a science teacher, have created *“Touch the Universe – A NASA Braille Book of Astronomy”*. The book was recently showcased at a press conference at the meeting of the American Astronomical Society in Pasadena, California. Funding for the project came through the Hubble Space Telescope (HST) Guest Observer program.

The magnificent images taken by the Wide Field Planetary Camera 2 aboard the HST, have appeared in textbooks, newspapers, and the Web. They have been a major tool to share new discoveries about the universe with students and the public. Unfortunately, approximately 10 million visually impaired citizens of the United States, and many more worldwide have not had the opportunity to enjoy the benefits of these images to the same extent. The small number of resources available to the visually impaired may be due in part to the fact that space science is often considered to be a visual science. After all, much of what we know about the universe is derived from the analysis of the visible light emitted by the objects in it. We are in awe of the details and colors revealed to our *eyes* by Hubble pictures. However, the success of the few astronomy resources that are available for visually impaired, such as the *“Multi-Sensory Kit”* created by the Southeast Regional Clearing House (featured in *Voyages, issue 1*), or Noreen Grice’s Braille/Large Print astronomy book *“Touch the Stars”*, have clearly demonstrated that vision is *not* a prerequisite for studying and enjoying space science.

*“Touch the Universe”* contains 14 spectacular

Hubble images. The reader is taken on a journey of discovery to more and more distant objects, starting with images of the telescope itself in orbit, and ending with the Hubble Deep Field. Each



*The input from the students at the Colorado School for the Deaf and the Blind was a crucial step in the process of creating the tactile overlays for “Touch the Universe”. This picture shows a student exploring a prototype image of Jupiter.*

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color image is supplemented by a transparent tactile overlay in which the color features such as gases of different colors and planetary rings, are represented by tactile symbols. The explanatory text is given in both Braille and large print. Thus, readers of all visual abilities are able to view and read the book together.

The interest in "Touch the Universe" generated by the media coverage following its release in June was much greater than anticipated. Hundreds of emails and phone calls from around the world have poured in requesting copies of the book. Based on the initial \$10,000 budget and the time-consuming process for producing the tactile overlays, the original plan was to release 400 copies in the first edition. However, it has become clear that the demand for the book cannot be met with this number. The project collaborators are currently exploring ways to automate the production process, so the book can be mass-produced. They hope the first edition will be available to the public by this fall.

The most important lesson from the release of "Touch the Universe" is that there is enormous interest in space science among the visually impaired. This is a significant opportunity for the NASA Education Program. While the team is considering producing Braille books about other missions and areas of space science, they also hope that their success will inspire others to follow suit in addressing the space science needs of the visually impaired.

Contact Bernhard Beck-Winchatz (bbeck@condor.depaul.edu) for more information about "Touch the Universe", or the web site <http://analyzer.depaul.edu/ttu>.

### **Congratulations to the Space Science Education Resource Directory (SSERD) Team!**

The SSERD team was honored with a NASA Group Achievement Award in presentation ceremonies at NASA Headquarters this June. The award states - "To the Space Science Education Resource Directory Development Team for a dedicated, demanding, and innovative effort to successfully develop an important new educational resource for use by students and teachers across the country" - signed Dan Goldin, June 21, 2001. Karen Meyer, team lead accepted the award on the behalf of the team.



*Karen Meyer with NASA Administrator Dan Goldin and Associate Deputy Administrator Dan Mulville.*

In addition to the SSERD team, NASA Group Achievement awards were also given at other NASA ceremonies to the Cassini/Jupiter Microwave Observing Campaign team and the Sun-Earth Connections Education Forum team. Articles about education and public outreach (E/PO) activities leading to these awards appear later in newsletter.

### **Display Your Wares in the FY 2001 E/PO Annual Report**

**NOW** is the time to submit your input to the FY 2001 OSS E/PO Annual Report. This comprehensive compilation of OSS-sponsored E/PO projects active between October 1, 2000 and September 30, 2001, will be posted on the OSS web page as a searchable database and distributed in print to a broad range of persons interested in space science education. **To have your project(s) included, you must enter information about the project into one of the following databases by September 30, 2001.**

Information about E/PO products is reported by registering the product in the NASA Space Science Education Resource Directory. Online forms and instructions are available at <http://ossdev.stsci.edu/registry/>. Questions may be directed to the Education Forum overseeing the space science theme addressed by the product, or to Carole Rest ([crest@stsci.edu](mailto:crest@stsci.edu))

Information about E/PO activities is reported by making an entry into EDCATS, the NASA-wide education tracking and reporting system. You may obtain password access to EDCATS through your OSS sponsor:

- Flight missions: contact the mission E/PO lead
- Individual research grants: contact Rosalyn Pertzborn ([rpertzbo@hq.nasa.gov](mailto:rpertzbo@hq.nasa.gov))

- IDEAS: contact Heather Bradbury ([hbradbur@stsci.edu](mailto:hbradbur@stsci.edu))
- Others: contact an OSS Broker / Facilitator, Education Forum, or Phil Sakimoto ([psakimoto@hq.nasa.gov](mailto:psakimoto@hq.nasa.gov))

All OSS-sponsored researchers and educators are invited to submit information, whether or not they have been specifically funded for the E/PO being reported. The goal is to display in the broadest possible manner the contributions of the OSS community to E/PO.

Last year's Annual Report was the first attempt to compile comprehensive information. That report brought widespread recognition to the OSS E/PO program and drew accolades from Government Performance and Results Act (GPRA) auditors, even though many projects were not reported. To make this Annual Report even more complete, your help is needed in entering information about the E/PO projects that you have conducted. OSS wants to ensure that all work is recorded and acknowledged. Contact information for Forums and Broker / Facilitators, and the online version of the FY 2000 Annual Report, can be found on the OSS home page at <http://spacescience.nasa.gov> under the link to *Education*.

### Space Science Education Resource Directory (SSERD) Update

The SSERD has been a huge success since going online last October. As noted by Dr. Isabel Hawkins, co-Director of the Sun-Earth Connection Forum, it has been searched over 300,000 times and has over 100 items available for downloading. "The Directory has been so well received by the K-12 community because it was explicitly designed with teacher input. Our goal has always been to meet the needs of educators."

In addition to updates to the user interface, online help, and a new search mechanism, the product registry has been enhanced to allow for easier registry of OSS educational resources into the Directory.

The first annual OSS Product Review is also underway. This is a peer review of 60 selected hardcopy space science products for education effectiveness and science accuracy. A subset of the most highly rated products will be printed in large quantity for wide spread distribution. The SSERD is found at <http://teachspacescience.stsci.edu>

## Educational Products

### View Space: A Multimedia Astronomy Display for Museums and Planetariums

*Space Telescope Science Institute (STScI)*

Among the hundreds of small science museums and planetariums, one often finds modestly-scaled astronomy exhibits that are "frozen in time": A glass case containing lithographs of Voyager II images, a well-worn VHS tape of NASA's classic "Universe" film (1976), a Landsat 5 picture, or a Rand-McNally moon globe. It occurred to John Stoke, informal science education manager at STScI that it would be a real service to come up with a means of supplementing these exhibits with something replicable, updateable, unique... and inexpensive.

With the support of Scala, Inc., who donated production software, John embarked on the creation of a series of multimedia presentations designed to interpret images and discoveries from the Hubble Space Telescope, to put the "pretty pictures" into a meaningful context. The presentations, collectively called *View Space*, orchestrate high resolution images, digital movie clips, nocturnal space music, and minimally intrusive text. The intent was to preserve the visceral qualities of awe and beauty and wonder that Hubble images (and other good celestial vistas) naturally provoke, while gently leading the viewer to an understanding of what they mean.

To run *View Space* in their facility, a host



*View Space showing in the Maryland Science Center.*

institution must provide a Windows PC, a display device (large monitor, LCD projector, plasma screen, etc.), small sound system, and Internet hookup. **View Space** comes on a CD with updates via CD. Plans are to transition to an Internet distribution model next year that will allow “push” of new content onto remote playback machines without any intervention on the part of the users. There are also plans to extend the **View Space** concept and STScI will be soliciting content from other NASA Space Science missions.

So far the response from the “marketplace” has been encouraging. Over 70 institutions have requested the program and several have sent very positive feedback. A more formal evaluation survey is being planned. Meanwhile, if you would care to have a look at **View Space**, just contact John at [stoke@stsci.edu](mailto:stoke@stsci.edu) to get a copy.

## **Space Science Reference Guide**

*Lunar and Planetary Institute*

The Space Science Reference Guide (SSRG) is a resource for publishers of children’s science textbooks and others. Included in the SSRG are high-resolution images of objects in the solar system, illustrations of planetary science concepts, articles about current research, summaries of ongoing missions, and classroom activities. Materials are organized into a user-friendly format in a two-CD set. CD #1 is configured in a searchable web browser format to allow the user to easily locate items of interest. CD #2 is a collection of high-resolution images that are indexed to correspond to the low-resolution, fast-loading versions, with captions, found on CD #1. All of the materials included in the SSRG are free of copyright, provided proper credit is given to the initial contributor. Intended for wide dissemination, it is hoped the SSRG will be a valuable resource for publishers, graphic artists, writers, educators, students, and the public. Production of a second volume is planned.

The SSRD was conceived as a result of interacting with teachers and students in the classroom and becoming aware of something that many parents and education professionals already know - science information (particularly space science) in K-12 textbooks is often very out of date, and sometimes contains inaccuracies. In many cases, even fairly recent textbooks contain only

drawings of planets such as Saturn, which is completely unnecessary when such breathtaking, high-resolution images are available. In an effort to change this situation, contributions were solicited from the Space Science community and compiled into the SSRG.

Science articles include the following topics: Astronomy, Planetary Science, Hot Topics in Space Science, Life on Mars Debate, and Scientific Instruments. Space Science Missions represented are: Cassini Mission to Saturn, Galileo Mission to Jupiter, Gamma-ray Large Area Space Telescope (GLAST), Hubble Space Telescope, Lunar Prospector, Mars Global Surveyor, Mars Pathfinder, Near Earth Asteroid Rendezvous (NEAR), Solar and Heliospheric Observatory (SOHO), STARDUST Mission to Comet Wild-2, and Student Nitric Oxide Explorer (SNOE). We thank all of the collaborators who contributed to this project.

Contact Kathleen Johnson at LPI for information on receiving the SSRD.

([Johnson@lpi.usra.edu](mailto:Johnson@lpi.usra.edu))

## **Genesis Products Reach Out with New Approaches to Learning**

*Mid-continent Research for Education and Learning*

What is the Sun made of? Are the Earth and planets made of the same stuff? NASA’s Genesis mission will send a spacecraft to collect pieces of the Sun, called solar wind, that may contain the answers. The Genesis spacecraft will journey a million miles sunward, unfold its collectors, and “sunbathe” for nearly three years before returning to Earth with its precious cargo. Scientists will study the solar wind samples for years to come.

Genesis mission E/PO products present a unique opportunity for educators and the public to learn about the mission and the science that drives it, and to meet some of the people who are working to make the mission a success through online interviews and video footage. All materials have been developed through a partnership between the Jet Propulsion Laboratory, Lockheed-Martin Astronautics, Los Alamos National Laboratory, the NASA Johnson Space Center, the California Institute of Technology, and Mid-continent Research for Education and Learning (McREL).

Genesis offers nine Web-based education modules (<http://genesismission.jpl.nasa.gov>), that are print-optimized and feature teacher guides, student texts, and student activities that are aligned to the National Science Education Standards. The modules are -

- Cosmic Chemistry: Cosmogony
- Cosmic Chemistry: An Elemental Questions
- Cosmic Chemistry: Planetary Diversity
- Cosmic Chemistry: The Sun and Solar Wind
- Cosmic Chemistry: Understanding Elements
- Heat: An Agent of Change
- Exploring Origins
- Dynamic Design: A Collection Process
- Dynamic Design: The Cleanroom

These education modules are also available on a CD entitled "Genesis in Education". Interactive learning exercises include a Periodic Table modeling simulation, available as a full software download, and an electronic field trip featuring four interactive simulations based on working in the cleanroom at the NASA Johnson Space Center.

Also on the website are modules for the general public which explain the mission science, **Genesis Kids** featuring online children's learning activities with an interactive stickerbook and **Ask Blast**, where children can submit questions about the mission science and receive an answer from a mission scientist. Additionally, the Web site offers public materials for community youth organizations, including the Boy Scouts and Girl Scouts of America.

Evaluation is an integral part of Genesis E/PO product development for further modification and improvement of educational materials. Genesis has nationwide formal development networks in place in which teachers field test materials in their classrooms in California, Texas, Kansas, Virginia, New Jersey and Florida. The end result is impact on classroom teaching and learning through classroom teachers via teacher feedback and input.

## Award Winning Websites

NASA Goddard Space Flight Center

**The Imagine the Universe!** and **StarChild** web sites were created five years ago by scientists at NASA Goddard's Lab for High Energy Astrophysics (LHEA) who wanted to bring the excitement of their field to high school students and their teachers, and bring general astronomy to a younger audience.

The Imagine site is geared to those 14 years and older while StarChild is for the younger set. Frequent updates bring the latest space science discoveries to the site.

<http://imagine.gsfc.nasa.gov>

<http://starchild.gsfc.nasa.gov>



Scientists have also teamed up with educators to provide lesson plans and activities for the sites. Through the years, scientists have continued to manage and contribute to these sites, as well as work with teachers to develop workshops and a series of poster/information booklet sets. Scientists in LHEA also volunteer to answer questions as part of Imagine's "Ask a High-Energy Astronomer" service.

**StarChild** has received many honors through the years, including the Webby Award for Education in 1998. **Imagine the Universe!** has also received a number of honors, most recently that of being included in the sciLINKS program, an innovative initiative by the National Science Teachers Association that links science textbooks to the Internet. Information on sciLINKS is at

<http://www.scilinks.org/>

# Educational Programs

## Teachers and Students Do Real Science with Cassini Team

*NASA Jet Propulsion Laboratory*

When the Cassini spacecraft flew past Jupiter this year, not only were scientists able to collect high-resolution data on Jupiter's radiation belts, but students and their teachers across the country also had an opportunity to do some real science. Using the Goldstone-Apple Valley Radio Telescope (GAVRT) the research team collaborated with teachers and students from across the county to perform a series of ground-based observations of Jupiter coordinated with spacecraft observations during the Cassini encounter from November 2000 through March 2001.

The GAVRT antenna, formerly known as DSS-12, was decommissioned from the Deep Space Network (DSN) in 1996. With the effort of a team of visionary scientists, educators, engineers, and community volunteers, the antenna found new life as an educational tool that offers teachers and students across the country a unique opportunity to experience the scientific process, as well as contribute directly to important, current research. The GAVRT science education partnership is jointly managed by the Lewis Center for Educational Research (<http://www.avstc.org/>) in Apple Valley, California, and the DSN Science Office at the Jet Propulsion Laboratory in Pasadena.

During the Cassini-Jupiter Microwave Observing Campaign (JMOC), ground measurements of Jupiter's microwave emissions were used to calibrate and support interpretation of simultaneous measurements taken by Cassini's radar instrument receiver. GAVRT students and teachers had the task of delivering to the Cassini program a prescribed set of radio astronomy measurements that would enable Cassini to perform previously unplanned observations, enhancing science return at Jupiter. The project gave the students a chance to become part of an interdependent science team.

An ongoing curriculum of the GAVRT partnership is called Jupiter Quest, a hypothetical mission to Jupiter or one of its moons. Students measure the radio emission from the Jovian

atmosphere and its radiation belts using the radio telescope (controlled via the Internet through the GAVRT Operations Control Center in Apple Valley) and use the information in their mission plan. To participate in the program, qualified teachers receive a week of training at either the Lewis Center or at Auburn University, Auburn, Alabama. Forty Jupiter Quest teachers and 2300 students at 26 schools in 13 states participated in the Cassini-JMOC.

The GAVRT program allows students and teachers to reach beyond science education as the mere learning of facts and concepts. It gives them the real experience of solving unexpected problems, of collecting data on heretofore unknown or poorly understood phenomena, and of interpreting that data. Many teachers participating in Cassini-JMOC report their students were greatly excited by the experience, gaining confidence in themselves and comfort with the scientific process.

The experiences of the GAVRT teachers and students during the Cassini-JMOC have been recorded in a film called "Space Patrol," produced by *30 Second Films*. At many of the participating schools around the country, the film crew has attempted to capture the essence of each student's life and interests, and how this exciting scientific experience has enriched their lives. The documentary is planned for national airing on a cable channel this fall.



*Teacher, Joe Monaco (far right), with students at Redlands East Valley High School (Redlands, California) on line with the GAVRT Operations Control Center in Apple Valley, California.*

## Solar System Ambassadors Help the NEAR Mission Go Out With a “Bash”

*NASA Jet Propulsion Laboratory  
Johns Hopkins University Applied Physics Lab*

From an open house at New York’s Natural History Museum to a meeting of the Richland Astronomical Society at a Denny’s restaurant in Ohio, JPL Solar System Ambassadors (SSA) across the nation rallied in February to celebrate the successful end to the 5 year-long NEAR (Near Earth Asteroid Rendezvous) mission.

The idea for a nationwide celebration came from JHU/APL’s Kerri Beisser, who in late January proposed giving presentation kits to 20 JPL Solar System Ambassadors if they would conduct NEAR events in their home communities in February. Beisser did not realize at the time that this humble offer would make almost as much impact as the spacecraft itself landing on the asteroid Eros.

The response was greater than anyone could have imagined. Within a day, 74 eager Ambassadors from 28 states requested kits. To help NEAR fill these orders, the Solar System Exploration Forum provided funds for additional materials. The Forum not only sponsored the additional kits for Ambassadors, it also produced 78 kits that were sent out to museums and planetariums to support local activities. The offer was made via the listserve of the International Planetary Society and the Association of Science & Technology Centers.

Armed with their kits and the archived website materials from the earlier SSA NEAR training, Ambassadors set up public events in communities across the country. Ambassadors conducted a total of 90 events during February and 72 additional events took place in March and April reaching almost 70,000 individuals.

Along with media coverage, these events focused on the NEAR mission and the intrepid team that boldly eased an orbiting spacecraft onto the surface of an asteroid for the first time and increased public awareness of space exploration. In fact, media coverage of an Ambassador event at a high school planetarium in Indiana gained the director (the Ambassador) \$60,000 in renovation funds from her local school district. She had sought these funds for several years, but it wasn’t until her NEAR open house was covered by the

NBC affiliate that the need was perceived and money became available.

In addition to honoring the success of the NEAR Shoemaker spacecraft, this experience has shown that by utilizing existing networks and providing inspiration and materials, our message about the wonders of space exploration can reach a larger audience than before. In its final days NEAR-Shoemaker not only landed on Eros, it opened a door to a new era in public outreach.

Learn more about the JPL Solar System Ambassadors program at:

<http://www.jpl.nasa.gov/ambassador/front.html>

Learn more about the NEAR mission at

<http://near.jhuapl.edu>



*Ambassador Randy Rubis of St. Clair Shores, Michigan during his presentation to a group at the Macomb County Community College.*

## Space Science: A Growing Field at CUNY

*City University of New York*

As part of the NASA OSS Minority Institution Initiative (described in *Voyages*, issue 2), the New York City Space Science Research Alliance (NYC-SSRA) will receive \$245,000 a year for three years to foster collaborations in space science research and develop a space science major (BS) in the CUNY BA/BS program.

The Alliance is anchored by the City University of New York (CUNY), the Hayden Planetarium of the American Museum of Natural History, the National Space Science Data Center at the NASA Goddard Space Flight Center, the

Minority University Space Interdisciplinary Network of NASA, and the NASA Goddard Institute for Space Studies. In addition to Medgar Evers College, which is the lead institution, seven other CUNY colleges are participating. They are the College of Staten Island, the City College of New York, Hunter College, York College, LaGuardia Community College, Queensborough Community College and Hostos Community College, "This award is a big boost to the growing interest in Space Science at CUNY" says Dr. Leon Johnson, Professor of Physics at Medgar Evers College, who is the NYC-SSRA Project Director. "CUNY has a long standing relationship with NASA and by bringing the Hayden Planetarium into the Alliance we are expanding and enriching the Space Science resources available to students in CUNY. We are especially honored that the Planetarium's Director, Dr. Neil de Grasse Tyson has been part of the NYC-SSRA team since its inception."

By creating a multi-campus research alliance, NYC-SSRA will engage underrepresented students and faculty from colleges and high schools in NASA Space Science research and education projects. NASA OSS support is enabling the establishment and enhancement of the space science research capabilities of faculty in participating colleges; creating a pipeline of research activities from high school to graduate school; and integrating research and research-related activities into undergraduate programs. The creation of the space science BS degree in the CUNY Baccalaureate Program is a major accomplishment and one that could not take place without the cooperation between institutions brought about by NYC-SSRA. This effort will help



*Students in Observational Astronomy practice using the 16-inch telescope at the Astrophysical Observatory at the College of Staten Island.*

increase the number of under-represented students in the science, math, engineering and technology pipeline who undertake study and research in space science.

Professor Irving Robbins, Co-Investigator at the College of Staten Island states, "This Alliance has a potential impact on our science and engineering students by offering a major in space science which will open new and exciting professional opportunities for these graduates. Also an added value of this program is outreach to the Education Departments in CUNY by offering courses that bring space science into their sphere of influence."

### **Illinois MagNet Project**

*DePaul University*

For many school teachers, doing space science in their classes means having their students study constellations or build models of the solar system to hang from the ceiling. Through their connections with NASA, teachers in the Chicago area are beginning to expand the reach of space science for their students. An example of this is the formation of an Illinois MagNet, a network of teachers and students who will build magnetometers and use them to collect data about the Earth's magnetic field.

The project began in June 2000 when a group of 25 Illinois teachers visited Goddard Space Flight Center in a program developed by the DePaul Broker/Facilitators, the education staff at Goddard, and the Sun-Earth Connection Forum, and funded by the Illinois Board of Higher Education. During their week-long visit, the teachers heard many presentations by scientists, including one by Dr. Sten Odenwald on building and using magnetometers.

The story continued in the fall when several teachers decided that they would like to share student-collected data in a project that they could control locally. They found the magnetometer to be interesting on a number of levels. In addition to dealing with the Sun and Earth and their connections, there was considerable additional space science that was related and could be used and there were good uses of math, other sciences, and social sciences. The building of the magnetometer itself would allow them to address state standards related to technological design. Finally, they liked the theme of "making the



invisible visible” and what it tells their students about the nature of science.

At this point, Walter Payton College Prep, the new Chicago public school with a math and science emphasis, became involved. Jackie Barge and Sam Dyson, teachers at Payton, got the okay from their principal (and funds for a server) to become the “Design Shop and Data Center” for the project. An organizing team met several times, swapping experiences and results, taking a hard look at the issues and needs, and making subject-matter connections. After that, the Illinois MagNet was given an official kick-off by Dr. Odenwald, the Chicago teachers, and the DePaul Brokers at a meeting on February 3 at Payton. Twenty-five teachers built magnetometers and explored issues related to their classroom use. Future meetings to recruit additional teachers into the network and to develop a coordinated testing phase took place over the next few months, with the goal of carrying out science projects in earnest during the 2001-2002 school year (a year of predicted heavy solar storm activity.) In the minds of the teachers, this project has several characteristics that make it exemplary. First, it is teacher-created and teacher-led. Second, the project is turning out to be much richer than first realized, and offers learning opportunities to students from all grades and related to many different classes.

A final addition to this story—through Dr. Odenwald, Sam Dyson has recently established contact with the developer of a schools magnetometer network (PopMagNet) in the UK. While both projects are still in their infancy, the hope is to have students in the two countries comparing results during the next year.



*Carol Katzberger, one of DePaul's Teacher Consultants, prepares for the part of a MagNet workshop where she'll help others learn to build and use "soda bottle magnetometers."*

## **Gravity and Black Holes**

*Adler Planetarium & Astronomy Museum*

The Adler Planetarium & Astronomy Museum in Chicago is continuing its tradition of education and public outreach through the newly created Adler Center for Space Science Education (ACSSE). Established with support from the NASA Office of Space Science, ACSSE serves as a nexus between the research and education communities in the Midwest. The goal is to bring a broad program of astronomy and space science education to the 500,000 annual Adler visitors, and to reach beyond the traditional museum setting to provide educational support for students, teachers, and families.

The ACSSE educational programs developed for the 2000-2001 academic year have explored the theme of *Gravity and Black Holes*. The Adler worked with 62 middle school classrooms from across Illinois providing educational opportunities to engage students, teachers and families in a semester of investigation into gravity and its role in the Universe. A series of graduate level teacher education courses were sponsored to assist teachers in developing the content foundation and instructional skills necessary to implement an integrated, inquiry-based curriculum in their schools. Focused field experiences at the Adler provided students with the ability to investigate the thematic concepts through gallery programs, exhibit interactions, and by actively participating in the new StarRider™ Theater presentation, *Black Holes: Into the Dark Abyss*. In addition, 22 teachers were paired with Project ASTRO volunteers to provide classroom support and allow the students to interact with members of the astronomy community.

Teachers and students have found creative ways to represent their learning. One example is the composition of *Symphony No. 2: Secrets of the Universe* by the Batavia Middle School 7<sup>th</sup> and 8<sup>th</sup> Grade Orchestras. Under the direction of Rita Feuerborn, the 7<sup>th</sup> and 8<sup>th</sup> grade orchestra members created a musical interpretation of the concepts of gravity and black holes. The students performed the piece to a public audience at the Adler Planetarium on March 21, 2001. Following the performance, Mark Whitley, an eighth-grade member of the orchestra, was very excited about the project, saying: “I think music is a great way

for me to share my excitement about astronomy with other people.”



*Batavia Middle School 7<sup>th</sup> and 8<sup>th</sup> Grade Orchestras performing their original composition interpreting Black Holes.*

Through ACSSE, students have also been engaged in an on-line learning community that enables them to communicate with students from other schools throughout Illinois. Participating teachers were provided with the training, materials, and support necessary to effectively integrate the use of technology in their instructional programs. This community serves as a forum for students to share ideas with their peers and to present what they have learned to the public. The final learning products are presented in displays in the museum and on the Adler Planetarium website.

Visit the Adler site to find out more- <http://www.adlerplanetarium.org> or access the Gravity and Black Holes curriculum at <http://www.adlerplanetarium.org/education/ac/gravity>

## **Workshop for Scientists, Engineers, and Education and Public Outreach (E/PO) Professionals**

*Space Science Institute*

The Space Science Institute (SSI) hosted 37 participants at its 7<sup>th</sup> annual K-12 Education Workshop for Scientists, Engineers, and Education and Public Outreach (E/PO) Professionals, May 14-17 in Boulder, Colorado. The workshop was supported by NASA OSS.

The workshop offered participants the knowledge necessary to both contribute meaningfully to E/PO, and to design and implement effective E/PO programs in connection with scientific research programs. Conveners Dr. Paul Dusenbery (SSI), Dr. Cherilynn Morrow (SSI), and Dr. Ramon Lopez (University of Texas, El Paso) led participants from 21 states and Puerto Rico through an educational program that included:

- hands-on work with inquiry/standards-based curricular materials;
- interactive presentations and discussions, including “A Day in the Life of a Middle School Teacher”;
- a field trip to a local school to see science education reform in action;
- breakout sessions on E/PO planning and educational technology;
- an exploration of the diversity of roles for scientists in E/PO;
- an extended opportunity for dialogue with practicing classroom teachers; and
- a poster session that allowed participants to exchange and showcase information about educational projects involving the science community.

SSI is working to continue this and other advanced topic workshops and to facilitate an active network of the more than 235 workshop alumni.

For more information about SSI’s education workshops, go to: <http://www.spacescience.org>, and click on “Workshops”



*Rhonda Hines of the Jet Propulsion Laboratory interacts with children on the field trip to Crestview Elementary School in Boulder, CO during the 2001 SSI Workshop.*

## Sun-Earth Day: Having A Solar Blast

*Sun-Earth Connection Education Forum*

*Sun-Earth Day: Have a Solar Blast*, an education and public outreach event held on April 27 and 28, was a national celebration of the active Sun and its effects on our planet. NASA's Sun-Earth Connection Education Forum (SECEF) developed and supported Sun-Earth Day to share solar science and Sun-Earth Connection (SEC) discoveries in classrooms, museums, planetaria, NASA centers, and at hundreds of National Astronomy Day celebrations throughout the country. Many events were linked with National Astronomy Week or the 5<sup>th</sup> Anniversary of SOHO (Solar and Heliospheric Observatory). SECEF also partnered with the European Space Agency (ESA) who focused their efforts in 40 locations throughout Europe.

Over 65 K-12 education events took place at NASA centers. More than 3000 educators attended workshops on Sun-Earth Connection science and participated in numerous hands-on activities, which they could in turn share with their students. NASA mission scientists donated time and expertise in these workshops and in the actual classrooms. A Sun-Earth Day webcast hosted by Paul Mortfield of Stanford University drew approximately 10,000 students.

SECEF and SEC missions developed support materials for Sun-Earth Day in a resource kit that reached 9,000 educators. A colorful space weather folder offered background information, activities, a lithograph set, and CD-ROMs. SECEF also developed a comprehensive support website. Heavily visited in March and April, the website allowed scientists and educators to register to participate in events. Total website registrations included 87 scientists who requested materials to support their efforts, and 267 educators.

The Sun-Earth Day website is  
[http://sunearth.gsfc.nasa.gov/SECEF\\_SunEarthDay](http://sunearth.gsfc.nasa.gov/SECEF_SunEarthDay)

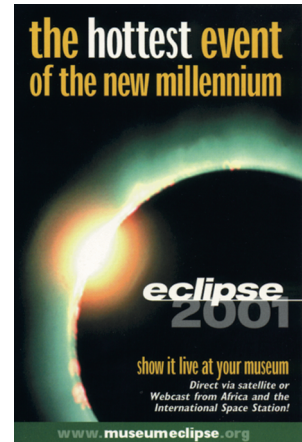


*Students show their UV-sensitive bracelets.*

## Solar Eclipse 2001- Live From Zambia

*Sun-Earth Connection Education Forum*

Reliable, constant, unchanging. This is the way we typically think about our Sun. But research has shown that the Sun is a variable magnetic star whose activity affects the Earth and other planets in fundamental ways. Total solar eclipses, complete with darkened sky, fiery corona, reappearing stars, and birds and animals sleeping during the day, are fascinating natural events that draw large public audiences into discussions about the Sun-Earth Connection.



On June 21, the first total solar eclipse of the new millennium occurred in Zambia, Africa, providing an opportunity to highlight themes of solar maximum, habitability of space, and Living With a Star. The eclipse totality was streamed to the rest of the world via satellite and Internet. *Eclipse 2001- the View from Zambia*, a live webcast event, was made possible through a partnership between the San Francisco Exploratorium and NASA's Sun-Earth Connection Education Forum (SECEF). The webcast included a conversation about solar radiation in space with astronauts Jim Voss and Susan Helms, speaking from the International Space Station.

Museums and planetaria took advantage of the broadcast to host public events for thousands of participants. There were 50 institutions from the United States, 23 others from around the globe and 69 Girl Scout Troops involved.

The National Society of Black Physicists (NSBP) was an official participant in the event. As explained by Dr. Charles McGruder, president of the NSBP, "Our members provided information on the eclipse event and generated excitement, wonder, and appreciation for science in under-represented minorities."

If you missed this event, the archived eclipse webcast can be viewed at:

<http://www.exploratorium.edu/eclipse>

## *On the Horizon*

### **IDEAS 2001 – Call for Proposals**

The Initiative to Develop Education through Astronomy and Space Science (IDEAS) is a grant program which funds innovative start-up educational outreach projects that team educators with scientists. Developed in 1991 by NASA OSS, the IDEAS program provides opportunities for scientists to share their knowledge and excitement about astronomy and space sciences with students, educators, and the general public. Proposals for the next funding cycle will be accepted until Friday, October 26, 2001 at 5:00 P.M. EDT.

In 2000 there were 15 programs accepted for funding from 11 states. The ratio of accepted proposals was approximately 45%. For more information about IDEAS, please visit the Web site at <http://ideas.stsci.edu>.

### **PBS Series to Feature Mars**

PASSPORT TO KNOWLEDGE invites teachers and students to return to the Red Planet with the 2001 Mars Odyssey mission!

October 30 - LIVE FROM MARS 2001 originates live from NASA's Jet Propulsion Laboratory in Pasadena, California. Just days after the Odyssey reaches Mars orbit (October 24), mission scientists and engineers take students behind the scenes for a live update on the spacecraft as it begins to lower itself down towards Mars to begin its science mission. Amazing images from the ongoing Mars Global Surveyor mission show new evidence for the existence of water on the planet, raising the continuing and tantalizing possibility of past life.

Web-based e-mail will allow students to send questions to the NASA researchers, and receive back answers in real time. Pre-taped segments show how to follow this and other NASA missions throughout the school year give opportunities for students to actually target some of Odyssey's science instruments and analyze results, working alongside Mars scientists!

March 19, 2002 - LIVE FROM MARS 2002 will update viewers on new results "just in" from Mars Odyssey. Students will see how Odyssey's instruments use parts of the electromagnetic spectrum beyond visible light to discover

otherwise hidden aspects of Mars' mysterious surface. At Arizona State's new Imaging Facility, built specially to accommodate student guest observers, viewers will see how 5th to 12th graders can become directly involved in Mars science. LIVE FROM MARS 2002 will explain how "virtual observations" are open to any teams of students, anywhere, via the Internet.

Both programs will relate exciting, cutting-edge space research to fundamental science concepts being studied in every course of instruction: light and optics, force and motion, weather on Earth and the planets of our solar system, water and life, and many more topics central to the curriculum. Interdisciplinary opportunities including math, language arts, social studies and more will also be offered. Online resources will relate the content of the programs directly to national and state science standards. Hands-on activities created by NASA, JPL, ASU and others are already available online in PDF and html formats, via the Mars Exploration Program and Mars Odyssey websites: <http://mars.jpl.nasa.gov/classroom/teachers.html>

### **Sun-Earth Day March 21, 2002**

This past April's Sun-Earth Day was such a success that we are ready to announce the 2<sup>nd</sup> **annual Sun-Earth Day**, complete with new opportunities to share the science of the Sun with educators, students and the general public. There are many ways you can participate: organize an event with a local club, institution, or museum; present or talk at your local school or university; set up solar observing telescopes or pinhole cameras and share the view—or just read, explore, and learn about Sun-Earth connections through the web. We are planning another webcast and more web chats. Announcements, updates, participation opportunities, and ideas can be found on the website, and the new theme will be announced soon. Keep watching:

[http://sunearth.gsfc.nasa.gov/SECEF\\_SunEarthDay](http://sunearth.gsfc.nasa.gov/SECEF_SunEarthDay)

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If you'd like to receive an electronic copy of future newsletters, contribute an article or have questions about getting involved with the NASA OSS Education and Public Outreach Program, contact Larry Cooper, Editor. [larrycooper@oai.org](mailto:larrycooper@oai.org)