

The Pierre Auger Observatory – A Window to UHCRs Understanding

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The Pierre Auger Observatory (PAO) is an international cosmic ray observatory designed to detect ultra high energy cosmic rays (UHECRs) which have far higher energies than any man-made accelerator can reach, thus they continue to challenge our understanding. These are sub-atomic particles (protons or other nuclei) with energies beyond 10^{20} electron-volts, the energy of a tennis ball traveling at 53.3 miles per hour, but packed into a single proton. They have an estimated arrival rate of just $1/\text{km}^2$ per century, therefore, in order to record a large number of these events, PAO has created a huge detection area, 30 times bigger than Paris, in western Argentina's Mendoza Province. The observatory is designed to study showers through detecting not only the particles, with an array of 1600 water Cherenkov detectors, but also the fluorescence light, using four stations, each with six telescopes overlooking the particle detectors. The PAO management is hosted by Fermilab and it will have two sites, one in the southern hemisphere (Argentina) and one in the north (U.S.A), in order to view UHECR over the entire sky. More than 300 scientists from all over the world are working to discover the mystery of UHECR around the predicted GZK phenomena. The Pierre Auger Collaboration is also developing the study of inclined events, and showers with zenith angles above 85 degrees have been seen. This was expected as they had been detected long ago with much smaller arrays, but the richness of the new data is impressive. These events form the background against which a neutrino flux might be detectable. There is an exciting future ahead.