

## Nuclear Astrophysics Underground –Status of CASPAR

*Thursday, May 12, 2022 11:00 AM (30 minutes)*

Even more than 60 years after the groundbreaking publication by Burbidge, Burbidge, Fowler, and Hoyle, Nuclear Astrophysics is still a thriving and exciting research field at the interface of nuclear physics, astrophysics, and particle physics. Current topic is associated with the evolution of stars and its impact on the production of heavy elements but also the source strength of solar neutrinos from pp chain and CNO cycle. Certain nuclear reactions play a key role for these topics depending on the stellar environment. The study of these reactions at stellar energies has been a major goal by the community, in Europe, the US and increasingly also in China. However, the large cosmic ray induced background has been prohibitive for advancing these measurements into the stellar energy range and the present reaction rates rely on theoretical extrapolations that carry high uncertainties.

Accelerator laboratories located deep underground offer unique conditions for measuring these reactions at very low interaction energies as demonstrated by the success of the LUNA facility at Gran Sasso, Italy. However, over the past years also the CASPAR (Compact Accelerator System for Performing Astrophysical Research) laboratory at the Sanford Underground Research Facility (SURF) has produced first scientific results. CASPAR operates a 1-MV fully refurbished Van de Graaff accelerator that can provide high intensity proton and alpha beams. The current status and the future program of this first underground accelerator facility in the U.S. will be discussed.

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**Session Classification:** Plenary - Nuclear Astrophysics, Biology, DUNE Module of Opportunity

**Track Classification:** Nuclear Physics