

APR08-2008-000279

Abstract for an Invited Paper
for the APR08 Meeting of
the American Physical Society

Going Deep - Nuclear Science Underground

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The creation of a Deep Underground Science and Engineering Laboratory (DUSEL) at the Homestake Mine in South Dakota as well as the construction of SNOLAB in Sudbury, Ontario provide exciting new opportunities for the nuclear science community. The proposed next generation of underground experiments to be sited at these facilities aim to investigate a broad set of fundamental questions: What is the nature of neutrinos? Can we directly detect dark matter? How did the elements originate? What nuclear reactions are important to stellar evolution and dynamics? How did the matter - antimatter asymmetry we observe in the universe arise? Answers to these questions impact not only nuclear physics, but particle physics, astrophysics, and cosmology. There are numerous technical challenges that need to be met, including attaining unprecedented levels of material purity, developing ultra-sensitive assay techniques, and improving our understanding of nuclear properties. Likewise there are a number of interesting theoretical issues that need to be addressed including improving our knowledge of nuclear matrix elements and understanding the limits of nuclear stability. This talk will give an overview of the physics, the experiments, and the technologies that will help us reach a better view of our universe by going deep underground.