

# Education and Public Outreach for the Pierre Auger Observatory

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**Abstract.** The scale and scope of the physics studied at the Auger Observatory offer significant opportunities for original outreach work. Education, outreach and public relations of the Auger collaboration are coordinated in a separate task whose goals are to encourage and support a wide range of education and outreach efforts that link schools and the public with the Auger scientists and the science of cosmic rays, particle physics, and associated technologies. The presentation will focus on the impact of the collaboration in Mendoza Province, Argentina, as: the Auger Visitor Center in Malargüe that has hosted over 40,000 visitors since 2001, a collaboration-sponsored science fair held on the Observatory campus in November 2007, the Observatory Inauguration in November 2008, public lectures, school visits, and courses for science teachers. A Google-Earth model of the Observatory and animations of extensive air showers have been created for wide public release. As the collaboration prepares its northern hemisphere site proposal, plans for an enhanced outreach program are being developed in parallel and will be described.

**Keywords:** Auger Education and Outreach

## I. INTRODUCTION

Education and public outreach (EPO) have been an integral part of the Auger Observatory since its inception. The collaboration's EPO activities are organized in a separate Education and Outreach Task that was established in 1997. With the Observatory headquarters located in the remote city of Malargüe, population 20,000, early outreach activities, which included public talks, visits to schools, and courses for science teachers and students, were aimed at familiarizing the local population with the science of the Observatory and the presence of the large collaboration of international scientists in the isolated communities and countryside of Mendoza Province. The collaboration has been successful becoming part of the local culture. As an example of the Observatory's integration into local traditions, the collaboration has participated in the annual Malargüe Day parade since 2001 with collaborators marching behind a large Auger banner (see Fig. 1). The Observatory's EPO efforts have been documented in previous ICRC contributions [1]. We report here highlights of recent education, outreach, and public relations efforts.



Fig. 1. The Auger collaboration and Science Fair participants in the November 2007 Malargüe Day Parade.

## II. THE AUGER VISITOR CENTER IN MALARGÜE

The Auger Visitor Center (VC), located in the central office complex and data acquisition building in Malargüe, continues to be a popular attraction. Through the end of April 2007, the VC has hosted 43,777 visitors with an average of about 6000 per year. A noticeable increase of visitors occurred after the opening of a new, nearby planetarium [2] in August 2008. Fig. 2 shows the number of visitors logged per year from November 2001 through April 2009. The VC is managed by a small staff led by Observatory employee Analía Cáceres which includes local teacher Miguel Herrera and other Auger collaborators. Fig. 2 shows Auger physicist Julio Rodríguez explaining the Observatory to a visiting school group in the data acquisition center.

Recent exhibits that were field tested at the VC, notably the illuminated scale model of the Observatory developed at the Forschungszentrum Karlsruhe [1] and the Google Earth fly-over animation [3] developed by Stéphane Coutu of Pennsylvania State University, have since been replicated elsewhere. As examples, copies of each display are in the interim Auger North VC at Lamar Community College in Colorado and in a new physics and astrophysics learning center called the Galileum in Teramo, Italy, whose director is Auger collaborator Aurelio Grillo.

## III. THE 2007 AUGER SCIENCE FAIR

Following a successful Science Fair held in November 2005, the Collaboration sponsored a second Fair on November 16-17, 2007, that attracted the exhibition of 40 science projects in the areas of natural science, mathematics, and technology (see Fig. 3), in contrast to

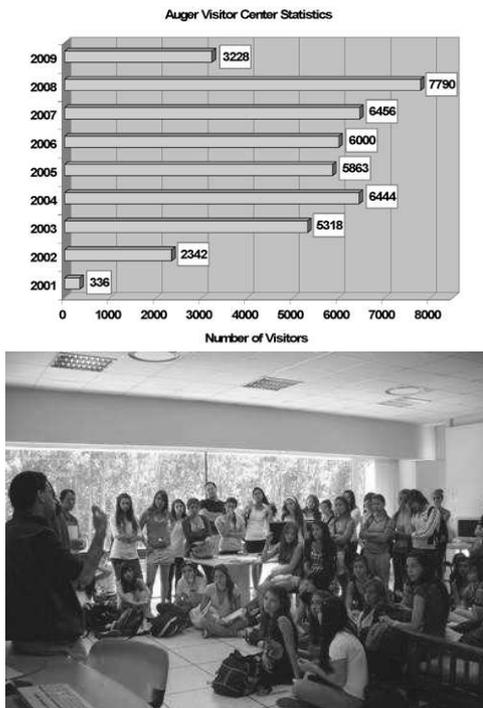


Fig. 2. Top: Number of visitors logged by year at the Auger Visitor Center. Bottom: Julio Rodriguez with a school group visiting the Observatory.

29 projects presented at the 2005 Fair. While the 2005 Fair was open only to high school level participants, the 2007 Fair offered awards in four age categories: grades 1-3, 4-7, 8-9, and 10-12. A team of Auger collaborators judged the projects on the basis of science content, oral and visual presentation, and the written report that accompanied each project. Although the Fair's participants came from all over Mendoza Province, a noticeable number of participants and award recipients attended the James Cronin School in Malargüe. The collaboration is indebted to the Observatory staff, the local organizing team of three science teachers, and the city of Malargüe for helping to make the Science Fair a success. A third Auger Science Fair is scheduled to take place in November 2009.

#### IV. THE 2008 AUGER INAUGURATION

The Collaboration held an inauguration ceremony on November 13-15, 2008, to mark the complete installation of the southern hemisphere Observatory. More than 200 guests and 100 collaborators attended. Guests included Julio Cobos, the Vice President of Argentina, Celso Jacque, the Governor of Mendoza Province, both shown in Fig. 4, the directors of Fermilab and CERN, several ambassadors, many high-level officials from funding agencies and research officers from collaborating institutions. The 3-day event featured talks on the history and status of the Observatory, the unveiling of commemorative monument, traditional folk music and dance performances during an outdoor *asado*, and opportu-



Fig. 3. Top: The 2007 Science Fair in the Assembly Building. Bottom: Jim Cronin with Science Fair award recipients.

nities for visitors to tour the vast Auger site. Many guests indicated how much they were impressed with Observatory and even enjoyed the dusty two-hour ride across the *Pampa Amarilla*.

#### V. OTHER OUTREACH ACTIVITIES

The scholarship program which brings top Malargüe students to Michigan Technical University (MTU), described in [1], has enjoyed continued success. A fifth student in the program, who would normally begin his studies in science or engineering in the fall 2009, will be delaying matriculation for one year and enroll at MTU in the fall of 2010. The first MTU student from Malargüe who enrolled in 2001 completed a Masters Degree in mechanical engineering and has embarked on an engineering career in the U.S. The second and third students have also graduated and returned to Argentina with their engineering degrees. The fourth student will begin his third year of studies at MTU in the fall 2009.

In August 2007 and 2008, Observatory employee Analía Cáceres served as a lead organizer for the National Week of Science and Technology held at the Malargüe Convention Center. These interdisciplinary symposia drew participants from all over Argentina and featured several Auger collaborators speaking about the Observatory and other science topics.

The public release of extensive air shower data for instructional purposes [1] has proven to be successful, and web-based information and instructions are now available in English, Spanish, French, Italian, and German [4]. The web sites register an average of 50 unique



Fig. 4. Top: Auger collaborator Miguel Mostafa (left) translating the comments of Argentina Vice President, Julio Cobos, at the 2008 Inauguration. Bottom: Mendoza governor Celso Jacque presenting a plaque to Auger collaborator Ingo Allekotte at the Inauguration.

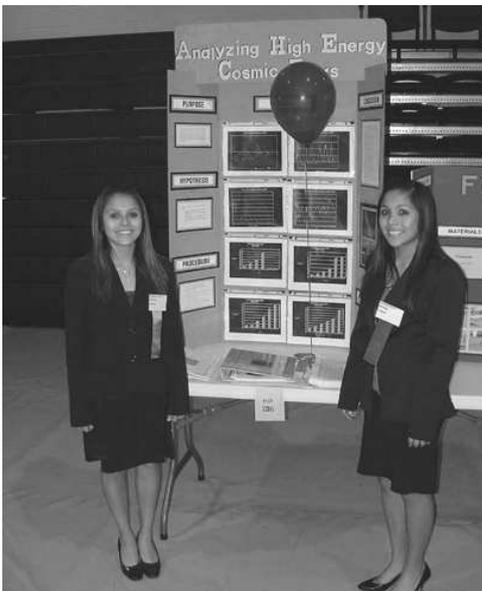


Fig. 5. Students from Lamar High School with their science fair poster based on Auger data released to the public.

hits per day from 43 countries, although the bulk of the traffic is from the U.S., Argentina, and a few European countries. A major spike in usage occurred just after the Collaboration published its notable result on the correlation of arrival directions of its highest energy events with AGN galaxies [5]. The public data served as the basis for an award-winning science fair project of two students from Lamar High School in Colorado, shown in Fig. 5.



Fig. 6. The interim Visitor Center at LCC.

In the fall 2008, Randy Landberg, Education and Outreach Director for the Kavli Institute for Cosmological Physics, Auger collaborators from the University of Chicago, and personnel from the American Museum of Natural History (AMNH) in New York received U.S. National Science Foundation funding to produce a 10-minute, high-resolution video about the Observatory. The video is foreseen as one of the AMNH online Science Bulletins [6]. A AMNH film crew visited the Observatory in November 2008 to shoot footage of Observatory sites and surroundings and to film interviews with Auger collaborators. The Science Bulletin is scheduled to be released in the late spring 2009.

Many Auger collaborators have organized activities at their institutions and in local communities associated with the 2009 International Year of Astronomy.

#### VI. AUGER NORTHERN SITE OUTREACH

As the Auger collaboration prepares its proposal to build a northern hemisphere site in southeast Colorado, the Education and Outreach Task continues to lay the groundwork for a comprehensive outreach program that will be linked to the outreach efforts in the southern hemisphere. Primary outreach goals in this period are to promote the Observatory in southeast Colorado, provide information to people at all levels, and establish early ties with science teachers and students in the region's schools. Lamar Community College (LCC) has been named the host institution for Auger North outreach, and efforts have been led by LCC employee Brad Thompson.

An interim Visitor Center has been established (see Fig. 6) in the LCC library which features explanatory posters, take-home information brochures, a scale model of a Surface Detector (SD) station, an SD photomultiplier tube, scintillator detectors which register cosmic ray muons as viewed on an oscilloscope, and a large flat screen monitor to view the Google Earth display [3] of the Observatory. This display was recently expanded to include the layout of the proposed northern site. A larger state-of-the-art visitor center is foreseen to be included in the headquarters of Auger North at LCC.

A recent highlight was the installation of two full-sized SD detector stations in the area, one on the

LCC campus, and one near the county fairgrounds in the nearby town of Las Animas. The names for these stations, Pierre's Dream and Cosmos, respectively, were determined by a contest among area primary school students. The SD stations allow area landowners to view examples of detectors they will be asked to host on their property as Auger North proceeds.

An unveiling ceremony for the detectors was held on October 27, 2007, in both Lamar and Las Animas, with the mayors of each town welcoming the Observatory to the area. The winners of the detector naming contest were also recognized at the ceremony, as shown in Fig. 7. Additional SD stations are presently being placed in visible locations in other towns in the footprint of the Auger North array, namely, in Springfield and Eads, Colorado. In addition to their role in public relations, the detectors will be filled with water and outfitted with temperature sensors for freezing studies, part of the R&D for Auger North.



Fig. 7. Shown with the display SD station at LCC are the students and families responsible for the detector's name.

#### REFERENCES

- [1] G. Snow for the Pierre Auger Collaboration, "Education and Public Outreach for the Auger Observatory", Proc. of the 27th ICRC, Hamburg, Germany, 2001; B. García and G. Snow for the Pierre Auger Collaboration, "Education and Public Outreach for the Auger Observatory", Proc. of the 29th ICRC, Pune, India, 2005; G. Snow for the Pierre Auger Collaboration, "Education and Outreach for the Auger Observatory", Proc. of the 30th ICRC, Mérida, Mexico, 2007.
- [2] See <http://www.malargue.gov.ar/plaetario.php>.
- [3] The Google Earth model is available at: [http://www.auger.org/features/google\\_earth.html](http://www.auger.org/features/google_earth.html).
- [4] See as examples <http://cabtep5.cnea.gov.ar/experiments/auger/ED/>, <http://apcpaox.in2p3.fr/ED/>, or Wikipedia.
- [5] J. Abraham, *et al.*, "Correlation of the highest energy cosmic rays with nearby extragalactic objects", *Science* **318**, 939 (9 November 2007).
- [6] See <http://www.amnh.org/sciencebulletins/>.