



NOAO and the Tohono O'odham Nation "Reach for the Stars" Together

Katy Garmany

"Reach for the stars!" This expression can mean many different things to different people. For students at Indian Oasis-Baboquivari School District on the Tohono O'odham Nation, it is the name of a program initiated by the district last summer to encourage them to do their best in school.

The schools on the Nation face many challenges. One basic issue their leaders want to address is student attendance. This year, the district decided to offer incentives to students from kindergarten through high school for good attendance, including weekly prizes, field trips, and other rewards. These incentives will culminate with grand prizes at the end of the year: a pick-up truck (donated to the high school by the local auto dealer), a laptop for the middle school, and a bike for the elementary school.



These 5th grade students wondered how astronomers measure distances to galaxies.

Kitt Peak National Observatory was asked to participate in "Reach for the Stars" as a major partner. Kitt Peak Director Buell Jannuzi and NOAO Director Todd Boroson readily agreed to help, both financially and through staff time. The school district was eager to offer a field trip to Kitt Peak for students with the best attendance so far. Thus, in October, we hosted a series of three evening visits to give students the chance to observe through the 20-inch telescope at the Visitor Center, learn how to use a planisphere, and experience the wonderfully dark skies atop Kitt Peak.

Many of the students had never been to Kitt Peak beyond the picnic grounds. A number of enthusiastic parents came along as well. Happily, all three nights were clear—the cloudy night back-up plan involved visits to various domes and hands-on activities. We were very pleased at the positive response to this program from the visiting astronomers at the major telescopes.



Students from Baboquivari Middle School enjoy sunset.

Kitt Peak Observatory later received a two-page letter from a 5th grade student, who ended by writing, "I loved the trip to Kitt Peak. I learned a lot and I would recommend that kids come to school every day and maybe they could go to Kitt Peak too." Kitt Peak's support of the program was also noted on page one of a story in [The Runner](#) newspaper, the primary source of general news on the Nation.

The school district is honoring the best students at the monthly Board of Education meeting in Sells. They requested that Kitt Peak print some posters with pictures of the eight major planets. Large posters designed and printed by NOAO public affairs now hang in the Board Room to remind everyone of the program. Among the prizes to be awarded at the board meeting will be binoculars and other items with an astronomical theme.

Fostering Optics Education Around the World

NOAO Manager of Science Education Stephen Pompea gave two invited papers in October at the International Workshop on Science Education in School in Bucharest, Romania. Pompea is the director of the Hands-On Optics project that recently completed its NSF Informal Science Education funding and is now a core outreach program at NOAO. He was also part of an international team of judges who evaluated school science fair projects on polarization, spectroscopy, and astronomy, including this project (photo) by younger students on light and shadows, which won an award. The conference and science fair were sponsored by the Center for Science Education and Training at the Romanian National Institute of Laser, Plasma, and Radiation Physics; the European "Hands-on Science" Network; and SPIE-the International Society for Optical Engineering. The trip followed upon several presentations by NOAO outreach staff members in Athens, Greece, at the Communicating Astronomy with the Public 2007 meeting, sponsored by the International Astronomical Union.



GLOBE at Night: Plans for 2008 and Look Ahead to IYA 2009

Constance E. Walker, Douglas Isbell & Stephen M. Pompea

The ongoing loss of a dark night sky as a natural resource is a serious and growing issue for much of the world's population. It impacts not only astronomical research, but also human health, ecology, safety, security, economics and energy conservation. Dark-skies education efforts aim to heighten awareness of light pollution as a global problem with a local solution.

These efforts have proven to be most effective when they get people physically involved. For example, "star hunts" or "star counts" provide people with a fun, fast and no-frills way to acquire heightened awareness about light pollution through firsthand observations of the night sky. Over the past two years, the GLOBE at Night program led by NOAO educational outreach staff has enabled thousands of citizen-scientists around the world to contribute measurements of their local sky brightness to a growing global database in two ways: simple unaided-eye observations that anyone can do and quantitative digital measurements through a handheld, well-calibrated sky-brightness meter. The dates for GLOBE at Night 2008 are February 25-March 8.

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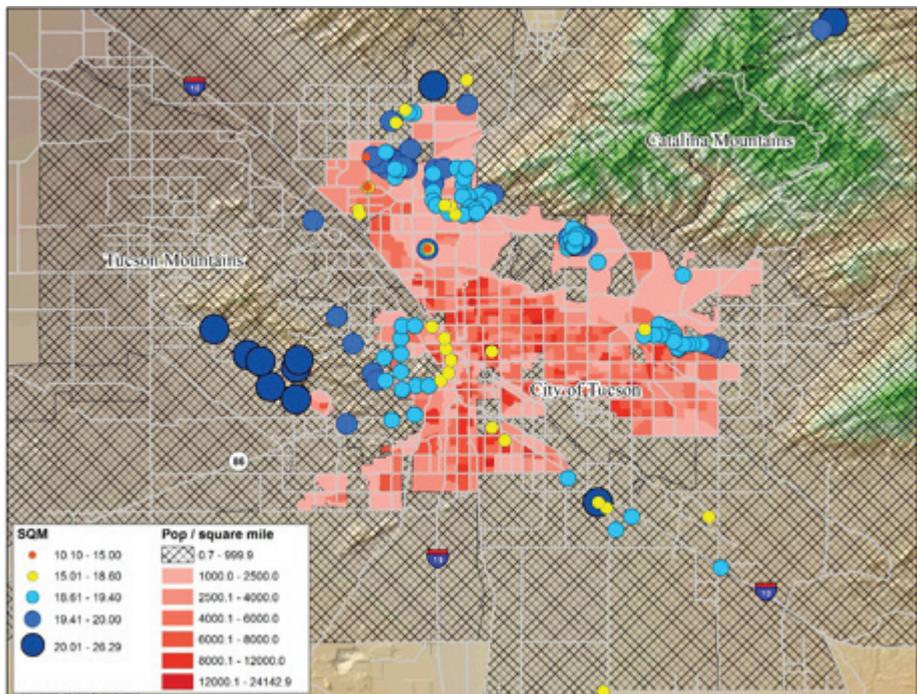


Figure 1: GLOBE at Night 2007 data from Tucson compared to a population density map.

GLOBE at Night continued

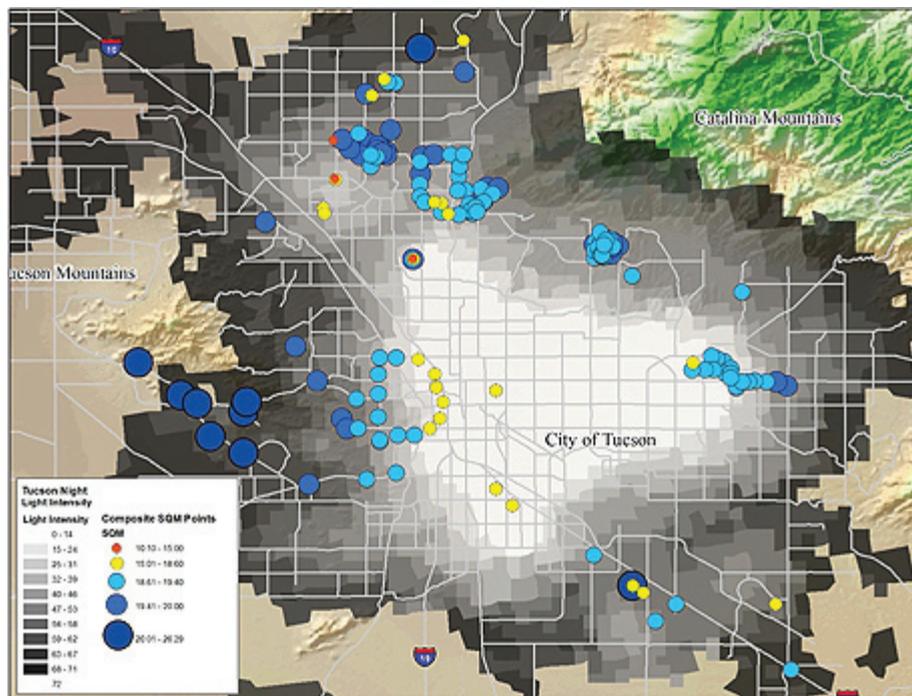


Figure 2: GLOBE at Night 2007 data from Tucson compared to the intensity of local nighttime lighting using satellite imagery.

The success of GLOBE at Night and related public outreach efforts has prompted dark-skies awareness to be named one of the cornerstone projects of the International Year of Astronomy (IYA) 2009, which is being planned now by the International Astronomical Union (IAU) and a network of nearly 100 individual country contacts. Connie Walker of the NOAO educational outreach group is leading both the international dark-skies task group and the related US IYA 2009 working group. Malcolm Smith of the CTIO scientific staff (and director of the related IAU commission) is an active contributor.

Past star-count programs have originated in Greece, Austria, Canada, the International Dark-Sky Association and a pilot program between NOAO North in Tucson and NOAO South in La Serena, Chile, among others. GLOBE at Night benefited greatly from the experience gained by these efforts, and has built upon them by adding digital data to the mix.

More than 18,000 people contributed 4,600 observations from 96 countries in the first GLOBE at Night campaign in March 2006. Citizen-scientists recorded the brightness of the night sky by matching its appearance

toward the constellation Orion with one of seven stellar maps of different limiting magnitude. They submitted the measurements to a Web site developed by a team that included the GLOBE program, Windows to the Universe, ESRI, and NOAO. Participation increased to 8,500 observations from 60 countries during GLOBE at Night 2007. This expanded the success of the inaugural campaign in 2006 by adding an effort to obtain precise measurements of the brightness of urban dark skies toward zenith using digital sky-quality meters (SQMs).

The digital GLOBE at Night program was made possible by a small grant from the NSF, which funded the purchase and distribution of 135 low-cost, handheld, well-calibrated SQMs manufactured by Uniuhedron. The SQMs and supporting light pollution teaching kits developed by NOAO were distributed to citizen-scientists in 21 US states plus Washington, DC, and in five countries, including Chile.

About 1,000 measurements were reported. Initial results from 2007 show very good consistency, with obvious gradients in brightness from city center to known dark areas. Lots of creativity was demonstrated in the way measurements were made, such as

via an automobile Moon roof augmented by the GPS unit in the car. The citizen-scientists taking the data included teachers, their students, astronomers at local and national observatories, International Dark-Sky Association (IDA) members, staff from 19 science centers, members of advocacy groups and guide staff at the national parks.

As a sample illustration of the results, the SQM data for Tucson is plotted against population density in figure 1 and against the intensity of nighttime lights in figure 2. There is high correlation between the values of the SQM measurements and those for population density and the intensity of nighttime lights. The higher the population density or intensity of nighttime lights, the brighter the SQM reading.

We will continue to build on the existing infrastructure of local coordinators and participants in GLOBE at Night to create a similar, but extended, US-based classic and digital program in 2008. The program will include greater collaboration with the IDA (www.darksky.org) and a local SQM-related citizen-science program called Night Vision (www.nightwise.org/nightvision.htm). Participants will be offered the opportunity to continue SQM measurements year-round.

NOAO and the GLOBE Program in Boulder, Colorado, are developing plans for more extensive SQM-related Web pages linked to the main GLOBE at Night site that will allow one to compare classic observations and digital measurements (discussing the importance of both) and show how to make an SQM measurement with the template provided. It will also provide a selection of different types of SQM measurement programs, such as grid surveys of your town on one night (repeatable every month), seasonal surveys, hourly surveys over a night at one or more locations, or surveys of eight cardinal directions along the horizon (concurrent with regular SQM measurements).

Analysis of the maps will include a comparison with other data sets such as last year's SQM data set, the limiting-magnitude unaided-eye observations, population density, regional environmental concerns (e.g., sea turtles in Florida), and satellite data on nighttime lights (a top-view looking down versus the bottom-up view from Earth via GLOBE at Night).

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GLOBE at Night continued

The outcome of the 2008 campaign will provide the basis for a quantitative global effort in 2009 as one of the major IYA 2009 cornerstone programs. We also plan to connect with the many “lights out” events that are emerging around the world, including the one being planned for the United States on March 29, 2008 (see www.lightsoutamerica.org).

The US IYA dark-skies working group has come up with several related ideas that may extend to the global cornerstone project. The ideas include establishing dark-sky teaching sites, astronomy nights in national parks, news articles and podcasts, public service announcements, art contests, a “world series” competition for adults and kids to iden-

tify objects in the sky (the darker the sky, the more objects), and the many sidewalk astronomy events and cultural storytelling activities being planned.

For more information, see www.globe.gov/globeatnight/ and www.astronomy2009.us or contact Connie Walker at cwalker@noao.edu. 

Students Needed for the 2008 REU Program at Kitt Peak

Kenneth Mighell



Each summer, a group of talented college students comes to Tucson to participate in astronomical research at Kitt Peak National Observatory (KPNO) under the sponsorship of the National Science Foundation's Research Experiences for Undergraduates (REU) program. Like the parallel program at Cerro Tololo, the KPNO REU 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 one or more staff members on specific aspects of major ongoing research projects at NOAO. These undergraduates gain observational experience with KPNO telescopes, and develop expertise in astronomical data reduction and analysis as part of their research activities. They also take part in a weekly lecture series and a field trip to New Mexico to visit the National Solar Observatory at Sacramento Peak and the Very Large Array in Socorro.

At the end of the summer, the students share their results with the Tucson astronomical community in oral presentations. As part of their internship experience, all six of our 2007 REU participants will present posters describing their astronomical research projects at the January 2008 American Astronomical Society meeting in Austin, Texas.

We anticipate being able to support six REU positions during the summer of 2008. Student participants must be citizens or permanent residents of the United States to meet NSF requirements.

The KPNO REU positions are full-time for 10-12 weeks between June and September, with a preferred starting date of early June. The salary is \$600 per week, with additional funds provided to cover travel to and from Tucson. Further information about the KPNO REU 2008 program, including the online application form, can be found at www.noao.edu/kpno/reu. Completed applications (including official transcripts, and at least two letters of recommendation) must be submitted to KPNO no later than Wednesday, 30 January 2008.



Kitt Peak National Observatory 2007 REU students.