ASTROPHYSICS SEMINAR SERIES

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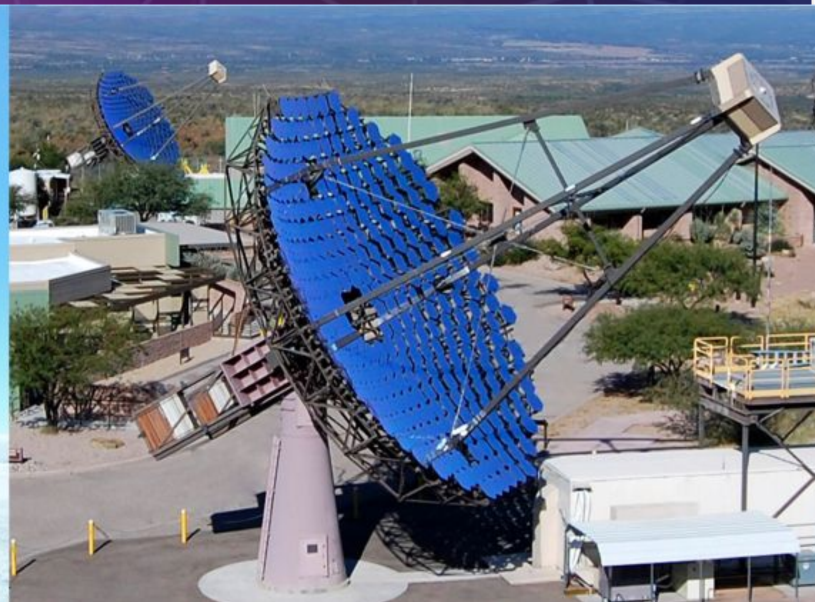
Understanding the Universe



Searching for extreme hadronic accelerators in our Universe with multi-messenger observations

NAHEE PARK | *QUEEN'S UNIVERSITY*

Since the discovery of cosmic rays in 1912, we have studied the origin of these highly energetic particles for over a hundred years. As magnetic fields would deflect the trajectories of these charged particles, the sources of these particles remain a mystery. The improved sensitivities of gamma-ray observatories have revealed over two hundred stellar objects that can accelerate high-energy particles with energies up to several hundred TeV. However, as gamma rays can be created by leptonic particles (such as electrons and positrons), the source sites of hadronic particles, the majority of cosmic rays we observe at Earth, remain elusive. Detection of neutrinos will provide the most direct measurements of high-energy hadronic accelerations as neutrinos are only generated by hadronic interactions. Neutrinos can also probe obscure environments hidden from electromagnetic observations, and they can travel much longer distances than gamma rays, allowing us to explore a larger part of the Universe. The detection of a diffuse neutrino flux by the IceCube neutrino observatory and the recent multi-messenger observations triggered by IceCube in the direction of the blazar TXS 0506+056 show the potential of this approach. I will overview what we have learned from multi-messenger observations of potential source sites of high-energy particles, and what we expect to learn in the future with the next-generation neutrino observatories, such as P-ONE and IceCube-Gen2.

01 FEB 2022 | **1:30 PM EST** | **YouTube Live**