



Matthew Rossi presenting at Broadmor Elementary School.

## Outreach: Sharing the Excitement of Science

The School of Earth and Space Exploration focuses on training the next generation of explorers, but it also believes in educating and inspiring citizen scientists. The school engages the minds of its students, and through a variety of informal science education and public outreach activities it also educates the community. During the year the school reaches out to the community in a number of ways. Details of a few of its most recent events follow. Visit [sese.asu.edu](http://sese.asu.edu) for a complete list.

## Visit to Broadmor Elementary School

Entertaining elementary students isn't as hard as you might think. Throw some Earth science at this typically tough crowd and odds are pretty good that you'll have their attention. Matthew Rossi and Roman DiBiase, both graduate students in SESE, succeeded in engaging the young audience at Broadmor Elementary School with a presentation on rivers and geology as a kick off to the Broadmor's Science Fair.

A lack of participation was one thing Rossi and DiBiase did not have to fret about. "You worry that your research interests won't be compelling to the most demanding audience – elementary students. Then you talk to them and you realize that the spirit of science originates with them," Rossi says. Eager little hands flew into the air each time a question was asked. Especially spell-binding was a series of fly-throughs of famous landforms such as the Grand Canyon. When it was over, it was difficult to tell who was more upset: the elementary students or the graduate students. "The probing questions of elementary students reinvigorates the passion I have for my own research," Rossi adds.

## Upcoming Events

<b>Lunar Planetary Science Conference:</b>	March 23-27
<b>Astronomy Open House:</b>	March 27
<b>Origins Symposium:</b>	April 3-6
<b>Traveling Telescope:</b>	April 11

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## Announcement

The ASU/NASA Space Grant Program invites graduate students to apply for a 2009/2010 academic year NASA Fellowship. Outstanding graduate students in all academic disciplines interested in promoting Science, Technology, Engineering, and Math (STEM)-related research to the public have the opportunity to be awarded a NASA Fellowship.

Applicants must be a U.S. citizen and full-time graduate student at ASU. Awards include: stipend, both in- and out-of-state tuition, and health care.

**Application deadline:**  
Noon on Monday, April 20

[http://nasa.asu.edu/v2/extra/grad\\_application.php](http://nasa.asu.edu/v2/extra/grad_application.php)



## International Year of Astronomy 2009

The International Year of Astronomy 2009 (IYA 2009) is a global celebration of astronomy and its contributions to society and culture. It also marks the 400th anniversary of the first use of an astronomical telescope by Galileo Galilei. The aim of IYA 2009 is to stimulate worldwide interest, especially among young people, in astronomy and science under the central theme “The Universe, Yours to Discover.”

Since discovery and exploration are at the heart of SESE, the school will be heavily engaged in activities. In addition to holding its own activities, the school

will be partnering with other science organizations around the globe throughout the year.

Each month the Arizona Science Center is focusing on a different astronomical topic. On Saturday, March 14, the topic was: “Mars, What’s New? (Part 1).” SESE students and Space Grant interns, with the Mars Education team guiding the way, offered a variety of activities at the Arizona Science Center, including the Gusev Crater and Valles Marineris giant floor puzzles, MOLA map puzzles, THEMIS image feature match, Robotic arms, and a Mars Trivia game.

### “The Universe, Yours to Discover”

*A global celebration of astronomy and its contributions to society and culture, and the 400th anniversary of the first use of an astronomical telescope by Galileo Galilei.*

### Traveling Telescope

Throughout the year, the school hosts observing sessions with the Traveling Telescope. Planetarium Coordinator Dan Matlaga oversees the telescope and makes it available to public.

The February 28, 2009 Traveling Telescope event at Tempe Town Lake treated 358 viewers to the sight of the crescent Venus during the daylight hours. Aside from the raw numbers, it is interesting to note that with at least a half-dozen cases the viewer left the telescope only to return for another peek.

**Date of next Traveling Telescope:**  
Saturday, April 11 (7:30 -10 p.m.)  
Object of interest: Planet Saturn

*Find the Traveling Telescope on the south side of Tempe Town Lake on the grassy area just to the east of the parking lots off Ash Ave. and Rio Salado Parkway.*

**[sese.asu.edu/telescope](http://sese.asu.edu/telescope)**

## The Research Success of Seasoned Scientists

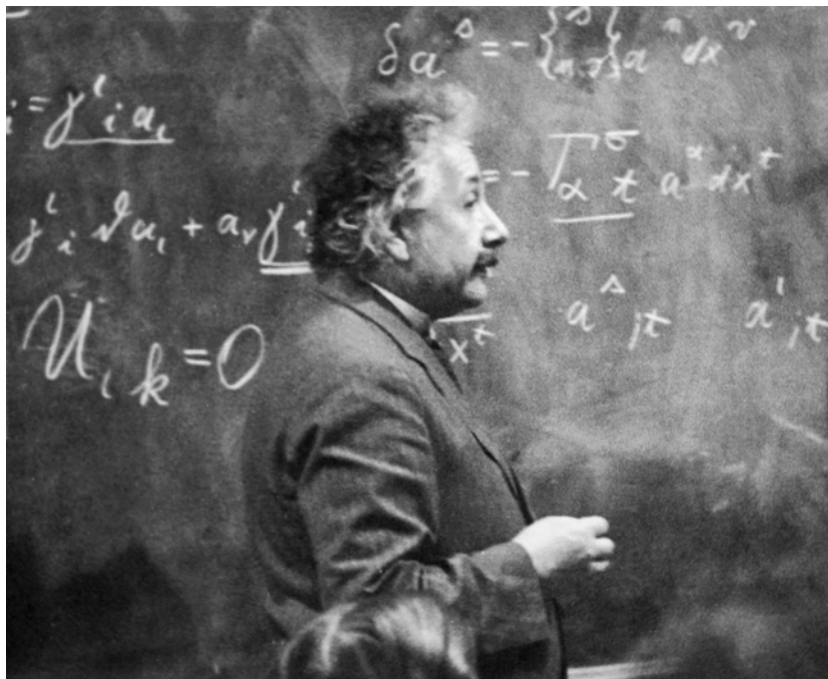
To understand early evolution of life, we have to know how organisms were nourished and how they evolved. All living organisms need nitrogen, a basic component of amino acids and proteins. Nitrogen was a life-giving nutrient billions of years ago and remains so today. But for atmospheric nitrogen to be usable, it must be converted to a biologically useful form. Billions of years ago, Earth’s tiniest organisms – microbes – played a key role in developing the modern nitrogen cycle by turning atmospheric nitrogen into ammonia, a form in which the nitrogen can be easily absorbed by other organisms.

Professor **Ariel Anbar** is part of a team that published research in the Feb. 20 edition of Science that shows that by about 2.5 billion years ago some microbes evolved that could carry the process of making usable nitrogen a step further, adding oxygen to the ammonia to produce nitrate, a process known as nitrification. That was the beginning of what today is known as the aerobic nitrogen cycle.

Scientists examined material from a half-mile-deep core drilled in the Pilbara region of northwest Australia. They looked specifically at a section of shale deposited 2.5 billion years ago, and found recorded in it the onset of the modern nitrogen cycle.

F-e-r-r-o-p-e-r-i-c-l-a-s-e. Ferroperricite. It’s hard to decide which is more difficult: spelling it, pronouncing it, or studying it since it’s a rock found deep within Earth’s mantle. Professor **Ed Garner** is part of a research team that is publishing a paper in Science that focuses on this unique rock that possesses “anisotropic” properties, meaning its properties are directionally dependent. Seismologists such as Garner attempt to measure the directional dependence of speeds of seismic waves and for an anisotropic rock, a seismic wave travels through it at different speeds in different directions. Accurately measuring the effects of anisotropy in seismic data can provide important information about the composition, convection, and evolution of Earth’s interior.

This new research states that anisotropy in the deep mantle may actually be dominated by ferroperricite, and not perovskite or post-perovskite as was originally believed.



In 1905 Albert Einstein published his theory of special relativity, which showed that space and time can be seen as aspects of a deeper structure, space-time, and that mass and energy are really the same thing. Credit: Hulton Archive/Getty Images

## Bold Visions Lead to New Initiatives

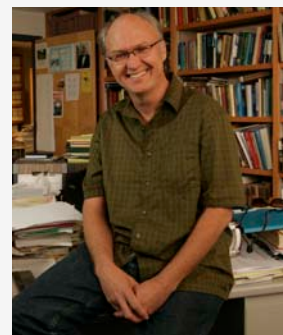
The Cosmology Initiative at ASU, centered in the School of Earth and Space Exploration and partnering with the Physics Department, represents a major new national program. Co-directed by Paul Davies, Lawrence Krauss, and Rogier Windhorst, the program's research activities include observational and experimental cosmology, theoretical cosmology and particle astrophysics, and experimental particle astrophysics.

Cosmology at ASU involves studies of the Universe from its earliest moments to its far future. The Cosmology Initiative currently underway will create one of the largest and most comprehensive cosmology programs in the country. Areas of activity include: the early universe, physics beyond the standard model, extra dimensions, quantum cosmology, inflation and multiverses, dark matter and dark energy, galaxy formation and evolution, neutrino astrophysics, gravitational waves, stellar evolution, and the long term future of the universe.

The quickly approaching Origins Symposium will inaugurate another new initiative at ASU: Origins. This University-wide transdisciplinary endeavor will support research in key areas of strength including: the origin of the universe, origins of stars and planets, the origins of life, human origins, origins of consciousness and culture.

The Origins Symposium will be held April 6, 2009 Gammage Auditorium, and broadcast live on the web. The most well known scientific public intellectuals in the world will assemble in one place, with speakers such as: Stephen Hawking, Steven Pinker, Richard Dawkins, Craig Venter, Lawrence Krauss, Brian Greene, and Donald C. Johanson. There will also be a Nobel panel, including: Steven Weinberg, Frank Wilczek, Walter Gilbert and Baruch Blumberg.

Origins.asu.edu  
Cosmology.asu.edu



Professor Everett Shock elected Geochemistry Fellow, a first for ASU.

### Awards

Being elected a Geochemistry Fellow is a significant honor, and for the first time that honor belongs to an ASU professor. **Everett Shock** has been elected a Geochemistry Fellow by the Geochemical Society and the European Association for Geochemistry. The number of Fellows elected each year is limited to less than 1% of the membership of the combined societies. This honor is bestowed upon scientists who over the years have made a major contribution to the field of geochemistry. Shock divides his time between building algorithms to estimate thermodynamic data; analyzing water, sediment, rock and biological samples; and testing ideas about the transport of water and solutes through the environment, and the potential for life on other planets.

SESE Director **Kip Hodges** was also honored with a similar high-profile award. Hodges was elected a 2009 AGU Fellow and joins the following SESE professors who were past fellows: Ron Greeley, Phil Christensen and Everett Shock. This is an honor bestowed to less than 0.1% of all AGU members in any given year. Hodges' research, which focuses on the evolution of mountain-making systems, has significantly impacted his field over a sustained period of time.



## Display Case in the Dean's Office

No time to tour the wonders of Earth and space in the museums? Then stop by the Dean's Office (Fulton Building, suite 145) for the next best thing – a bite-size, five-minute tour of SESE in a display case. The display showcases research interests and features something new every two months. The current SESE display includes specimens from all areas of the school.

The Lunar Reconnaissance Orbiter Camera facility graciously lent a true lunar treasure: a “real moon rock”, which was blown off the surface when an asteroid crashed into Earth's moon. The meteorite was later found in the sand desert near Dar al Gani, Libya. Also from LROC is a shiny model of the Lunar Reconnaissance Orbiter (set to launch in May).

Brad Archer in the Robert S. Dietz Geology Museum loaned rock samples including vanadinite from Globe, Ariz.; olivine in basalt from Gila County, Ariz.; a type of geode called a “thunder egg” from Central Oregon; and azurite on malachite from Arizona.

After 12 trips to Antarctica, SESE has an Antarctica expert in its midst. On display from Professor **Ed Stump** is a 500-million-year-old specimen from Byrd Glacier, as well as a smooth ventifact, fossilized wood, and a pair of crampons (Antarctic-like spurs that allow geologists to walk on steep ice without falling. Stump will tell you they are “one of the tools of the trade for polar research.”)

Globes of Earth's moon and Mars sit close to models of a rover and a NASA shuttle. Arranged throughout the display are images from Mars, the Himalaya and Antarctica. Images of the Crab Nebula and exploding stars add bursts of color to the already vibrant display ... a display you don't want to miss.

## Alumni Spotlight:

### Dr. James D. Webster

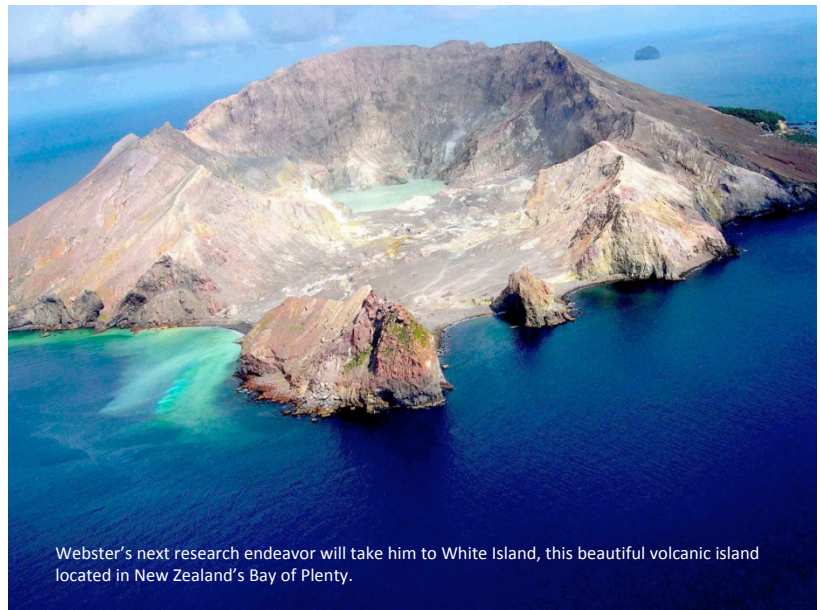
*Interesting research at some of the world's most beautiful locations ... it can't get much better for this SESE alumnus.*

Once a SESE Ph.D. student under John Holloway, Webster now teaches his own students at the Richard Gilder Graduate School at the American Museum of Natural History. His research focuses on how the volatiles water, fluorine, chlorine, sulfur, and carbon dioxide influence the formation of metallic ore deposits, and how these volatiles lead to volcanic eruptions. He is also interested in determining how ore deposits form via late-stage magmatic and mineralizing processes in ore metal-rich magmas.

Webster is presently working with colleagues at the Woods Hole Oceanographic Institution on experimentally prepared samples to better understand magmatic degassing,

the past 25,000 years. Webster also studies mineralizing processes in tin-bearing granite magmas of the Erzgebirge province, Germany, with collaborators in Potsdam, Germany.

With scientists from the University of Naples, he is examining volcanic rocks from Mt. Vesuvius, Italy, to better understand the behavior of volatiles in magmas that have erupted there during



Webster's next research endeavor will take him to White Island, this beautiful volcanic island located in New Zealand's Bay of Plenty.