GLOBE at Night 2008 and Earth Hour Results
a Solid Step Toward IYA 2009

Connie Walker & Douglas Isbell

The international star-hunting activity known as GLOBE at Night inspired 6,838 measurements of night-sky brightness by citizen scientists around the world, including 660 digital measurements using handheld sky-quality meters.

The third edition of GLOBE at Night was held from February 25 to March 8, with assistance from the educational outreach networks of the Astronomical Society of the Pacific (ASP) to help spread the campaign to amateur astronomers and science centers.

The 2008 campaign received measurements from 62 countries, surpassing last year’s total of 60 countries. Just over 4,800 of the measurements came from the United States (with 48 states and the District of Columbia reporting at least one measurement). Observers in Hungary submitted the most measurements (380) from outside the US, followed by Romania, the Czech Republic, Costa Rica, and Spain, all with over 100 observations; Canada was next largest, with 95 measurements reported.

A representative world map of GLOBE at Night 2008 observations is available at www.noao.edu/outreach/press/pr08/pr0805.html. See the related story in this Newsletter section on a GLOBE at Night 2008 measurement campaign in northern Chile.

These basic numbers fall roughly midway between the 2007 and 2006 results from GLOBE at Night, which may result from several factors. While we have just begun to analyze the data, we have strong anecdotal evidence from our citizen-scientist network in North America that they experienced abnormally cloudy skies this year. The timing of the March new Moon this year—which is required to give everyone sufficiently dark skies to properly observe the constellation Orion—also fell further into summer vacation for our partners in Chile and some other Southern Hemisphere countries, which made it more difficult to attract large numbers of students.

The classic GLOBE at Night program directs students, families, and the general public how to observe and record the number of stars visible in the constellation Orion, as seen from different locations. Observers report their results online by comparing their view of Orion with a set of template images on the program’s Web site, which shows the number of stars in the constellation for a range of visibilities from bright skies to very dark.

The digital version of GLOBE at Night takes advantage of low-cost digital sky-quality meters manufactured by Unihedron of Ontario, Canada, which can make a highly repeatable direct measurement of integrated sky brightness.

Both the “classic” GLOBE at Night exercise that anyone can have fun doing with their unaided eyes, and the digital effort will be conducted again in March 2009, as one of several start-hunting efforts connected to the “dark-skies awareness” cornerstone program of the International Year of Astronomy (IYA) 2009.

Next year, GLOBE at Night will occur in the latter half of March 2009. These dates should provide better conditions for schools in the Southern Hemisphere, and will likely coincide with Earth Hour 2009 on March 28.

The World Wildlife Fund (WWF), which organized and coordinated the inaugural global version of Earth Hour on Saturday evening, March 29, 2008, reported that an estimated 36 million Americans took part in this effort to turn off lights for one hour as a way to reduce energy waste and related carbon emissions. According to a survey by Zogby International, approximately 16 percent of the US adult population reported taking part in Earth Hour, and 78 percent were aware of the event, which took place globally in more than 400 cities in 35 countries across all seven continents.

Beyond the four official US flagship cities of Atlanta, Chicago, Phoenix and San Francisco, WWF estimates that more than 100 cities and towns across the nation took part in the event, including Tucson. Iconic landmarks in the US going dark included the Golden Gate Bridge, Sears Tower, Empire State Building, Coca-Cola billboard in Times Square, Bank of America Plaza (Atlanta), US Airways Arena (Phoenix), Alcatraz and others turned off their lights to symbolize the need to take action on climate change.

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**GLOBE at Night 2008 and Earth Hour continued**

There were indications from data taken before, during and after the event by the new all-sky camera at Kitt Peak National Observatory that the event demonstrated a positive impact on dark skies toward Phoenix. The same camera also appears to show that regular lighting curfews in Tucson have a measurable impact in maintaining dark skies in southern Arizona.

A first look at results from GLOBE at Night 2008 was presented by project leaders who attended the March 2008 meeting of the National Science Teachers Association in Boston. More detailed analysis of the GLOBE at Night 2008 data will be presented at the May 31-June 4 annual meeting of the Astronomical Society of the Pacific in St. Louis, to be held jointly with the American Astronomical Society. The meeting’s primary focus is national and regional training and planning related to IYA 2009. See [www.astrology.org/events/meeting.html](http://www.astrology.org/events/meeting.html) for more details.

For more information and access to the data sets, see the program’s Web page at [www.globe.gov/globeatnight](http://www.globe.gov/globeatnight), or contact globeatnight@globe.gov or outreach@noao.edu.


GLOBE at Night is a collaboration among NOAO, the Centro de Apoyo a la Didáctica de la Astronomía (CADIAS) in Chile funded by NOAO and the Gemini Observatory (see related article), the Global Learning and Observations to Benefit the Environment (GLOBE) Program, Boulder, CO; Environmental Systems Research Institute, Inc. (ESRI); and the International Dark-Sky Association (IDA).

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**A GLOBE at Night 2008 Campaign Around Cerro Tololo**

*David Orellana, Daniel Munizaga & Michael Warner*

During the GLOBE at Night 2008 campaign, two of us from Centro de Apoyo a la Didáctica de la Astronomía took a set of measurements of the night-sky brightness in the region around Cerro Tololo with a pair of Unihedron sky-quality meters (SQMs), supplied via the NOAO Public Affairs and Educational Outreach office in Tucson. Our SQM readings were taken at 46 points distributed around Cerro Tololo, spaced mainly along valley roads at roughly 10-kilometer intervals.

The aim of this pilot study was to define a model for making, summarizing, and distributing a baseline dataset of simple, yet reasonably reliable, electronic SQM measurements to compare with naked-eye observations being made in the region at night by the general public. Ultimately, this will contribute to integrating the educational community into the study of the heritage of the night sky, and the relation of humankind with the environment, by means of an integrated set of observational activities consistent with the local high-school curriculum.

We also hope to support public policy efforts to inform local, regional and national authorities about the impacts of the application of the Chilean DS686 “norma luminica” lighting regulations. These regulations are designed to govern the development, preservation and future sustainability of the environmental heritage of the skies over the Coquimbo (IVth) Región of Chile.

The measurements were made between March 3–6, using two SQMs selected from a set of seven SQMs calibrated on February 29. These measurements were taken in public places along access roads to communities in the Elqui and Limari valleys.

Using one GPS, two SQMs, a watch, flashlight and data table, the measurements were taken starting one hour after sunset (after 10 pm) until 3:30 am the following morning. The measurement routine was continued.
**GLOBE at Night 2008 Campaign Around Cerro Tololo continued**

to note the time, coordinates, and altitude with the GPS, and readings with the two SQMs simultaneously – avoiding, where possible, the light from street lamps (this was not possible in the central squares). The main sector incorporated the 65 kilometers around Cerro Tololo Inter-American Observatory (see figure 1).

These data were first transferred to an Excel spreadsheet. A simple Comma Separated Values (.cvs) archive was created containing three columns of decimal numbers: latitude, longitude, and SQM reading. The .cvs archive was then converted into a GPS Exchange Program (.gpx) archive using the freeware application GPSBabel. The .gpx archive could then be loaded directly into Google Earth, enabling the creation of figure 2.

In order to obtain a uniform grid in meters, the decimal coordinates were converted into Universal Transverse Mercator (UTM) coordinates using the Mapsource application for Garmin GPS. These were then used by the Matlab program, which extrapolates the sparse 3D measurements into a uniform 100x100 grid as shown in figure 3. For SQM magnitude readings below 20, a gain of 1/10 was applied; for example, an SQM reading of 15 is displayed with a value of 19.5 = 20-(20-15)/10. Such bright readings were often affected by street lamps in the field of view of the SQMs and would have distorted the 3D grid.

We judge this first data-collection experience to be quite successful, and we look forward to adding to our baseline measurements over the next several years, as we share our results with local schools and government agencies.

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**New Exhibit on Telescope Mirror Technology**

Thanks to expert design work by a Kitt Peak Visitor Center docent and key contributions from the Steward Observatory Mirror Laboratory, a completely revised exhibit on large telescope mirrors has been installed at the visitor center.

The attractive exhibit includes information on the Large Synoptic Survey Telescope and both Giant Segmented Mirror Telescope projects, as well as an actual mirror-mold core, related hardware, and a one-tenth scale model of the WIYN 3.5-meter mirror provided by the Steward mirror lab. The finished exhibit represents collaborative efforts of the NOAO Photo/Imaging department and public outreach staff, members of LSST Corporation, and Kitt Peak maintenance staff, all acting upon the inspired vision of visitor center volunteer docent Barclay Ward, a retired professional exhibit developer. Stop by the Kitt Peak Visitor Center during your next trip to the mountain to see how this exhibit contributes to a more insightful experience for our public guests.
High Fire for LSST

Suzanne H. Jacoby (LSST Corporation)

The combined primary/tertiary mirror for the Large Synoptic Survey Telescope (LSST) experienced a successful “high fire” over the weekend of 28-29 March 2008 at the University of Arizona (UA) Steward Observatory Mirror Lab (SOML). After reaching a peak temperature of approximately 1165 ºC (2125 ºF) in a flawless casting, the LSST mirror will now anneal and cool gradually to room temperature over the following 100 days in the slowly rotating mirror lab oven.

In mid-August, the cooled mirror blank and cores (which together weigh 85,000 pounds) will be lifted from the furnace and turned on end so the cores can be removed. A total 16,000 pounds of glass will be removed from the faceplate and backplate of the mirror during grinding and polishing. The finished mirror will weigh about 35,900 pounds.

High fire marks the critical first step in fabricating the key optical components of LSST, the unique wide-field survey telescope expected to see first light in 2014 from Cerro Pachón in Chile. This exciting milestone was also a great excuse for a party! To celebrate high fire and increase the visibility of LSST, a day-long program of talks, tours, and interactions took place in Tucson. More than 300 people toured the mirror lab throughout the day and 150 VIP guests attended the high fire festivities.

The UA Flandrau Science Center served as home base for the event, with LSST exhibits in the lobby and informational presentations in the planetarium theater in the morning. LSST System Scientist Zeljko Ivezic, (University of Washington) spoke about “Breakthrough Science of LSST,” pointing out the particular realms in which the James Webb Space Telescope, Giant Segmented Mirror Telescope, and LSST will lead us forward. Victor Krabbendam (LSST/NOAO), Project Manager for Telescope and Site, spoke about visiting Cerro Pachón, and how its peak known as El Peñon was selected as the home for LSST. His multimedia tour appealed to both the scientists and the world travelers in the room.

Welcoming remarks at the event luncheon were delivered by LSST Board Chairman John P. Schaefer, UA President Robert N. Shelton, and UA Steward Observatory Director Peter Strittmatter. In the early afternoon, Edward ‘Rocky’ Kolb (University of Chicago) gave a dynamic talk titled “The Quantum and the Cosmos.” Rocky presented a cosmologist’s point of view in describing how LSST will take us back in space and time to the origin of the Universe, and an increased understanding of dark matter.

UA Regents Professor and Mirror Lab Scientific Director Roger Angel then shared a bit of history of the mirror lab and insight into the unique challenges of casting the LSST M1/M3 monolith. Small groups led by SOML and LSST experts toured the lab throughout the afternoon, and enjoyed seeing the LSST glass spinning in the furnace, as well as views of the fold-sphere mirror and mirror number one from the Giant Magellan telescope project on the polishing floor.

Festivities continued with cocktails and a celebratory dinner that evening. Music was provided by the eight-member UA HarpFusion ensemble. Tables were beautifully decorated at the Marriott University Park with rose petals, individual pieces of etched LSST glass for each guest, and menu cards illustrated with cactus photographs from the collection of John Schaefer. LSST Project Manager Don Sweeney welcomed guests with opening remarks and presented a model of the LSST telescope, a gift presented to Simonyi in appreciation of his fund’s generous contribution to the project.

Charles Simonyi ended the evening with a fascinating and personal presentation about his experiences as the fifth civilian space flight traveler to the International Space Station in April 2007.

Figure 1: UA Mirror Lab Director Roger Angel, the National Science Board’s Steven Beering, LSST Director Tony Tyson, Purdue University Physicist Ian Shipsey, University of Chicago Cosmologist Rocky Kolb, and LSST Project Manager Don Sweeney pose in front of the spinning oven in which the LSST primary mirror is being cast.

Figure 2: Charles Simonyi talks about his experience as a space tourist at the event dinner. In the foreground is a scale model of the LSST telescope, a gift presented to Simonyi in appreciation of his fund’s generous contribution to the project.

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High Fire for LSST continued

The mirror casting and surrounding celebration both unfolded flawlessly and set new standards for telescope-themed entertainment. A large number of people contributed to the day’s success, including many students, docents from Kitt Peak and SOML, and others who volunteered their time to make the project look good. Guests enjoyed the informality of the day, Tucson’s perfect March weather, and the opportunity to mingle amid the people and locations making scientific history with LSST.

More information, including a video of the glass melting in the oven, can be found at www.lsst.org/News/highfire_event.shtml.

A month after the event, LSST moved into new offices just across Cherry Avenue from NOAO, on the 5th floor of Steward Observatory.

New contact information:

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933 North Cherry Avenue
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520-881-2626 (LSST main number)
520-881-2627 (fax)
www.lsst.org

New NOAO and Kitt Peak 50th Anniversary Bookmarks