



# "Space Science" Stands for "Education"

*Efforts by the NASA Office of Space Science invigorate Education and Public Outreach.*

by Cherilynn A. Morrow

A decade ago, I had opportunity to serve as a visiting scientist at NASA Headquarters in the Office of Space Science (OSS). My career made a fateful shift over the course of a two-year appointment during which time I might otherwise have been observing solar oscillations from Antarctica. At the time of the Hubble Space Telescope repair mission and then NASA Administrator Daniel Goldin's controversial "Faster, Better, Cheaper" model for missions, my charge was perhaps comparably heretical—develop policies and strategies for engaging the funded space-science community in K-12 education and public outreach (EPO).

Nothing short of revolution has occurred in this domain during the past decade. EPO programs have been embedded within scientific research programs in all scientific disciplines, and scientists are increasingly active in education at all levels. A new and diverse profession of EPO leaders has arisen with the purpose of creating compelling educational opportunities for students, educators, and the public that have closer access to real-world scientific research.

NASA OSS has been a pioneer in these developments. In 1990, Charlie Pellerin, former director of the NASA Astrophysics Division, hired Jeffrey Bennett and charged him with the off-beat task of using resources of the astronomy community to help solve problems in science education. I was hired as Bennett's successor, and I pushed onward through the difficult terrain, starting out on the important trails Jeff had blazed. I offered the first presentations on OSS educational strategy to the Space Science Advisory Committee, and served as one of three NASA presenters at a meeting convened by Goldin and Carl Sagan about how NASA could better communicate with the public. Experiences at these meetings taught me how to stand my ground with famous people who combined far greater seniority with active opposition to

the idea of a NASA research office mobilizing its community in support of K-12 education.

I found two seminal works in 1993 that bolstered the success of my arguments for scientists' involvement in education. One was an essay by the president of the National Academy of Sciences, Bruce Alberts, taken from a book called *Science Education Partnerships*. Repeatedly I quoted his assertion that scientist-teacher partnerships are essential to successful reform in science education and an important national priority. The second resource was a paper by Caltech physics professor David Goodstein and entitled "Scientific Elites and Science Illiterates." The paper begins with the paradox that America—a country producing the world's greatest number of Nobel laureates—has a citizenry among the most scientifically illiterate in the developed world. Goodstein sees this gap as an enormous problem in an era where public understanding and appreciation of science are assuming greater significance for the health of scientific research. He makes persuasive arguments for why scientists need to contribute to the education of all students, not just those "diamonds in the rough" whom they are more naturally inclined to cut and polish in their own image. Goodstein's paper remains the most effective resource in my "first-aid" kit for doubting scientists.

Meanwhile, I have discovered the need to convey other key messages. Just as students and teachers can have misconceptions about space science, space scientists can harbor misconceptions about education. Many resources for scientists in education are posted at [www.spacescience.org/Education/ResourcesForScientists/1.html](http://www.spacescience.org/Education/ResourcesForScientists/1.html).

As part of my current work with the Space Science Institute, I disseminate such resources at scientific conferences and also in our education workshops for scientists, engineers, and EPO leaders. Over the past ten years, our workshops have oriented over 500 participants from more than 100 NASA missions and programs to best practices in education. It is vital to sustain and evolve such professional devel-

opment opportunities to help promote the highest standards for NASA EPO.

Today, every NASA space science mission devotes 1-2% of its budget to EPO. This policy accounts for about \$25 million of the \$40 million per year OSS currently spends on EPO. By comparison, my annual EPO budget in the early 1990s was about a million in today's dollars. Even so, it helped to initiate what have become important education projects. For example, it provided seed funding for astronomer-teacher partnerships in the newly forming Project ASTRO in San Francisco, which the ASP used to leverage NSF support that led to the current national network of ASTRO sites. It also funded a program to fly teachers with astronomers aboard the Kuiper Airborne Observatory—an idea that lives on in the EPO plan of Kuiper's successor, SOFIA.

To help guide the space-science community in the best use of their EPO wealth, OSS created in 1997 a national network of ten organizations called Brokers and Forums. Having led an SSI-based Broker program in the American west since that time, my strong opinion is that NASA should extend such a network across all its enterprises to enhance the valuable coupling between educational needs and the resources of NASA's technical workforce.

From time to time I wonder whether I should have chosen to continue my research on solar oscillations. Amid post-9/11 reflections on the worth of what I was doing in science education, some potent words from Sagan's *Pale Blue Dot* reaffirmed my conviction: engaging scientists and educators in raising awareness of the astronomical perspective of planet Earth has far more power to change people's thinking and make a better world. ■

CHERILYNN A. MORROW is an astronomer, NASA Broker, and Director of Education at the Space Science Institute in Boulder, Colorado. She loves to sing, dance, fly, dive, and climb almost anything. Her email address is [camorrow@colorado.edu](mailto:camorrow@colorado.edu).