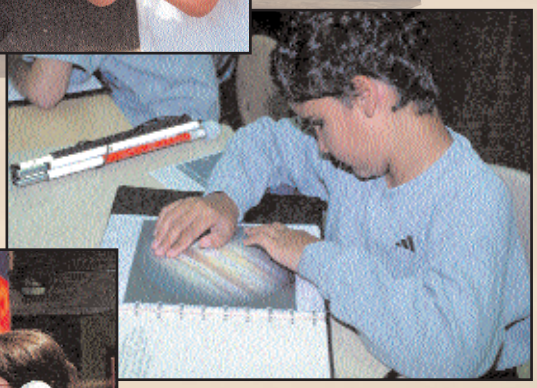
National Aeronautics and
Space Administration

Office of Space Science

Education and Public Outreach



Inspiring the Next Generation of Explorers

ON THE COVER: An artist's conception of a Mars Exploration Rover (background) beginning its exploration of the Red Planet symbolizes the journeys of discovery being taken by (clockwise from right) a student from the Colorado School for the Deaf and Blind examining a tactile image of Jupiter; a visitor to the *Cosmic Questions* exhibition pondering the structure of the Universe; a student from the Southwestern Indian Polytechnic Institute taking time out from examining meteorites at NASA Johnson Space Center to test-fly a Space Shuttle simulator; a young explorer investigating the Sun as it appears in *Voyage*—a scale model Solar System on the National Capitol Mall; and a student peering through a small telescope outfitted with a special filter for viewing the Sun.

Photo Credits: (Background) NASA Jet Propulsion Laboratory; (clockwise from right) Colorado School for the Deaf and Blind, Smithsonian Astrophysical Observatory/Kevin Burke, University of New Mexico/Horton Newsome, NASA/Renee Bouchard, Sun-Earth Connection Education Forum/Lou Mayo

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National Aeronautics and
Space Administration

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Reply to Attn of: **S**

Dear Colleague:

It is a pleasure to present this Annual Report summarizing the NASA Office of Space Science (OSS) Education and Public Outreach (E/PO) Program for FY 2002.

As documented by this report, the OSS E/PO Program is only one component of an overarching NASA education program. It is also one of the largest single programs in astronomy and space science education ever undertaken. The credit for making this program work and for the accomplishments to date goes to the more than 100 OSS missions and research programs; 1,000 OSS-affiliated scientists, technologists, and support personnel; and 500 external partner institutions and organizations that have implemented the efforts described here. We are also indebted to the Space Science Advisory Committee's E/PO Task Force and to the Lesley University Program Evaluation and Research Group, both of which have spent countless hours evaluating our efforts and providing the critical feedback necessary to make our program a success. Finally, special credit must be given to the members of the OSS E/PO Support Network, composed of Educational Forums and regional Broker/Facilitators, who are the unsung heroes of the OSS E/PO Program. They are the often unseen backbone that make possible the E/PO efforts reported here.

On behalf of everyone involved in the OSS E/PO Program, I invite you to browse through the descriptions of these FY 2002 E/PO efforts and to join us in continuing to make our space science E/PO efforts even more vibrant and successful in FY 2003.

If you have any questions or comments, or if you wish to receive additional copies of this report, please contact Dr. Philip Sakimoto at *Philip.J.Sakimoto@nasa.gov* or 202-358-0949. Searchable and downloadable versions of this Annual Report are available online on the OSS E/PO homepage at *http://spacescience.nasa.gov/education/* under the link to "Annual Report."

Sincerely,

Jeffrey D. Rosendhal

Jeffrey D. Rosendhal
Director of Education and Public Outreach
Office of Space Science

"The most important result of NASA's Space Science program is the sense of wonder and imagination it inspires in America's youth."

— Edward J. Weiler,
NASA Associate Administrator for Space Science

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FOREWORD

In April 2002, NASA Administrator Sean O'Keefe announced that education would be a fundamental part of NASA's new mission:

To understand and protect our home planet,
To explore the Universe and search for life,
To inspire the next generation of explorers
. . . as only NASA can.

The importance of inspiring the next generation of explorers cannot be overstated. Our Nation is failing to produce the number of scientists, mathematicians, engineers, and technologists needed to support our economic and national security needs. Our Nation's education system is failing to equip our children with essential mathematics and science skills. Our Nation's economic growth and competitiveness rely upon science and mathematics as key drivers in an economy that depends heavily on innovations in technology. NASA is uniquely positioned to help increase the number of our Nation's children who choose careers in science, mathematics, engineering, or technology. Our quests to understand and protect our home planet and to explore the Universe and search for life inspire our young people in ways that no other scientific endeavors can.

The meaning of education as a core mission of NASA is vividly illustrated in this Annual Report on NASA space science education and public outreach (E/PO) efforts during FY 2002. E/PO was built into every space science mission and research program conducted during FY 2002, and over a thousand members of the NASA space science community selflessly devoted some of their time and expertise to education and outreach efforts. Such dedicated efforts are what make the Space Science Enterprise E/PO Program a prime example of how NASA leverages its unique missions and research programs to inspire the next generation of explorers.

Adena Williams Loston
Associate Administrator for Education

PREFACE

The Office of Space Science (OSS) Education and Public Outreach (E/PO) Program is aligned with and strongly supports the new NASA mission to "inspire the next generation of explorers." Our commitment to education places a special emphasis on precollege education, diversity, and increasing the general public's understanding and appreciation of science, technology, engineering, and mathematics. This emphasis complements our traditional role in higher education, where we will continue to support professional education through research involvement as a central element of meeting our responsibility to help create the scientific workforce of the future.

During FY 2002, a new NASA Office of Education was being established to carry out the mandate to inspire the next generation of explorers. OSS is committed to seeing that space science education is a key component of the activities of this new organization. OSS eagerly supported and participated in the planning processes and discussions that led to the establishment of this new office and welcomed the opportunity that it offered to coordinate OSS education and public outreach programs with other similar efforts being undertaken throughout NASA.

It was only 6 years ago that OSS turned from planning to implementing an E/PO program based on a radical set of recommendations that emerged from a Space Science Advisory Committee Task Force chartered to develop a new approach for OSS to use in carrying out its E/PO programs. Rather than attempting to put a thin veneer of education on top of business as usual, we concentrated on getting our missions, research programs, and scientists to themselves develop and operate E/PO projects in highly leveraged partnerships with professional educators. Six years later, the results—as summarized in this Annual Report—are impressive. We now have more than 3,500 E/PO events annually, an online directory of hundreds of space science educational resources, traveling museum exhibitions and planetarium shows appearing in venues across the country, and a presence in every State. The OSS effort has become a major national program in a very short period of time.

At the same time, there are a number of critical issues that we must address in the coming years. Among these are the need to build more coherence into our wealth of educational products, the need to provide professional development opportunities for those who guide and operate our E/PO projects, and the need to better understand the impact of our program on its intended audiences. Addressing these needs and coordinating our E/PO efforts with those of the NASA Office of Education set our agenda for FY 2003 and beyond.

Edward J. Weiler
Associate Administrator for Space Science

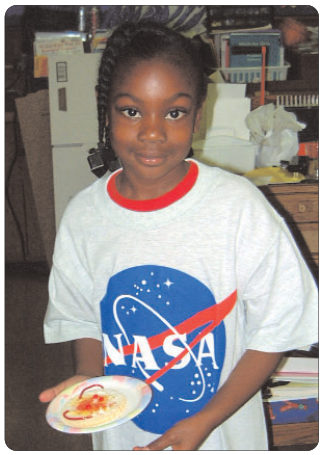
EXECUTIVE SUMMARY

Federal fiscal year (FY) 2002 was a turning point for NASA's Office of Space Science (OSS) Education and Public Outreach (E/PO) program. It marked a transition from an initial phase focused on establishing the program's infrastructure and nurturing its very rapid start-up to a more mature phase focused on paying much greater attention to improving the program's quality and impact.

Evidence of the breadth and scope that the OSS E/PO has achieved is contained in this FY 2002 Annual Report on the OSS E/PO Program. The report contains summaries of some 400 E/PO products and activities developed or carried out in FY 2002 under the OSS E/PO Program. It includes products and activities developed through the E/PO efforts of OSS missions and research programs, the Initiative to Develop Education through Astronomy and Space Science (IDEAS) program, the Minority University Education and Research Partnership Initiative in Space Science, the OSS E/PO Forums and Broker/Facilitators, and a number of additional comprehensive or special purpose E/PO projects managed by OSS at NASA Headquarters. Taking into account the fact that many of the activities reported involve multiple events that took place in a variety of venues, the total number of E/PO events reported for FY 2002 is more than 3,500—more than a 20-percent increase over the number of events reported in FY 2001. Events took place in all 50 States, the District of Columbia, and Puerto Rico.

While accurate information on the numbers of participants in these events is difficult to gather, estimates indicate that more than 360,000 people were direct participants in OSS-sponsored workshops, community and school visits, and other interactive special events, either in person or via live two-way communications links. Over 1.6 million visitors came to museum exhibitions, planetarium shows, public lectures, and special events featuring content from OSS missions and research programs. An additional 6 million Internet users logged in for Webcasts, Web chats, and other Web events. OSS materials and programs were made accessible to some 200 million people through conferences at which there were OSS exhibits or displays, radio and television broadcasts, news- paper columns, or other forms of public media for which precise counts of attendance, viewing audience, or readership were not available.

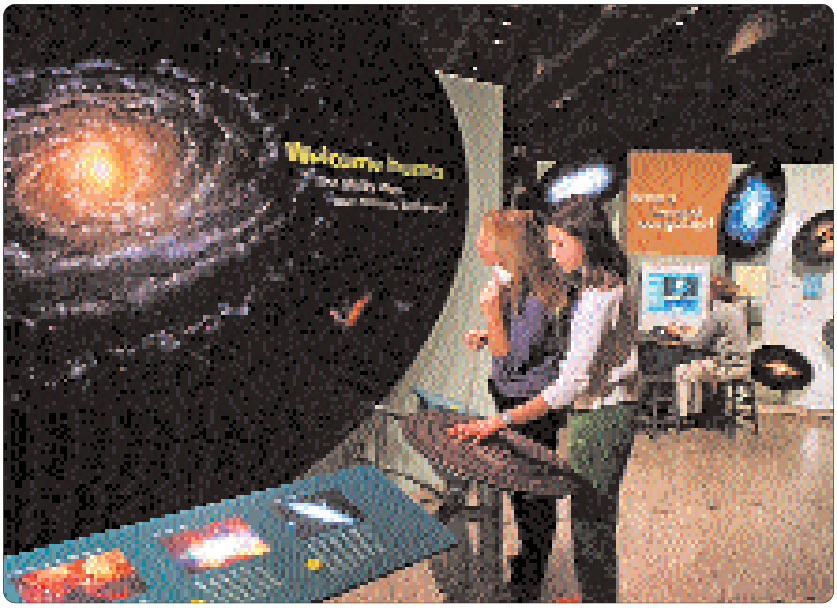
One measure of the success of the OSS E/PO Program is the more than 30 awards or other forms of public recognition for educational excellence that OSS E/PO products and activities received in FY 2002. Most significant among them was the Presidential Meritorious Executive Award given by the President of the United States to Dr. Jeffrey D. Rosendhal, OSS E/PO Director, for his leadership in creating and implementing the OSS E/PO Program. This award was a testimony not only to Dr. Rosendhal's leadership but also to the dedication of more than a thousand people throughout the extended NASA space science community who collectively worked to make the OSS E/PO Program a success.



Learning can be fun—and edible—when you make a model of the Sun on a cookie. (Credit: Sun-Earth Connection Education Forum/Karin Hauck)

Nearly 150 science centers, museums, and planetariums partnered with OSS in FY 2002 by contributing substantially to developing exhibitions, planetarium shows, materials, or other activities based on OSS content. Taking into account the many other institutions that participated by serving as additional host sites for exhibitions, planetarium shows, displays, or other educational activities based on OSS content, a total of nearly 300 science centers, museums, and planetariums in 45 States, the District of Columbia, Guam, and Puerto Rico participated in OSS E/PO efforts in FY 2002.

Several major debuts highlighted the year. Voyage: A Journey Through Our Solar System, an accurate, one ten-billionth



The Milky Way serves as a gateway to the *Cosmic Questions* exhibition. (Credit: Smithsonian Astrophysical Observatory/Kevin Burke)

scale model of the Solar System, opened on the National Mall in Washington, DC. Cosmic Questions: Our Place in Space and Time, a 5,000-square-foot traveling exhibition on the past, present, and future of the Universe, opened at the Museum of Science in Boston. Also making its debut was Northern Lights, a planetarium show tailored for smaller planetariums that emphasizes audience participation in exploring the beauty and causes of auroras.

Continuing their national tours in FY 2002 were the Hubble Space Telescope: New Views of the Universe, MarsQuest, and Space Weather Center exhibitions. In addition, Explore the Universe, an exhibition featuring the Hubble Space Telescope (HST) backup mirror, continued to be on display at the Smithsonian National Air and Space Museum. ViewSpace, a series of multimedia presentations showing images from HST and other NASA space science missions, was displayed in over a hundred small planetariums and science centers around the country.

OSS continued to emphasize providing opportunities for meaningful participation in space science activities by individuals from groups that are currently underserved and underutilized in science and technology. After years of anticipation and planning, Touch the Universe: A NASA Braille Book of Astronomy was published by the National Academy of Sciences. Touch the Universe is a 64-page book that makes the magnificent images taken by the HST accessible to visually impaired students.

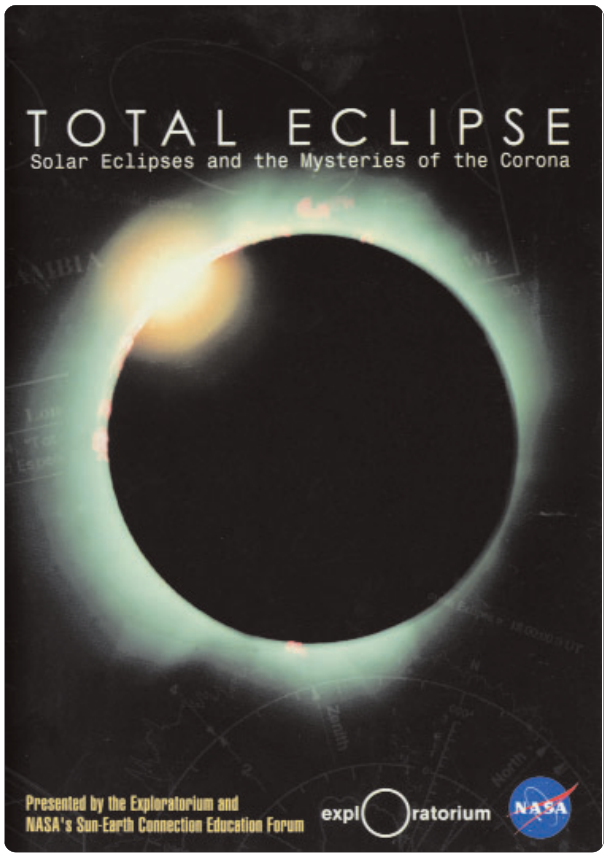
Touch the Universe makes images from the Hubble Space Telescope accessible to students with visual impairments. (Credit: National Federation of the Blind)

In a continuing effort aimed at developing space science capabilities at minority universities, 15 minority institutions first funded in FY 2001 continued to make excellent progress under the NASA Minority University Education and Research Partnership Initiative in Space Science. By the close of FY 2002, these institutions collectively reported being engaged in research collaborations with 9 NASA space science missions or suborbital projects and in more than 30 working partnerships with major space science research groups. In academic programs, the 15 minority institutions collectively reported having established on their campuses 22 space science faculty positions, 11 space science degree programs, and 66 space science courses. They were also engaged in a wide variety of teacher training, precollege outreach, and public outreach programs serving constituencies in their local communities.

Teachers training at the University of Hawaii at Hilo prepare for a Polynesian voyage as a means of learning traditional star lore and celestial navigation. (Credit: University of Hawaii at Hilo/Nathan Chang)

More significant involvement of a minority university in the OSS scientific program occurred at Hampton University where, as a result of an open, competitive peer review process, Hampton's Aeronomy of Ice in the Mesosphere (AIM) mission was selected for flight under the Small Explorer (SMEX) program. This success made Hampton University the first Historically Black College or University (HBCU) ever to be given the lead responsibility for conducting a complete space flight mission.

Providing educational products that use space science missions and discoveries to enhance what is taught in the classroom continued to be a major facet of the OSS E/PO Program in FY 2002. Invisible Universe: The Electromagnetic Spectrum from Radio Waves to Gamma Rays, a set of middle school classroom activities on the electromagnetic spectrum, was published as part of the Lawrence Hall of Science's Great Explorations in Math and Science (GEMS) series. Total Eclipse: Solar Eclipses and the Mysteries of the Corona, a new video and DVD that explores the science behind eclipses, was released. In addition, more than 70 other new products were reported as having been developed during FY 2002.



The **Total Eclipse** video/DVD explores the science behind eclipses.

Efforts to improve the utility of the NASA Space Science Education Resource Directory (SSERD), an online repository of OSS educational resources, continued during FY 2002. The SSERD established a partnership with the NASA Central Operation of Resources for Educators (CORE) through which the capability of ordering some products in multimedia hard-copy forms (such as CD-ROM, videotape, or DVD) was added to the SSERD's existing capability of disseminating materials in electronic formats. In addition, a product review process was initiated. During FY 2002, 46 OSS products were evaluated and rated. Procedures are being put in place so that products receiving exemplary ratings will be highlighted within the SSERD.

More than 170 OSS-sponsored educational activities that directly supported classroom education, some 90 educational activities directed specifically to the general public, and a number of activities that were aimed at improving the participation of the space science community in E/PO activities were conducted in FY 2002.

The Mars Student Imaging Project (MSIP) is an example of the unique opportunities for students to work directly with NASA space science missions, data, and personnel that are generated by the OSS policy of embedding E/PO efforts within each mission and research program. Under MSIP, pre-college or undergraduate students may participate in acquiring images and analyzing data from the Mars Odyssey spacecraft. The MicroObservatory, a network of online telescopes that middle and high school teachers and their students can access through a Web interface from their classroom, is an example of how providing hands-on opportunities can improve student performance.

Numerous workshops for individual teachers held in FY 2002 offered educators the opportunity to experience some of the excitement of conducting space science flight missions and to increase their understanding of the discoveries made by such missions and research programs. The subject areas covered ranged from Beyond the Visible Universe: Teaching Invisible Astronomy to Extremophiles: Life on the Edge.

OSS also used public television and special events to expand the reach of its educational activities. In conjunction with the Mars Odyssey spacecraft's arrival at Mars, two Live from Mars specials were produced and broadcast during FY 2002 as part of the Passport to Knowledge (P2K) series. The second annual Sun-Earth Day was held on March 20, 2002, with the theme "Celebrate the Equinox," featuring discussions on the Sun's connection to the Earth and a emphasis on Native American traditions.

Essential to carrying out this vast portfolio of E/PO activities was the direct participation of more than 1,000 OSS-affiliated scientists, technologists, and support staff, and the participation and contributions of more than 500 institutional and organizational partners. These partners either led the E/PO efforts for OSS missions or programs or contributed substantially to developing OSS E/PO products or activities. Taking into account the wealth of additional institutions that served as host sites for OSS E/PO events or exhibits or as media outlets for OSS materials or programs, a total of more than 2,000 institutions and organizations participated in OSS E/PO efforts during FY 2002. In addition, OSS had a substantial presence at approximately 70 national or regional scientific and education conferences.

In June 2002, nearly 300 scientists and educators gathered in Chicago for the first national OSS E/PO Conference. The attendees gave a rousing community endorsement to the successes to date of the OSS E/PO Program as well as critical feedback on areas in need of improvement. Formal feedback received later in the year from a Space Science Advisory Committee E/PO Task Force and from the ongoing study being conducted by the Lesley University Program Evaluation and Research Group (PERG) substantiated and expanded upon both the endorsements and the critical feedback received at the conference.

In response to this feedback, major attention will be paid in FY 2003 and beyond to building a space science curriculum framework to bring greater coherence to the wealth of OSS E/PO materials being produced. Attention will also be paid to finding ways to offer professional development opportunities to the people implementing OSS E/PO programs and to

understanding and improving the impact that the programs are having on its intended audiences. Efforts to expand the reach of the OSS E/PO Program to wider and more diverse audiences will also be continued.

FY 2003 will also be highlighted by a number of new products and activities. Ringworld, a new, updatable planetarium show tracing the Cassini mission's exploration of Saturn, will debut in FY 2003. A new call for proposals under the Minority University and College Education and Research Partnership in Space Science will be issued in FY 2003, and partnerships with groups such as professional societies of minority scientists and the Girl Scouts of the USA will continue to be developed. Living With a Star: From Sunscreen to Space Weather, a new middle-school space science guide for teachers, will be added to the GEMS series in FY 2003. The next Sun-Earth Day, on March 18, 2003, will focus on auroras and will be centered on the debut of two new Passport to Knowledge science specials, Auroras—Living With A Star and Live From The Aurora, and the release of a new children's book and Web site, Auroras: Mysterious Lights in the Sky. Finally, the launch and landing on Mars of twin Mars Exploration Rovers will be the focus of major new outreach activities leading into FY 2004 and beyond.

With the strong foundation already established and with the improvements OSS continues to make, OSS anticipates having an increasingly vibrant and strong E/PO Program in FY 2003 and beyond. OSS is pleased to be making these contributions as part of the broader NASA education program, so that as we journey to Mars and unlock the secrets of the Universe, no child will be left behind.