LBNE's core is at the Sanford Lab

By Matt Kapust

Nearly a mile underground a drilling crew is working around the clock to extract rock core from the 4850 Level at the Sanford Underground Research Facility (Sanford Lab) in Lead S.D. Core samples are used to explore the rock mass that will house the Long-Baseline Neutrino Experiment (LBNE) liquid argon far detector. LBNE project staff went underground last week to observe the geotechnical work. "We wanted to kick the tires, learn how it works and see the drilling process," said Jim Strait, Project Director for LBNE.

It's LBNE's first construction project at Sanford Lab. Tracy Lundin, Conventional Facilities Manager for LBNE, said the drilling is an exploration program intended to characterize the rock mass.

LBNE will aim a beam of neutrinos generated at Fermilab near Chicago to an underground detector at the Sanford Lab, 800 miles away. "It's a lovely distance," said Strait. "It's in the sweet spot we need to efficiently study neutrinos."

Strait, a physicist by trade, also received a lesson in geology and rock mechanics while underground. "We know the rock is about 1.8 billion years old and contains some younger rhyolite, about 30 million years old," said David Vardiman, Geotechnical Design Engineer for Sanford Lab. The core samples can tell us about the strength and geologic composition of the rock. They can also reveal the orientation of folds and other imperfections in the rock mass, all of which can influence the design of the excavation that will house the detector.

Four exploration holes are being drilled,

Photo by **Matt Kapust**

Rock Mechanics Engineer for ARUP Reza Ghasemi and LBNE Project Manager Jim Strait examine a piece of core taken from the 4850 Level.

which will yield hundreds of feet of 3-inch (78mm) diameter rock core taken out in five-foot sections. All of it must be logged and packaged in boxes for later testing at a geotechnical laboratory. That work is being done by ARUP, an engineering firm.

First Drilling, the drilling subcontractor, set up a Conner 208h core rig, which was built in the 1970's, for this job. The rig uses a hollow diamond tipped bit that cuts through the hard rock and leaves a solid rock core sample in its wake. "It may be old but these babies get the job done," said Mike Kukar, drill supervisor.

The rig itself barely fits in the narrow drift on the 4850 Level. It had to be properly configured in the 8-foot underground tun-

nel. A generator set up behind the drill powers the rig. It takes 8 to 12 gallons of water per minute to lubricate and flush out the borehole. Kukar said it was one of the most extreme setups he's had to do.

Kukar left a good impression with LBNE's Environment, Health and Safety Manager Mike Andrews. Upon entering the work site, the first conversation was a thorough safety briefing presented by Kukar. "You just knew that safety was number one when managing this site," Andrews said. "I'm extremely happy with what I saw in the drilling project safety program."

Sanford Lab Executive Director Mike Headley said he was happy to host the LBNE staff and is pleased the drilling project is ahead of schedule.

"This experiment wouldn't be possible without the support of South Dakota," said Strait. "It's amazing that such a small state would make this tremendous investment in basic science. Without that investment it's quite possible LBNE might not be in the United States."

Eye on Safety

Viruses, Malware, Spyware, and Phishing scams are on the rise. The email server at Sanford Lab is reporting that over 50 percent of all mail received at the lab is spyware or phishing scams. "They are looking more and more like legitimate email," said Senior Systems Administrator Deb Meyer. Never click on links in emails unless you are absolutely sure of the origin and legitimacy of the email and its content. One quick test is to hover your cursor over the sender's address and links to see where they point. If you have any doubts about an email you receive, please forward it to the IT Department and we will look at it for you.