Scientists Celebrate Inauguration of Pierre Auger Observatory, Plan for Second Phase in Colorado

Scientists of the Pierre Auger Observatory, a project to study the highest-energy cosmic rays, celebrated the inauguration of the southern hemisphere site of their observatory in Malargüe, Argentina, this past November 14, 2008. The event marked the completion of the first phase of the Observatory construction and the beginning of the project's second phase, which includes plans for a northern hemisphere site in southeastern Colorado, USA, as well as enhancements to the southern hemisphere site.

The inauguration celebration began with an informal reception on November 13, followed by a symposium on November 14, included presentations on the origins of the project, the construction of the experiment and the latest scientific results.

The Pierre Auger Observatory is exploring the mysteries of the highest-energy cosmic rays — charged particles showering the Earth at energies 10 million times more than the world's highest-energy particle accelerator. Until now, there has been no consensus on the origin of these highest-energy cosmic rays.

To witness these extremely rare events, the Pierre Auger Collaboration began the construction of its southern hemisphere observatory in the year 2000. The project consists of an array of 1600 surface detectors (or "tanks") spread over 3000 square kilometers (1200 square miles) in Argentina's Mendoza Province, just east of the Andes Mountains. Surrounding the array is a set of 24 fluorescence telescopes that view the faint ultraviolet light emitted by the cosmic-ray shower particles as they cascade down through the atmosphere. The collaboration includes more than 400 physicists from 70 institutions in 17 countries, which have shared the construction cost of approximately $53 million. More than 40 funding agencies are contributing to the Pierre Auger Observatory.

The Pierre Auger collaboration published its first physics results in the fall of 2007, revealing new insights into the properties of the highest-energy particles in the universe. The collaboration found that the arrival directions of the highest-energy cosmic rays are not evenly distributed from the cosmos. The arrival directions show a relationship to the distribution of nearby galaxies that contain actively radiating black holes - called AGN's (Active Galactic Nuclei). Several science organizations selected this remarkable result as one of the most important scientific breakthroughs in 2007.

The collaboration has used its growing detector array to measure the cosmic-ray energy spectrum at the highest energies, achieving higher precision than any previous experiment. The Auger scientists found a fall-off of cosmic rays detected at the highest energies - a result that had been in dispute from previous conflicting cosmic ray experiments' data. This is consistent with an idea, proposed about 40 years ago, that cosmic rays interact with the leftover energy from the Big Bang on their way through the universe - causing the cosmic rays to lose some

energy. Hence, we expect to see less cosmic rays with very high energy, and Auger data seems to confirm this. Auger data has also put new limits on the constituent parts of ultra-high energy cosmic rays, which in turn has put more stringent limits on theories of cosmic-ray origins.

To complete the Observatories' data taking capabilities, the second phase, or northern hemisphere site will now enter the final planning stages. Research scientists from CSU, Colorado School of Mines, CSU- Pueblo and Michigan Tech will be strongly involved in the planning and deployment of a proposed 20 tank research and development test array of surface detectors south of Lamar in the near future. "The test array will be a mini-version of the proposed larger array to test the design, data taking capabilities and the communication network of the surface detectors," explained Dr. John Harton, of the CSU physics department. "We also will be deploying equipment to further study the atmospheric properties in the area," commented Dr. Lawrence Wiencke, of the Colorado School of Mines physics department. "We need much more detailed information about the atmosphere to fully understand how it will affect any detector equipment placed in the area and to maximize our data taking capabilities."

An earmark to the Department of Energy, started by the Colorado Community College System through Senator Allard's office, has been promised to provide the funds to develop and deploy the test array. LCC's Auger Outreach Coordinator Brad Thompson explained, "the test array and atmosphere studies will allow Auger Collaboration scientists to make final analysis and adjustments to the proposed northern site equipment and design plans."

"The work planned to begin in the near future is just the first step," clarified Dr. Fred Sarazin, of the Colorado School of Mines, "but it will begin a new phase in the project and provide local residents with visible signs of Auger work in the area. We still have a great deal of communication and negotiations to begin with local area landowners, but we hope the test array will be the start of making the northern hemisphere detector a reality." The aforementioned Colorado collaborators will also be heavily involved in the development of the northern site and with landowner communications.

Anyone interested in further information about the Observatory or the proposed plans for SE Colorado should visit the information center at the LCC Library or contact Brad Thompson at LCC through auger@lamarcc.edu or 719.336.1548. He is also available to give presentations about the Observatory to any interested school, government or civic group/organization in the region.

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