

# EDUCATIONAL OUTREACH

## PUBLIC AFFAIRS AND EDUCATIONAL OUTREACH

### Educational Outreach Update

#### National Science Teachers Association (NSTA) Workshops on “Invisible Universe”

Have you ever wondered what 90 teachers in one room making waves on springs might look like? Stephen Pompea, Connie Walker, and Alan Gould (Lawrence Hall of Science) found out when they led two successful workshops on teaching about the electromagnetic spectrum at the March 2003 NSTA meeting in Philadelphia, PA.



*“Sine wave” demonstration.*

The workshops were sponsored by the Optical Society of America (OSA), which furnished optics kits and teacher guides to each participant. The workshop was based on Pompea and Gould’s recently published guide, “Invisible Universe, The Electromagnetic Spectrum from Radio Waves to Gamma Rays,” in the Great Explorations in Math and Science (GEMS) series. The two Philadelphia optics workshops, coupled with last year’s three



*NOAO-led workshops at NSTA were very popular.*

optics workshops at NSTA-San Diego (also sponsored by the OSA), have all been “standing-room only.” NOAO is currently offering a number of local workshops using the GEMS guide.

#### American Astronomical Society (AAS) and Chautauqua Workshops

At the AAS meeting in Seattle, a team led by Stephen Pompea (NOAO), Tim Slater (University of Arizona), and Katherine Garmany (Columbia University) led a three-hour workshop titled “Teaching Astronomy for the First Time: A Teaching Excellence Workshop for Graduate Students And Post-Docs.” The well-attended workshop introduced effective strategies for teaching astronomy, including activities on leading class discussions, writing effective exams, time-saving approaches, and techniques for a learner-centered astronomy classroom.

The workshop has been expanded into two National Science Foundation (NSF) Chautauqua short courses for college teachers: “Learner Centered Introductory Astronomy Teaching” was held May 18–20 at Columbia’s Biosphere 2 campus, and “Teaching Astronomy Under Hawaiian Skies” will be held July 14–16 at the University of Hawaii Institute for Astronomy in Honolulu. For more information, contact [spompea@noao.edu](mailto:spompea@noao.edu).

#### Southern Arizona GEMS Center

NOAO is a founding partner with the University of Arizona in the recently formed Southern Arizona GEMS Educational (SAGE) Center, which leads teacher professional development workshops and distributes the award-winning GEMS materials. On April 22–23, SAGE trained 25 teacher-leaders in a two-day workshop in Tucson, led by the University of California Berkeley Lawrence Hall of Science. These master teachers will conduct GEMS workshops around the state of Arizona this summer in a focused effort to promote inquiry-based science education.

#### Spanish Language Materials Center

The collection of the Spanish Language Astronomy Education Materials Center is growing by leaps and bounds. The Center has benefited greatly from the work of Maria Peña, an undergraduate astronomy student at the University of Arizona. Peña is working with Dr. Julieta Fierro, Professor of Astronomy at the Instituto de Astronomía, Universidad Nacional Autónoma de México (UNAM). Peña has compiled an extensive listing of astronomy education materials from UNAM and is working with librarians in both Tucson and Mexico to add to the list of materials. Several Tucson teachers from the ASTRO-Chile program are reviewing the materials collected by Peña. An annotated bibliography describing the materials has been created in English and Spanish and will be posted to the NOAO Web site in the next few months.

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## Public Affairs

### *Outreach Update continued*



This year's class of TLRBSE teachers is working hard toward their Tucson research visits this summer. The second edition of the TLRBSE Distance Learning course began in mid-January. The astronomy content in this year's course was reformulated in three problem-based activities centered on questions to be solved. This approach models the "best practices" pedagogy that we ask the teachers to use. The last two of the activity sets in this year's course were changed into group activities—another pedagogical improvement consistent with national education reforms.

Although the classwork is not complete yet, the level of teacher learning using the new approach seems to be improved over last year's group at this stage. This course is considered to be a national model for a successful, high-interactivity distance-learning course. In the first 12 weeks of the class, the 20 teachers in the TLRBSE cadre had made 22,438 hits on the site and wrote 1,111 postings. The TLRBSE class instructors made 7,246 hits and had 540 postings. With four weeks to go, the final numbers should be about 25 percent higher! The intense interactivity of the course encourages detailed dialogue about scientific and leadership topics, and helps the teachers prepare in-depth for their summer research experiences at Kitt Peak.

NOAO TLRBSE staff had a strong presence at the NSTA annual meeting in Philadelphia. They gave three TLRBSE-related workshops, each presenting an introductory problem from the three developed TLRBSE projects: the search for novae, active galactic nuclei, and sunspot evolution. Each of these interactive workshops, which were open to all NSTA participants, was completely full at the allotted 40 attendees.

NOAO education staff also completed the final draft version of a solar science education poster that resulted from a collaboration between the TLRBSE staff, led by Connie Walker, and astronomers at NSO Sacramento Peak. The poster is 3 × 6 feet and shows two weeks of solar images

in five different wavelengths. It is ideal for use in a science, research-oriented classroom, and copies will be distributed to the TLRBSE teachers that choose the solar research focus.



There have been an exceptional number of large star parties given recently by Project ASTRO-Tucson participants. For example, 150 students and parents attended a star party at Wakefield Middle School. The ASTRO teacher at this school

noted a marked increase in science class performance as a result of the Project ASTRO partnership efforts. New teachers are currently applying to enroll in the new program cadre beginning this fall.

NOAO's Family ASTRO-Tucson program, led by Connie Walker with assistance from Robert Wilson, is enjoying great success in its inaugural year. Family ASTRO event leaders from the Sunnyside and Baboquivri-Indian Oasis Unified School Districts have held eight successful events at their schools. On average, 10 families were in attendance at each event. "Race to the Planets" and "Night Sky Adventure" were the most popular themes. Eight more events, using the Moon Mission kit, are scheduled to take place by the end of the calendar year. Other events involving Family ASTRO this quarter included activities at the Math Engineering Science Achievement (MESA) Teacher Professional Development workshop, which also utilized a Star Lab portable planetarium. This inflatable planetarium is on long-term loan to the NOAO outreach group from the Flandrau Science Center, in return for NOAO's willingness to fulfill requests submitted to Flandrau for school programs.

#### **ASTRO-Chile**

ASTRO-Chile continues to expand its program with great enthusiasm in La Serena and Tucson. Plans are being formulated for a third and fourth video workshop on the new theme of light pollution, where each group would present results from a study by their students. Long-term plans are to link the two groups with international light pollution education efforts in Austria and Greece.



## REU/PIA Students at CTIO

*Alan B. Whiting*

The southern summer is over, and with it the CTIO 2003 student intern program. For ten weeks a group of five US and two Chilean undergraduates has been busy—in the computer room for the La Serena offices and at the mountain telescopes—learning how astronomy is done by doing it themselves. The US students belong to the Research Experiences for Undergraduates (REU) program, and the Chileans to the Prácticas de Investigación en Astronomía (PIA). Over the summer the two groups worked and lived together.

All the students took their turns observing with the 0.9-meter telescope in January, in support of several research projects involving variable stars and planetary nebulae. For most, it was their first exposure to the mechanics of observational astronomy, as well as to the brilliance of the southern sky.

Upon returning to sea level, they resumed work on their individual projects. Each was paired with an astronomer/mentor, who gave overall direction and helped with the mechanics of the process. But (to no one's surprise) the students quickly made themselves experts in various bits of software, helping each other and becoming less reliant on staff-supplied answers. Several also went on observing runs with their mentors at Cerro Tololo and elsewhere.

To take advantage of the increase in Gemini South and SOAR project astronomers in La Serena, the Cerro Tololo REU program was expanded this year. Gemini Fellow Bernadette Rodgers took time away from the demanding job of commissioning and supporting instruments to work with one of the students, becoming our first mentor from Gemini.

Breaking up their long sessions in the computer room were lectures on astronomy and astronomical instruments, as well as seminars led by CTIO staff on recent developments in the field.

A large part of the program is the experience (for the US students) of living in a foreign country and dealing with a foreign language. Here, the Chilean students were enormously helpful, giving invaluable cultural guidance. The group also organized trips to the Humboldt Penguin Sanctuary on the coast north of La Serena (for the unique view of penguins waddling among cacti) and a camping trip up the Elqui Valley. The camping trip featured naked-eye stargazing, a demonstration of native Chilean music (with pan-pipes and drums), and a traditional grape-stomping party with valley locals.



*The CTIO summer students visit Gemini South (part of the main mirror mount is visible behind them). From left to right: Ryan Peterson, Lara Pierpoint, Katherine Guenther, Rodrigo Fernández, Carey Borghi, Abner Zapata, and Rebecca Wilcox.*

The summer's work ended with oral presentations by each student to the La Serena staff (at least all that could fit into the crowded main conference room). The talks were of uniformly high quality, and featured graduate-level presentation and content. Those of the Chilean students were particularly noteworthy, displaying not only how much astronomy they had learned (and done), but how comfortable they had become with the English language.

Though the students have now returned to their homes, the 2003 REU/PIA program is not quite over. All will attend the January 2004 AAS meeting in Atlanta, where the US students will have the opportunity to play host to their Chilean counterparts, and present their work at poster sessions.

Carey Borghi (University of Wyoming), Rodrigo Fernandez (Universidad Católica, Santiago), Katherine Guenther (University of Texas), Ryan Peterson (Lawrence University), Lara Pierpoint (University of California, Los Angeles), Rebecca Wilcox (University of Washington), and Abner Zapata (Universidad de Concepción) have prepared Web pages outlining their projects and experiences, which can be found at [www.ctio.noao.edu/REU/ctioreu\\_2003/REU2003.html](http://www.ctio.noao.edu/REU/ctioreu_2003/REU2003.html).

I expect that you will be seeing more of these students at AAS meetings and in the journals for years to come.



### Ahoy, NOAO South!

*Elaine Mac-Auliffe*

An increasing number of cruise ships have continued to call in at Coquimbo (the port for La Serena) because it provides an interval in the route between the ports of Arica (at the northernmost tip of Chile) and Valparaiso (to the south). NOAO South is one of the favorite spots for these visitors, who are nearly all US citizens, so we try to accommodate as many of the tours as we possibly can. Passengers of such ships as the Royal Princess, Seven Seas Navigator, Seabourn Pride, Ryndam, and Norwegian Dream have visited us repeatedly.

*Passengers of the Royal Princess cruise ship by the Blanco 4-meter telescope, during their April 6 visit, with tour guides Ana Véliz and Kadur Flores.*



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#### Notable Quotes

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“If a gamma ray burst is the birth cry of a black hole, then the HETE satellite has just allowed us into the delivery room.”

—*Derek Fox of the California Institute of Technology, speaking on the view provided by NASA’s High-Energy Transient Explorer satellite of the death of a gigantic star and the possible birth of a black hole, quoted by Reuters, 19 March 2003*

“Ninety-six percent of the Universe is stuff that we’ve never seen.”

—*Michael Turner of the University of Chicago, quoted in a March 13 Nature magazine feature story on the cosmological implications of the latest measurements of the Cosmic Microwave Background by NASA’s Wilkinson Microwave Anisotropy Probe*

## Fun Educational Resources for Speakers

Ever thought you could enjoy one of the 50+ hours of fun, hands-on, science activities and activities designed just for you? You can! We've put them all in this list, accessible to you on page 27. Well, it's no help unless it's easier for you to find the resources that you need, so here are some tips to help you. Please see page 26 for help and then go to the Catalog Website at 1-800-848-8355 for more resources. Delivery not included.



### ☐ Lunar Phases w/Pictures (UAYF Activity A-1)

100 Sets of 6 Lunar Phases of different Lunar phases to put in chronological order

### ☐ Daily Motion of the Sun (UAYF Activity B-8)

20 Sun in a series of hemispheres

### ☐ Planet Picking (UAYF Activity C-9)

87 planet picking posters  
15 planet picking sheets

### ☐ Earth as a Peppercorn (UAYF Activity D-7 - Solar Sys Model)

1 1/2 sheets of  
1 PAM booklet  
1 laminated UAYF size comparison illustration

### ☐ Comet Making Supplies (UAYF Activity E-3)

50 sheets of 2x4s  
25 pairs of work gloves  
10 pairs of latex gloves  
10 wooden spoons  
10 plastic play knives

### ☐ Spectroscopy (Similar to UAYF Activity J-7)

6 spectroscopes  
35 diffraction gratings  
21 light crystals  
157 narrow pass filters

### ☐ Lunar Phases w/Moon Balls (UAYF Activity A-3)

100 sets of 30 Moon Balls complete with 30 Earth size sticks

### ☐ Venus Topography Boxes (UAYF Activity C-7)

14 topography boxes and 30 numbered Earth size sticks  
12 colored bamboo sticks  
10 1/2" high by 1 1/2" wide windows and 140 1/2" Earth diameter Venus surfaces

### ☐ Making Craters (UAYF Activity E-1)

12 rulers  
1 hammer  
18 foil pans  
100 1/2" diameter steel balls  
8 marachalls  
18 golf balls  
11 1/2" wide by 1 1/2" high paper plates  
20 marbles  
1 scale  
1 extra small steel ball  
2 small steel balls  
2 medium sized balls  
1 large steel ball  
1 extra large steel ball

cut along line



## Video Inventory

### General Astronomy

A History of the Universe from Creation to the Present  
The Universe: A Personal View

### Bill Nye Astronomer

Let's Learn Astronomy: Big Quiz  
Meeting the Universe: "We're Here"  
Meeting the Universe: Astronomy is Fun  
Looking into the Future: A Vision of the Future  
Encounter: NASA Announces Learning

### The Sun

Let's Learn Astronomy: The Magnificent Sun  
The Active Sun  
Let's Learn the Sun: Solar Windes & Solar Interactions: Program 1  
Solar Flare

### The Outer Cosmos

EQ: NASA: Big O  
Passport to Knowledge: Live from a Blackhole: Program 1

### Comets, Asteroids, Planets

Comet Odyssey  
Key to Life: Comets, Our Story - NASA  
Highlights of Planets  
Discovering Asteroid



### Telescopes, Instruments, and Observers

Comet North Observation & First Images  
Stargazing Peak: 50 Years  
Eyes on the Skies: Making the FBI Mirror  
The Observations: Understanding the World of Science