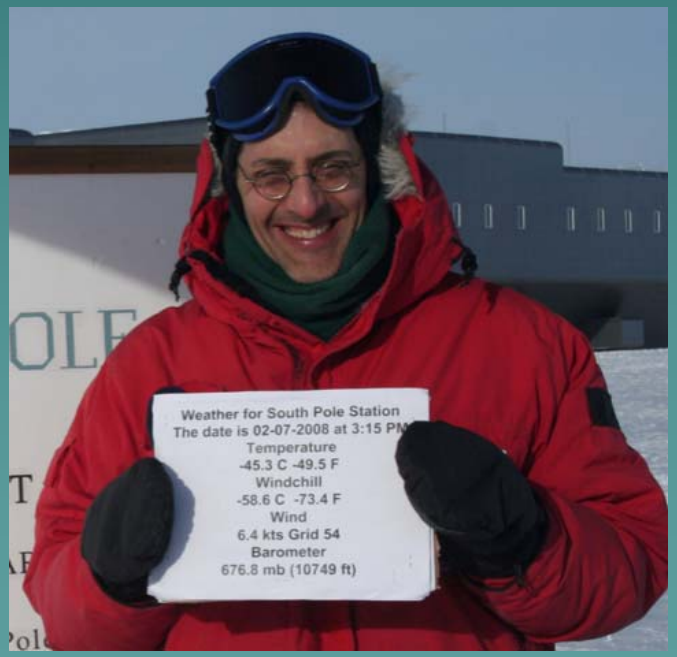
CU Physics Department Colloquium

Monday, April 16, 2012 4:10 PM 428 Pupin Hall

IceCube's Neutrino Microscope

IceCube is the world's largest neutrino detector. Buried deeply under the ice at the South Pole, IceCube is a sparsely instrumented Cherenkov light detector with about 5,000 sensors interspersed in a volume of roughly one cubic kilometer. It was designed to have optimal sensitivity to neutrinos with energies in the TeV to PeV range that can produce kilometer-scale event signatures, and has begun to place model-challenging limits on high energy neutrino production by astrophysical sources like gamma-ray bursts (GRBs).



In this talk, however, we will focus on IceCube's new-found ability to detect neutrinos at energies approaching 10 GeV, considerably lower than anticipated in its original design, with event signatures extending "only" to the 50-meter scale. This has been accomplished by the addition of the "DeepCore" in-fill sub-array, added to IceCube in the last two years of its seven-year deployment period. DeepCore gives IceCube sensitivity to dark matter and atmospheric neutrino oscillations in previously unexplored and intrinsically very interesting regions of parameter space. We will describe recent results from DeepCore, discuss measurements in progress, and highlight motivations and ideas for further extending the energy reach of Cherenkov detectors in the ice to the few-GeV scale and perhaps even to the sub-GeV realm.

Doug Cowen, Pennsylvania State University