Sanford Underground Research Facility

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Deep Thoughts

Notes from the underground by Communications Director Constance Walter

Monday, May 8, 2017

Forging Elements Inside Stars

The nuclear burning inside collapsing stars produces all the elements in the universe heavier than iron. Carbon, nitrogen and calcium—even the lead, gold and the rock beneath our feet come from stars. And researchers with the Compact Accelerator System for Performing Astrophysical Research (CASPAR) want to know how that happens.

Using a low-energy accelerator located on the 4850 Level of Sandford Lab, they'll fire a beam of alpha particles at various targets to try to mimic the nuclear fusion that occurs deep inside stars.

"The idea of studying stellar processes from deep underground may seem outlandish," said Daniel Robertson, technical coordinator for the CASPAR collaboration. "But in doing so, we hope to unravel the secrets of energy generation and the elemental production that makes stars shine."

Robertson will discuss the CASPAR experiment Thursday, May 11, during his Deep Talks presentation, "Forging Elements Inside Stars."

A research assistant professor at Notre Dame's Nuclear Science Laboratory and a visiting researcher at CERN in the cryogenics division, Robertson initially began his work with the DIANA (Dual Ion Accelerators for Nuclear Astrophysics) experiment. It transitioned to CASPAR in 2013.

The 50-foot-long accelerator system was used above ground at Notre Dame for more than 10 years before being moved to Sanford Lab in 2015. It is fully assembled and its control system has undergone initial testing. Operations could begin this week.

"We are poised at the point of first ion beam production," Robertson said. "With the go-ahead for first beam, CASPAR will become only the second accelerator lab of its kind in the world, and the only one in the United States."

Frank Strieder, the principal investigator for CASPAR and associate professor of physics at South Dakota School of Mines and Technology, will join Robertson at the Deep Talks presentation. Strieder, who worked for more than 20 years with LUNA (Laboratory for Underground Nuclear Astrophysics) at Gran Sasso Laboratory in Italy, is eager to begin operations.

"A better understanding of the stars, allows researchers a greater understanding of the universe." Strieder said.

Deep talks
Science for Everyone

Thursday, May 11, Sanford Lab Homestake Visitor Center, 160 W. Main, Lead, S.D
Social hour, 5 p.m.; talk, 6 p.m.
Free beer from Crow Peak Brewing Company in Spearfish is available for those 21 and older. Deep Talks is sponsored by Sanford Lab, the Sanford Lab Homestake Visitor Center, Lynn's Dakota Mart and Crow Peak Brewing Company in Spearfish.