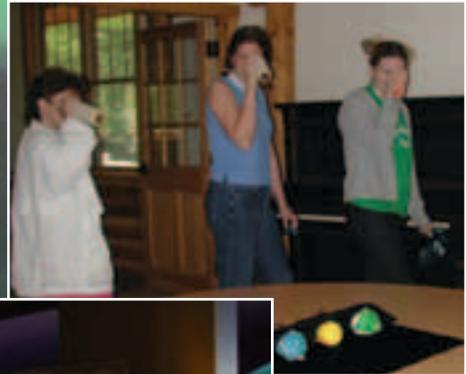


National Aeronautics and Space Administration

Space Science

Education and Public Outreach



Inspiring the Next Generation of Explorers

ON THE COVER: The beautiful aurora borealis “paints” the night sky over Alaska and served as the inspirational theme for Sun-Earth Day 2003 - one of thousands of events held across the country through which the Space Science E/PO program brought inspiration to “the next generation of space explorers”. These events included opportunities for personal engagement as represented by solar observing by students at Southern University (top left), participation in educator workshops such as this one for Girl Scout leaders (top right), experiencing planetarium shows and multimedia presentations such as provided by the award winning ViewSpace program (center), and engagement in major traveling museum exhibits such as “Cosmic Questions” (bottom left and bottom right).

Photo Credits: (Background) Jan Curtis; (from top left to right) Southern University/G. Stacy, NASA Jet Propulsion Laboratory, Clark Planetarium, Smithsonian Astrophysical Observatory, National Geographic Society/M. Thiessen.

National Aeronautics and
Space Administration



Headquarters
Washington, DC 20546-0001

June 2, 2004

Reply to Attn of: **S**

Dear Colleague:

It is a pleasure to present the NASA Space Science Education and Public Outreach (E/PO) Annual Report for Federal fiscal year (FY) 2003.

Contained in these pages are summaries of the contributions of more than 115 space science missions and research programs; 1,300 space scientists, technologists, and support personnel; and 500 external partner institutions and organizations to space science E/PO. Collectively, these individuals and organizations conducted more than 5,000 discrete E/PO events, hosted by more than 2,400 different institutions across the United States and its territories and possessions in FY 2003.

These space science E/PO activities comprise one of the largest single programs in astronomy and space science education ever undertaken, yet they are only one component of NASA's overarching education program. The program structure, policies, and plans described within this report are a direct response to intensive studies conducted by the Space Science Advisory Committee's E/PO Task Force and by 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. The cohesiveness that holds this remarkable collection of activities together is provided by the NASA Space Science E/PO Support Network, composed of four Educational Forums and seven regional E/PO Broker/Facilitators, who are the often-unseen backbone that makes possible the E/PO efforts reported here.

On behalf of everyone involved in the NASA Space Science E/PO Program, I invite you to browse through the descriptions of these FY 2003 E/PO efforts and join us in continuing to make our space science E/PO efforts even more vibrant and successful in FY 2004.

If you have any questions or comments, or if you wish to receive additional copies of this report, please contact Dr. Larry Cooper at Larry.P.Cooper@nasa.gov or 202-358-1531. Searchable and downloadable versions of this Annual Report are available online at the NASA Space Science Enterprise E/PO Web site: <http://space-science.nasa.gov/education>, under the link to "Annual Report."

Sincerely,

A handwritten signature in cursive script that reads "Philip J. Sakimoto".

Philip J. Sakimoto
Acting Director
Space Science Education and Public Outreach Program

*“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 December 2002, the NASA Education Enterprise was established to provide students and educators with unique teaching and learning experiences "as only NASA can." Working collaboratively with NASA's Science and Technology Enterprises, the Education Enterprise promotes education as an integral component of every major NASA mission.



NASA's Space Science Enterprise has been a pioneer in making education a fundamental part of each of its missions and research programs. This Annual Report provides vivid evidence of the power of such an approach. The education activities and products described in this report are the result of the commitment to build education into every space science

mission and research program conducted during FY 2003, with more than a thousand members of the NASA space science community devoting their time and expertise to education efforts.

The interplay between education and the science missions is mutually beneficial. The excitement of conducting missions and making new discoveries inspires future generations of explorers to pursue careers in science and technology. It is our desire that these future explorers will become part of the workforce who will carry out future missions.

As we enter the second century of flight, with the excitement of missions to the Moon, Mars, and beyond on the

horizon, the necessity of preparing the pathway for the next generation of explorers becomes critically important. To maintain and improve the quality of our future workforce, we must draw from the largest talent pool possible, and this talent pool must be inclusive of the full diversity that our Nation has to offer. In this regard, the Space Science Enterprise has shown tremendous dedication and innovation. Within this report, you will find descriptions of a number of special initiatives designed specifically to encourage participation in space science by minority universities, underrepresented populations, and students with disabilities.

The Space Science Enterprise education program is 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

A handwritten signature in black ink that reads "Adena Williams Loston".

PREFACE

Since 1997, the Space Science Enterprise has made education and public outreach (E/PO) an integral part of every new mission and every research program. No space science mission is complete until its results and discoveries are returned to the American public through extensive E/PO efforts led by the mission personnel themselves.



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 profes-

sional education by facilitating research, which is a central element of meeting our responsibility to help create the scientific workforce of the future.

Our approach to E/PO is based on a radical set of recommendations that emerged from a Space Science Advisory Committee Task Force chartered to develop a new approach for the Space Science Enterprise 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 develop and operate their own E/PO projects in highly leveraged partnerships with professional educators. Seven years later, the results—as summarized in this Annual Report—are impressive. We now have more than 5,000 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 Space Science Enterprise's original initiative to strengthen its education focus has become a major national program in a very short period of time.

We are very pleased to be making this contribution to NASA's overall education program. Since the establishment of NASA's Education Enterprise last year, we have found numerous opportunities to contribute our resources to major Agencywide education efforts. In the coming years, we expect such collaborations to increase, even as we continue to address a number of critical issues within our own Enterprise's E/PO programs. These issues include 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 greatly expand our already substantial efforts to improve the diversity of participants in NASA space science activities. Addressing these needs and coordinating our E/PO efforts with those of the NASA Office of Education will be our agenda for FY 2004 and beyond.

A handwritten signature in black ink that reads "Edward J. Weiler".

Edward J. Weiler

Associate Administrator for Space Science

EXECUTIVE SUMMARY

In Federal fiscal year (FY) 2003, NASA's Space Science Education and Public Outreach (E/PO) program was characterized by continued rapid growth, attention to establishing processes for addressing the critical areas of coherence in space science educational materials, professional development for specialists in space science E/PO, diversity in space science education and research programs, and increased collaborations with other parts of NASA's overall education program.

More than 5,000 discrete E/PO events sponsored by the NASA Space Science Enterprise took place in FY 2003—a more than 40 percent increase over the number of events reported as having taken place in FY 2002. These events took place in all 50 states, the District of Columbia, and Puerto Rico. They included exhibitions and planetarium shows at science centers and museums across the country, teacher workshops, activities involving students directly in the research and discovery of NASA space science missions, and a wide variety of public outreach events. In addition, 55 new space science educational materials or resources were developed during the year.

Essential to carrying out this vast portfolio of E/PO activities was the direct participation of more than 1,300 Space Science Enterprise-affiliated scientists, technologists, and support staff, affiliated with 115 different NASA space science missions and programs. More than 500 institutional and organizational partners contributed to leading the E/PO efforts for NASA space science missions or programs or to developing NASA-sponsored space science E/PO products or activities. Taking into account the wealth of additional institutions that served as host sites for NASA space science E/PO events and exhibits or as media outlets for NASA space science materials and programs, a total of more than 2,400 institutions and organizations participated in NASA space science E/PO efforts during FY 2003. In addition, the Space Science Enterprise had a substantial presence at more than 100 national and regional scientific and education conferences.

While accurate information on the numbers of participants in NASA space science E/PO events is difficult to gather, estimates indicate that more than 390,000 people were direct participants in NASA-sponsored space science workshops, community and school visits, and other interactive special events, either in person or via live two-way communications links. Over 3 million visitors came to museum exhibitions, planetarium shows, public lectures, and special events featuring content from NASA space science missions and research programs. An additional 6 million Internet users logged in for Webcasts, Web chats, and other Web events. NASA space science materials and programs were made accessible to some 200 million people through conferences at which there were space science exhibits or

displays, radio and television broadcasts, newspaper columns, or other forms of public media for which precise counts of attendance, viewing audience, or readership were not available.

An important measure of the success of the NASA Space Science E/PO Program has always been the numerous awards and other forms of public recognition for educational excellence that NASA space science E/PO products and activities receive. FY 2003 was no exception, with more than 30 such awards and recognitions received. What was notable was that many of these awards came from outside of the usual community of science educators. For example, a regional Emmy award was presented to the NASA CONNECT program, "[Data Analysis and Measurement: Having a Solar Blast!](#)," and a Telly Award was presented to the Spitzer Space Telescope mission's Ask an Astronomer video, "[Why Does the Moon Look Like It Changes?](#)" Recognition of the NASA Space Science E/PO Program as a whole came in the form of a NASA Outstanding Leadership Medal presented to Dr. Jeffrey Rosendhal for his tireless efforts to envision, initiate, and develop the program over the last ten years.



NASA Administrator Sean O'Keefe (left) and Deputy Administrator Frederick D. Gregory (right) present NASA Outstanding Leadership Medal to Dr. Jeffrey Rosendhal. (Credit: NASA/Bill Ingalls)

Major advances were made in FY 2003 in providing timely and up-to-date resources to science centers, museums, and planetariums. A [Mars Visualization Alliance](#) was established to bring near-real-time images and updates from the Mars Exploration Rovers to over a hundred participating science centers, museums, and planetariums. Each participating institution would incorporate these materials into live programs and special events staged in their own galleries and theaters. The [ViewSpace](#) program, already widely recognized for its innovative multimedia presentations featuring current space science images, narrative text, and background music, began a pilot program aimed at improving the currency of its programs. Instead of sending

the **ViewSpace** materials on CDs to the more than 100 participating science centers, museums, and planetariums that have **ViewSpace** galleries, a pilot program to provide **ViewSpace** updates over the Internet was conducted in FY 2003. Internet delivery will allow updates of the **ViewSpace** content as often as several times a day when there is breaking space science news.

Meanwhile, a suite of more traditional science center exhibitions and planetarium shows continued to bring recent NASA space science discoveries to the public in venues across the country. The “**Cosmic Questions: Our Place in Space and Time**”, “**Hubble Space Telescope: New Views of the Universe II**”, and “**MarsQuest**” exhibitions continued their national tours at sites ranging from Miami to Boston and across the Midwest. The “**MarsQuest**” planetarium show played in more than 20 major planetarium facilities in FY 2003, and the “**Northern Lights**” planetarium showkit was distributed to more than 100 small planetariums. Distribution of the “**Ringworld**” planetarium show also began in FY 2003, in anticipation of the Cassini-Huygens mission’s arrival at Saturn on July 1, 2004.

The Space Science Enterprise’s agenda of engaging the community of NASA-sponsored space science researchers in active collaborations with minority institutions proved its worth in FY 2003 as the first cohort of projects in the NASA Minority University and College Education and Research Partnership Initiative (MUCERPI) in Space Science completed their planned 3-year grant periods. Spectacular successes in establishing new space science faculty positions, new space science courses and degree programs, and new collaborations with NASA space science missions, flight projects, and research projects were reported by the 15 minority universities involved. A competitive solicitation conducted during FY 2003 established a second cohort of 16 minority universities who would receive MUCERPI



Guests at the “**Cosmic Questions**” exhibit opening at the National Geographic Society’s Explorers Hall use a near-infrared camera to see what their eyes cannot. The exhibition contains many examples of multi-wavelength observing. (Credit: Mark Thiessen/ Copyright National Geographic Society)

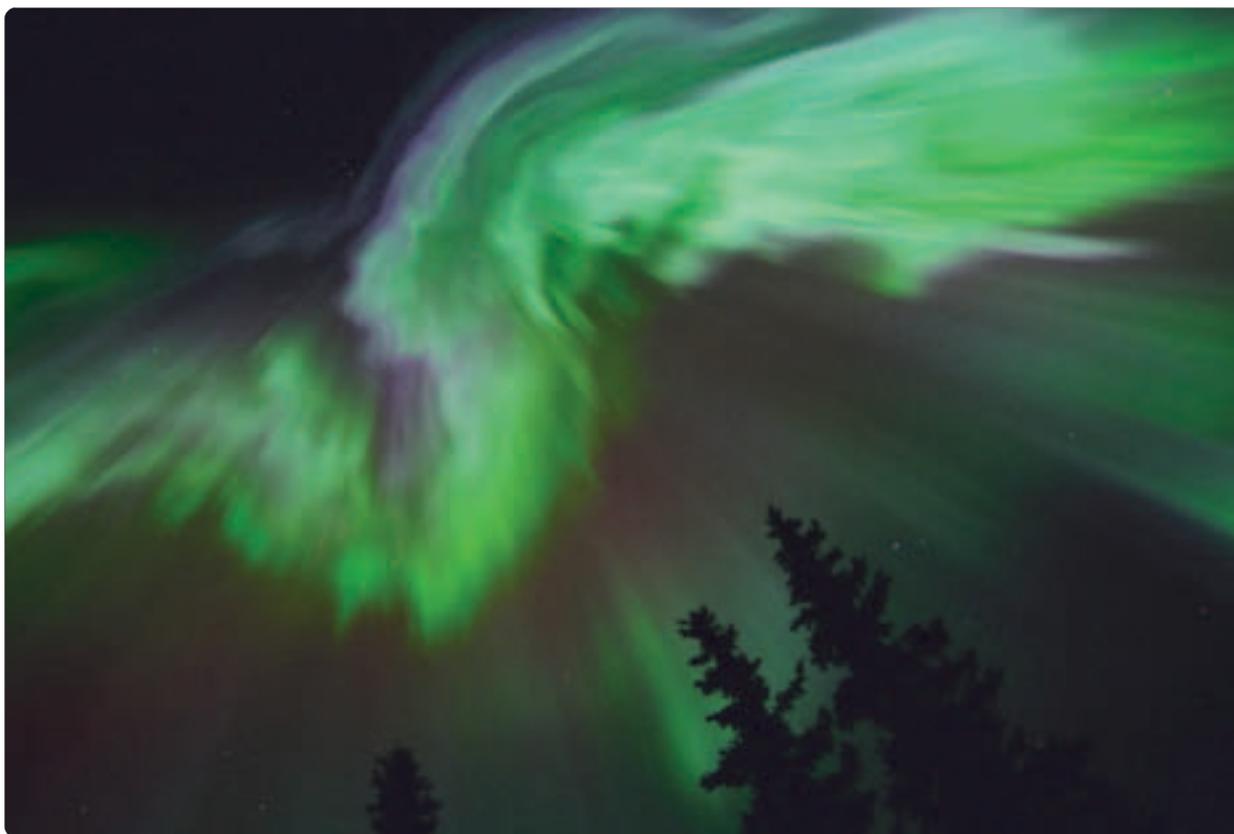


Telescope for solar observing captures the attention of students at Southern University for MUCERPI program activity. (Credit: G. Stacy, Southern University)

awards beginning in FY 2004. Building on the success of the MUCERPI program, the Space Science Enterprise planned to extend the concept of active partnerships with space science researchers to a much broader community of minority scientists through a special workshop, “**Chicago 2004**”, to be convened at the Chicago Hilton in June 2004.

In order to bring more coherence to the vast array of space science educational materials now available through the NASA Space Science E/PO Program, planning began in FY 2003 to build a Space Science Education Framework. Such a framework would lay out the story of space science and then show how key elements of that story are linked to national science standards at each of the various grade levels and also linked to readily available curriculum enhancement materials. This will give educators a standards-aligned sequencing of space science topics that they can use as a guide to find materials to use at each point in the curriculum. It will also give product developers a guide to understanding how materials they are planning to develop might best fit into the sequence, and to finding areas where new materials might be most useful. Work on fully defining the framework design will be completed in FY 2004, after which work on filling the details of the framework itself will begin.

Meanwhile, the NASA **Space Science Education Resource Directory (SSERD)** at <http://teachspacescience.stsci.edu> continued to be the primary mechanism for disseminating space science educational materials. At the end of FY 2003, 440 products were registered in the SSERD, with 322 of them accessible through online searches. Searches in the **SSERD** are limited to those products that are readily available as downloadable files or as multimedia products that can be ordered through a **SSERD** partnership with the NASA Central Operation of Resources for Educators (CORE) at



"Auroras! Mysterious Lights in the Sky" was developed to support Sun-Earth Day 2003, whose theme was "Live from the Aurora."
(Credit and Copyright: Jan Curtis)

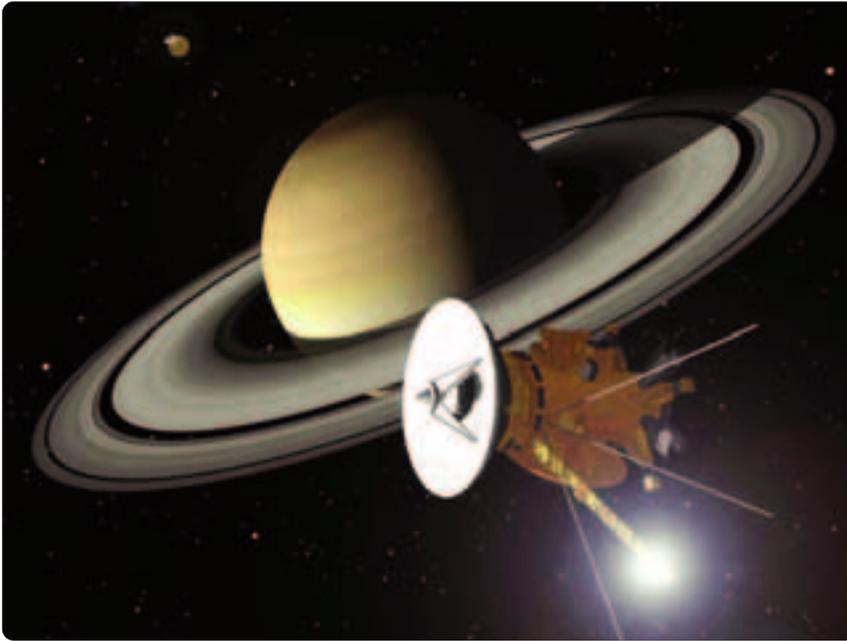
<http://core.nasa.gov>. Among the many new products registered in the SSERD during FY 2003 were "Living With a Star: From Sunscreen to Space Weather", a new guide for middle school teachers that is part of the Lawrence Hall of Science's "Great Explorations in Math and Science" (GEMS) series, and "Auroras! Mysterious Lights in the Sky", a video and interactive booklet for primary grade students developed by the Sun-Earth Connection Forum.

The NASA Space Science E/PO program conducted nearly 200 educational activities that directly supported classroom education, nearly 140 educational activities directed specifically to the general public, and nearly a dozen activities that were aimed at improving the participation of the space science community in E/PO activities in FY 2003.

In anticipation of the January 2004 arrival of the Mars Exploration Rovers (MER) on Mars, "To Mars with MER", a series of six hour-long PBS broadcasts in the "Passport to Knowledge" Program, began in FY 2003. The series consists of three educational broadcasts targeted at science centers, schools, and planetariums, and three prime-time documentaries targeted at the general public. The first educational broadcast, "Countdown to Mars," originated live from DePaul University in Chicago and NASA's Jet Propulsion Laboratory in Pasadena on May 1, 2003. The first public documentary, "Bouncing to Mars," aired in summer 2003.

Preparations were also being made in FY 2003 to engage students, educators, and the public in future mission events. In preparation for the arrival of the Cassini-Huygens spacecraft at Saturn in July 2004, a Saturn Observation Campaign was established. Through this campaign, both amateur and professional astronomers prepared to share their knowledge with the public through viewing events and other activities that correspond with Cassini-Huygens' exploration of Saturn and its moons. At the University of Colorado, a dust-counting instrument was being prepared by a team of students to fly on the New Horizons spacecraft to Pluto and the Kuiper Belt. This instrument will not only provide information on the dust particles encountered by New Horizons, it will also serve as the basis for data analysis projects involving precollege students and teachers in the explorations of Pluto and the Kuiper Belt.

Numerous workshops for individual teachers held in FY 2003 offered educators the opportunity to experience some of the excitement of conducting space science flight missions and increase their understanding of the discoveries made by these missions and research programs. Topics such as "Beyond the Visible Universe: Teaching Invisible Astronomy," "The Great Desert: Geology and Life on Mars and in the Southwest," and "Towards Other Planetary Systems" are just a few examples of the many subjects covered by these workshops.



An artist's conception shows the Cassini spacecraft approaching Saturn, the subject of the "RingWorld" Planetarium show. (Credit: NASA Jet Propulsion Laboratory)

Evaluation of impact and effectiveness continued to play a major role in the NASA Space Science E/PO Program in FY 2003. The NASA Space Science Advisory Committee (SScAC) received and accepted the final report from its E/PO Task Force's study, "Implementing the Office of Space Science (OSS) Education/Public Outreach Strategy: A Critical Examination at the Six-year Mark". In addition, preliminary findings from Phase III of the Lesley University Program Evaluation and Research Group's (PERG) evaluation of the NASA Space Science E/PO Program became available. Both of these studies found that the NASA Space Science E/PO Program was having a very positive and widespread impact on the audiences it serves. Educators applauded the high quality and rich variety of space science education resources being made available to them. Scientists recognized that E/PO had become an important part of their work as scientists. Previously disenfranchised communities, such as underrepresented minorities and students with disabilities, commended the NASA Space Science Enterprise for making genuinely productive and useful efforts to include them in a broad range of space science activities.

The evaluation studies also provided a number of critical recommendations for building upon previous successes and expanding beyond the impacts already achieved. The highest priorities among these recommendations were to develop a space science curriculum framework to bring greater coherence to the wealth of space science E/PO materials being produced, to provide regular professional

development opportunities for the people implementing space science E/PO programs, and to continue to expand opportunities for increasingly wider and more diverse audiences to become genuinely involved in NASA space science activities. These priorities were already being addressed in FY 2003 and will receive even greater attention in FY 2004.

FY 2004 promises to be a busy and productive year for NASA space science E/PO. In January 2004, the [Mars Visualization Alliance](#) will bring the landing of the MER rovers on Mars to audiences across the United States and around the world, while teams of students and educators become engaged in analyzing real data from Mars. On June 8, 2004, a transit of the Sun by Venus

will be broadcast live from Athens, Greece, with a host of educational activities conducted at a variety of venues throughout the Nation. On June 28-29, "[Chicago 2004: A Workshop to Broaden Diversity in NASA Space Science Missions and Research Programs](#)," will take place at the Chicago Hilton. Two days later—early on the morning of July 1, 2004—the Cassini-Huygens probe will arrive at Saturn.

Major museum exhibitions, including "[Cosmic Questions](#)" "[Hubble Space Telescope: New Views of the Universe](#)," and "[MarsQuest](#)" will continue their national tours, and a new exhibition, "Destination Mars", will begin its national tour at the Sheila M. Clark Planetarium in Salt Lake City, UT. E/PO program plans will be developed in FY 2004 for major new missions and programs such as Prometheus and Beyond Einstein, and relationships with community-based organizations such as the Girl Scouts of the USA will be expanded. Overlaying all of these activities will be efforts to fully develop the space science curriculum framework and provide professional development activities for E/PO specialists.

In the words of the SScAC E/PO Task Force, "significant progress has been made to date," and the agenda set for FY 2004 and beyond "will yield especially rich rewards in taking the OSS E/PO program to even higher levels of maturity, effectiveness, and accomplishment."