



NOAO Educational Outreach

Project ASTRO Workshop Number Five

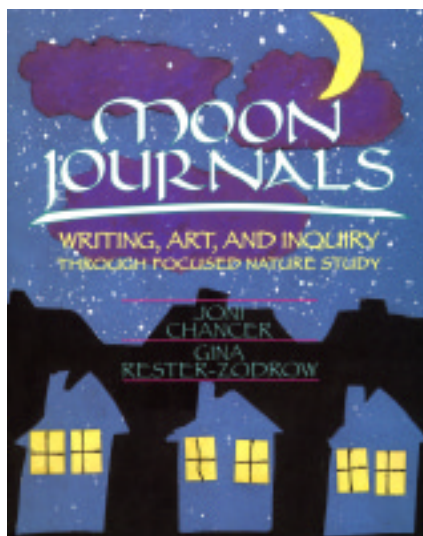
Ginny Beal



Project ASTRO is a program that pairs professional and amateur astronomers with educators throughout the country to enhance astronomy education and increase students' interest in science. Led by NOAO, the Project ASTRO–Tucson site hosted its fifth annual workshop October 13–14 at the Kitt Peak Visitor Center and the NOAO downtown offices. This year's workshop was partially funded by a NASA IDEAS grant titled "Did You See the Moon Last Night?—Scientific Inquiry through Writing, Art, and Observation."

Twenty-two teachers were paired with seventeen astronomers to form partnerships and teams. Most participants were from the Tucson area, but some traveled from the Tohono O'odham Nation, Casa Grande, Safford, Phoenix, and Russellville, Arkansas. Workshop presenters included authors Joni Chancer and Gina Rester-Zodrow (*Moon Journals: Writing, Art, and Inquiry through Focused Nature Study*), Dr. Robert Strom from the UA Lunar and Planetary Lab, Tohono O'odham Storyteller Daniel Lopez, and local educators Larry Dunlap, Michael Crawley, and Renee Crawley.

The Friday evening session at the Kitt Peak Visitor Center 16" telescope was hosted by Adam Block and Richard Barchfield, observers with the Nightly Observing Program (NOP). Unlike typical astronomer visitors, Project ASTRO participants were delighted by the rising full moon, and awed by observations they could make using telescopes, binoculars, and the naked eye. The Visitor Center NOP observers and Project ASTRO



The goals of this year's Project ASTRO–Tucson workshop are to extend concepts from the book *Moon Journals: Writing, Art, and Inquiry through Focused Nature Study* into the area of authentic scientific inquiry and to have teachers work in collaboration with trained astronomers to assist with student investigations of the Moon.

astronomers served as knowledgeable resources, and the exchange of astronomy facts was beneficial to all.

Project ASTRO National Network

In November 2000, Project ASTRO–Tucson will complete its term as first Project ASTRO National Network chair to the group of eleven expansion sites around the country. As members of the National Network Publicity Committee, Tucson staff will produce brochures and an exhibit to promote the group at the AAS/AAPT meeting in San Diego, January 7–11, 2001. Several Project ASTRO sites, including Tucson, will present poster papers at the meeting as well.



Public Presentation of NOAO Images and Science

Doug Isbell and Mark Newhouse

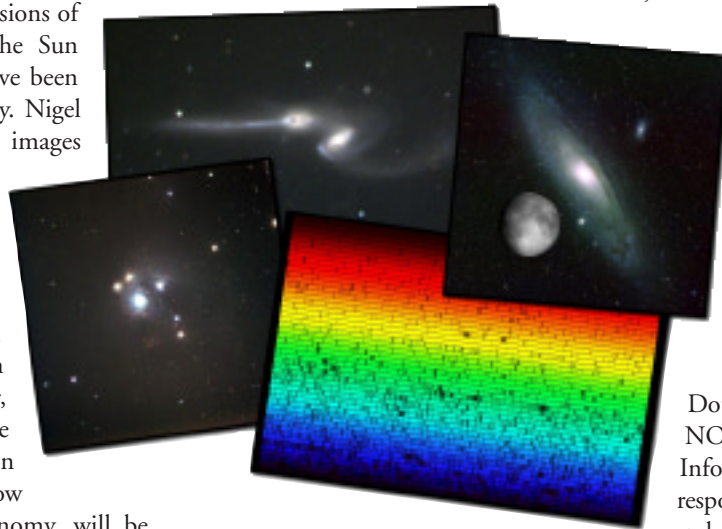
Images

NOAO maintains a library of astronomical images obtained with NOAO facilities. New additions to the NOAO Image Gallery, shown here, are available for downloading over the WWW at a variety of resolutions from the NOAO Image Gallery: <http://www.noao.edu/image-gallery/>.

- High resolution versions of the spectrum of the Sun and of Arcturus have been added to the gallery. Nigel Sharp created the images from digital atlases observed with the Fourier Transform Spectrometer at the McMath-Pierce Solar Facility on Kitt Peak. An educational poster, which uses these spectra to explain spectroscopy and how it is used in astronomy, will be available at the NOAO exhibit at the January AAS meeting in San Diego.
- An image of our Moon, superimposed at the correct scale on an image of the Andromeda Galaxy (M31), demonstrates the impressive size of M31 in the night sky.
- The NSF-funded Research Experiences for Undergraduates (REU) program at KPNO produced an

image of NGC 4676, which is also known as The Mice because of the long tails of stars caused by the interaction of the two galaxies that make up this system.

- The star-forming region NGC 7129 was also imaged during the REU 2000 program at Kitt Peak National Observatory. Herbig Haro 103 can be seen in the image as well.



Four new images have been added to the NOAO Image Library. Clockwise from top: NGC 4676, The Mice; M31 and the Moon; McMath-Pierce FTS Colorized Spectrum; NGC 7129.

The addition of Doug Isbell (see below) as NOAO's science writer helps our efforts to make the science facilitated by NOAO more accessible to the public.

Building on the foundation laid by Research Experiences for Teachers (RET) participants Cindy Weehler and Stan Hart, a number of Current Science articles, written at a public level, have been posted to the web site at <http://www.noao.edu/outreach/current/>. The most recent articles include links to additional information and, in some cases, links to classroom resources for teachers.

Media

Doug Isbell has joined NOAO as its new Public Information Officer and is responsible for media activities and supporting materials, and related functions like public inquiries. Doug will also be doing some general science writing for the NOAO Web pages and other outlets. He comes to Tucson from NASA Headquarters in Washington, where he managed diverse public affairs campaigns for planetary missions including the Mars Pathfinder and Galileo, along with international news events involving the Hubble Space Telescope, Compton Gamma Ray

Web Pages

Work has begun on a redesign of the NOAO Web site. A preview of the new look can be seen by visiting the US Gemini Program pages at <http://www.noao.edu/usgpl/>.

continued



Public Presentation continued

Observatory, and many others. Please let him know well in advance of publication or posting when you have interesting science results, exciting imagery, or other news that you would like people to hear about. Contact Doug at (520) 318-8214 or disbell@noao.edu.

Gemini North released its first scientific data on October 16—announced via a news release and an electronic image of the Galactic Center—which highlighted a bow-shock produced by a star as it plows through a gas cloud located just three light-years from the core. (See the Highlights section of this issue.) In the first few days, the release was reported by several news

organizations, including the BBC, MSNBC.com, *Florida Today's* Space Today home page, space.com, and astronomy.com, and was featured as the “Astronomy Picture of the Day.” The event received strong local media coverage in Hawaii and on TV outlets such as the BBC and Discovery Channel Canada.

In addition, an image of the Gemini North observatory made the cover of *TIME For Kids*, which has a circulation of more than three million.

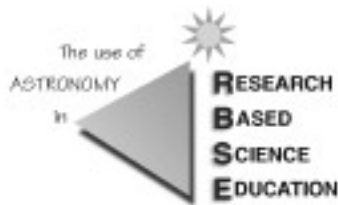
NOAO issued a news release in mid-November focused on an *Astrophysical Journal* paper by Debra Burris and NOAO researchers Caty Pilachowski

and Taft Armandroff concerning a more precise time line for epochs of early star formation in the Milky Way, based on a census of nearby, ancient halo stars (for a summary, see the Highlights section of this issue).

The Hubble Heritage Program archive release for November was an HST image of the galaxy collision in NGC 6745, taken under the guidance of Roger Lynds of NOAO/KPNO. Media coverage of this image included Page One of the *Tucson Citizen*, the *Arizona Daily Star*, CNN.com, and the “Astronomy Picture of the Day.”

The RBSE Program Continues to Shine

Travis A. Rector



The NOAO Teacher Enhancement Program, *The Use of Astronomy in Research-Based Science Education (RBSE)*, consists of a four-week summer workshop for middle school and high school teachers who are interested in incorporating astronomy research within their science classes. RBSE extends the experience to the classroom with materials, data sets, support, and mentors during the academic year.

Sixteen middle school and high school science teachers from across the country came to Tucson to participate in this year’s RBSE summer workshop. The teachers learned the astronomy content, image processing and data analysis techniques, and research education pedagogy necessary to implement the RBSE research programs in their classroom.

The RBSE research projects are real research programs led by NOAO scientists using data taken with Kitt Peak facilities. Currently, there are three projects: One involves using full-disk solar images taken

daily with the Kitt Peak Vacuum Telescope. In this project, students are searching for a connection between the lifetime of sunspots and their physical parameters: area, flux, latitude, and rotation rate. Students are also “blinking” multiple-epoch images of the Local Group galaxies M31, M33, and NGC 6822 from the KPNO 0.9-m and 2.1-m telescopes to search for novae. The long-term goal is to accurately determine the nova rate for these galaxies. Finally, students are studying optical spectra of objects in the FIRST and ROSAT-Green Bank Surveys to determine their identity, to search for quasars

and radio galaxies, and perhaps to discover something altogether unexpected.

RBSE continues to enjoy a high level of visibility with professional astronomers and the media. This year’s workshop was featured in articles in the *Arizona Daily Star* and the *Christian Science Monitor*. Astronomer mentors were found for all 16 teachers participating in this year’s program; we extend our appreciation to the following individuals for their participation:

continued



RBSE 2000 Teachers and Mentors

TEACHER	SCHOOL	LOCATION	MENTOR	INSTITUTION
Linda Stefaniak	Allentown High School	Allentown, NJ	Tad Pryor	Rutgers University
Richard Spitzer	Round Valley High School	Springerville, AZ	Travis Rector	NOAO
Margaret Holzer	Chatham High School	Chatham, NJ	Dale Gary	New Jersey Institute of Technology
Jim Hoffman	Franklin Central High School	Indianapolis, IN	Brian Murphy	Butler University
Theresa Roelofsen	Bassick High School	Bridgeport, CT	Eric Rubenstein	Yale University
Scott Tracy	Ellington High School	Ellington, CT	Bill Herbst	Wesleyan University
Helen Peyton	St. Bernard School	Omaha, NE	Tom Gehringer	Harry A. Burke High School
Walter Glogowski	Ridgewood High School	Norridge, IL	Bernhard Beck-Winchatz	DePaul University
			James T. Lauroesch	Northwestern University
Kate Meredith	Sturgeon Bay High School	Sturgeon Bay, WI	Robert Allen	University of Wisconsin
Melynda Thomas	Morrilton Junior High School	Morrilton, AR	Jeff Robertson	Arkansas Tech University
Andy Miller	Cummings Middle School	Brownsville, TX	Mario Diaz	University of Texas
Amy Stoyles	King Middle School	Bradenton, FL	Reggie L. Hudson	Eckerd College
Kaye Sullivan	Staples High School	Westport, CT	David Goldberg	Yale University
Edward Roberts	Pottsville High School	Pottsville, AR	Jeff Robertson	Arkansas Tech University
Carl Katsu	Fairfield High School	Fairfield, PA	Larry Marschall	Gettysburg College
Robert Groover	Bordentown Regional High School	Bordentown, NJ	Michael Strauss	Princeton University

This workshop was the last to be supported on the current RBSE grant. Our funding for RBSE will be completed in the spring of 2001. However, we have submitted a proposal to the NSF ESIE Teacher Retention and Renewal program to reach larger numbers of teachers and to support

more novice teachers in their efforts to integrate research and inquiry into their classrooms. The program will also address the high attrition rate among science teachers, especially those beginning their teaching careers.

For more information regarding the RBSE program, please contact either Suzanne Jacoby (sjacoby@noao.edu) or Travis Rector (rector@noao.edu).

The 2000 and 2001 REU Programs at Kitt Peak National Observatory

Buell Jannuzi and Kenneth Mighell



Every summer KPNO is fortunate to have a group of talented university students come to Tucson to participate in astronomical research under the sponsorship of the National Science Foundation's Research Experiences for Undergraduates (REU) Program. The program provides an exceptional opportunity for undergraduates considering a career in science to engage in substantive research activities with scientists working in the forefront of contemporary astrophysics. Each REU student is hired as a full-time research assistant to work with a KPNO staff member on specific aspects of major on-going research projects. As part of their research activities, REU students gain experience with KPNO's telescopes and develop expertise in astronomical data reduction and analysis.

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We anticipate being able to support six REU positions during the summer of 2001. As required by the NSF, student participants must be citizens or permanent residents of the United States. The positions are full-time for 10 to 12 weeks between May and September, with a preferred starting date no later than early June. A salary of \$355 per week and funds to cover travel to and from Tucson are provided. Completed applications (including basic applicant information, official transcripts, and letters of recommendation) must be submitted to KPNO no later than 22 January 2001. Additional information and application forms are available from <http://www.noao.edu/kpno/reu>.

During the summer of 2000, eight students participated in the KPNO

REU program and worked on a diverse range of topics. They also took part in a weekly lecture series, observing runs using telescopes on Kitt Peak, and a “field trip” to both NRAO’s VLA and NSO’s Sacramento Peak Observatory.

At the end of the summer, the students shared their results with the Tucson astronomical community through oral presentations describing their research. Most of these students will be attending the January 2001 AAS meeting in San Diego as part of the REU program (thanks to the NSF), and we encourage you to stop by their posters or attend their talks.

Their end-of-summer presentation titles (which may change by the time of the AAS meeting) and advisors are listed below:



The summer of 2000 saw eight undergraduates come to Tucson as participants in the KPNO REU program. Shown are (left to right) Abigail Hedden (Carleton), Christopher Greer (Northwestern), Heather Groch (Brown), Michael Cooper (Grinnell), Veronica Ponce (Virginia), Karin Sandstrom (Harvard), Stuartt Corder (Kansas), and Kimberly Mach (Beloit).

Michael Cooper (Grinnell):

*Star Counts in the Deep Wide-Field Survey:
The Galaxy at Faint Magnitudes*
Joan Najita

Stuartt Corder (Kansas):

Stellar Populations Near the Nucleus of M33
Kenneth Mighell

Christopher Greer (Northwestern):

*Evolution of Elliptical Galaxies in the Deep
Wide-Field Survey*
Arjun Dey

Heather Groch (Brown):

*Mosaic Image Reductions for the Deep Wide-
Field Survey*
Buell Jannuzi

Abigail Hedden (Carleton):

Infrared Observations of the Red Rectangle
Kenneth Hinkle and Dick Joyce

Kimberly Mach (Beloit):

*Investigations into the Dust Atmosphere of
2060 Chiron*
Nalin Samarasinha

Veronica Ponce (Virginia)

Variable Stars
Nigel Sharp

Karin Sandstrom (Harvard)

Metallicity of RR Lyrae Stars in M3
Caty Pilachowski and Abi Saha

How to Contact Educational Outreach

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