

Astrophysics

Pierre Auger Project

TANDAR GROUP: A. Etchegoyen, P. Bauleo, C. Bonifazi, A. Boselli, N. Fazzini, A. Filevich, H. González, and S. Nigro

The Pierre Auger Project aims at studying a foremost issue in astrophysics today, the origin of the most energetic cosmic rays with energies in excess of 10^{19} eV, focusing our attention in energies above 10^{20} eV. The flux of these latter cosmic rays is roughly estimated to be $1/\text{km}^2/\text{century}/\text{sr}$ and due to this, an International Collaboration spanning institutions in 19 countries has met to build two similar observatories $3,000 \text{ km}^2$ each, one in the southern hemisphere (in Malargüe, Province of Mendoza, Argentina) and one in the northern hemisphere (in Utah, USA).

Two experimental techniques will be used: surface detectors and fluorescence telescopes. Such hybrid approach will diminish systematic errors and will allow to measure both lateral and longitudinal shower profiles, respectively. The construction of the southern observatory has begun, and we are currently assembling an Engineering Array consisting in 38 surface detectors, two fluorescence telescopes, telecommunications and Central Station buildings. After finishing this phase, we plan to begin full construction next year.

The Argentinean Collaboration have groups working at Tandara/CNEA, the University of La Plata, the Institute Balseiro/CNEA-UNC, the Technological University at Mendoza, and to a lesser extend in the Instituto de Astronomía y Física del Espacio/CONICET, and Malargüe and San Rafael/CNEA. We are involved in most aspects of the project.

The overall cost of the Pierre Auger Southern Observatory is \$ 50,000,000 out of which CNEA will contribute, provided the availability of Federal Funds, with \$ 10,000,000 and the Province of Mendoza with \$ 5,000,000. This budget is earmarked towards construction of the Observatory, apart of which we will need to train young scientists and technicians to profit of this unique basic science project in this country. The overall management and responsibility of Argentina's expenditures is performed by Dr. A. Etchegoyen as Principal Investigator with accountability to the financing institutions and the International Collaboration. Eng. H. González is in charge of the accounting of CNEA's budget expenditures. The Project at CNEA depends from the Science and Technology Program, headed by Dra. Ma. C. Cambiaggio.

The Central Station Buildings

There are two main buildings in the Central Station, the Assembly and Office-Control building and a telecommunication tower, the three built under the supervision of Eng. N. Fazzini.

The Assembly Building was built with Mendoza's funding and it is already operational. As a distinct feature it has an ultra pure water plant technically specified and purchased by Dr. A. Filevich. The storage tank and water transportation systems were also designed and procured at Tandar. We are currently involved in the deployment of the surface detectors.

The Office Building is being budget with an additional funding of \$ 1M from the University of Chicago.



In the above pictures is displayed the Assembly Building, with the INTERNET satellite dish, the telecommunication tower and the 50,000 l ultra-pure water storage tank. On the right hand side is seen the construction of the Office Building.

Los Leones Building

The Observatory will have four fluorescence detector sites, the first one has already been built with funds from Mendoza and under the supervision of Eng. N. Fazzini. The original layout was performed by Dr. A. Filevich.



Above it is displayed the Los Leones building plus the telecommunication tower. The building has six bays for six telescopes, each one spanning 30 degrees in azimuth and elevation. Two prototypes are being assembled by the German and Italian collaborations and should be complete in May 2001. The German support structure is displayed on the right hand side.

The Surface Detectors

The surface detectors are ultra-pure water tanks which will measure Cherenkov light produced by the incoming shower particles. There will 1,600 of them regularly spread, 1,500 km apart from each, other over the 3,000 km². The first tank was deployed in Feb/2000.



In the above picture is displayed the first deployed tank.

The Tandar group centers its work on the surface detectors. Argentina is in charge of all tank deployment and the construction of 500 of them. We will manufacture all the internal highly diffuse reflective liners, the analog front end, the telecommunication antennae, the solar panels supports, batteries and batteries enclosures. The manufacturing of tanks and batteries enclosures is under the responsibility of Dr. A. Boselli and of the solar panels support of Eng. S. Nigro.



Above is displayed the water deployment of tank # 16, a difficult deployment position. The water transportation tank is installed on a flat bed and it is being pulled by two caterpillars.

On the right is seen a detail of the solar panel, communication antenna and electronics box of a tank.

Education and Outreach

The gift from the University of Chicago includes funds for a visitor's center. The visitor's center on the Auger Central Campus in Malargüe will augment an already strong outreach program with the people of the region. On each occasion of the recent collaboration meetings talks were organized for the community and the schools. At the 12-17 November collaboration meeting we invited the Malargüe community to an open house for the new Assembly Building. All of these events were enthusiastically received and well attended by the community. In turn, the mayor of Malargüe invited Auger collaborators to attend celebrations associated with 50th anniversary of the city. This included the Auger group participating in a parade down the main street. We were very warmly received.

Summary

The Pierre Auger Project is unique in magnitude for a basic science project in the history Argentina since it encompasses 19 nations, 50 institutions, 250 scientists/engineers and an Observatory site in this country over an area of 3,000 km². It entails the logistics of an expeditious free-customs duties for foreign equipment and the commissioning of the detectors. We are now just at the beginning of a great scientific adventure. The excitement is that we really do not know what we will find. But whatever it is, it will reveal news physics or astrophysics.

Apart from Tandar, we count on the paramount contributions from the other Argentinean groups already mentioned.

Argentina has the enormous responsibility of hosting the Southern Observatory. Apart of complying with our commitments to the International Collaboration we will need to train young scientists to be able to benefit from this 20-year long Project. These scientists will have the opportunity to work on a stimulating international environment and stay in this country.