Dear SURF Readers,

Welcome to the September 2012 Sanford Underground Research Facility (SURF) monthly newsletter. In the coming months, this newsletter will be posted online, and a pdf copy will be available. You will also receive an email reminder every month providing the link to the newsletter and SURF news updates. We will still be glad to receive your input on news, links to news articles, upcoming workshops, conference notices, scientific updates, information concerning SURF, employment opportunities, and other highlights relevant to underground science.

Important Dates

October 11-13: Community Planning meeting for High Energy Physics - Fermilab, Batavia, Illinois

Underground Science

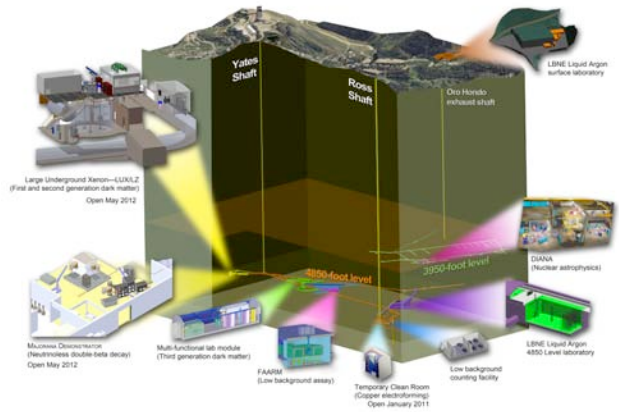

Figure 1: SURF Underground science graphic created by Multimedia Specialist Matt Kapust and consulting geologist Kathy Hart

The new graphic (shown above in Figure 1) illustrates current and proposed experiments at SURF (Sanford Underground Research Facility).

The first two experiments will take place in the Davis Campus, 4850 Level:

- The Large Underground Xenon (LUX Experiment has been installed in its protective water tank (could be filled in September).
- MAJORANA DEMONSTRATOR researchers are machining the ultra-pure copper that will be used to build the neutrinoless double-beta decay experiment.
- The "multi-functional lab module" and FAARM (Facility for Acquisition and Assay of Radiopure Materials) are in the proposal stages.
- The Temporary Clean Room (TCR) opened last year. MAJORANA researchers have been electroforming ultra-pure copper there.
- The low-background counting facility near the Ross Shaft is in the proposal stage.
- The proposed Long-Baseline Neutrino Experiment (LBNE) may be situated in one of two locations. One option is a surface laboratory in Kirk Canyon to the southeast of the Ross campus; the other option is a lab located on the 4850 Level. Designs and engineering plans are still in the development stage.
- DIANA, the Dual Ion Accelerator for Nuclear Astrophysics, is an experiment proposed for the 3950 Level.

Planetarium show

During the last week in August, Sanford Lab hosted astronomer and photographer José Francisco Salgado (shown in Figure 2). Salgado is the director of photography for "Dark Secret of the Big Bang", a program which will include time-lapse photography and animation from Sanford Lab and from CERN's Large Hadron Collider in Switzerland.

Figure 2: José Francisco Salgado inside the LUX dark matter detector water tank

At Sanford Lab's 4850 Level, Salgado used a Nikon D800 digital single-lens reflex camera equipped with a fisheye lens to shoot time-lapse images at three underground lab locations: in the drift from the Ross Shaft to the Governor's Corner, in the corridors from the Big X to the cart wash, and inside the Davis Campus. At the Davis Campus, Salgado donned a clean suit and entered the LUX dark matter

detector's water tank, mounting his camera on a motorized dolly rail to photograph the detector itself (shown in Figure 3). At the Ross Station, 4850 Level, Salgado mounted the camera on a flatbed rail car (shown in Figure 4), assisted by Sanford Lab Infrastructure Tech Bill Heisinger who carefully and slowly pushed the car with the locomotive, down the drift while the camera automatically photographed 36-megapixel images for the time-lapse video. The video will be projected on planetarium screens around the country. Look for "Dark Secret of the Big Bang" in a planetarium near you next year.

Figure 3: José Francisco Salgado checks his camera on a motorized dolly rail (blue rail) inside the LUX water tank

Figure 4: Astronomer/photographer José Francisco Salgado (left) and Infrastructure Tech Bill Heisinger check the image in Salgado's camera at the Ross Station on the 4850 Level

Sanford Lab Infrastructure Tech Bill Heisinger, LUX physicist Simon Fiorucci, Multimedia Specialist Matt Kapust, and Administrative Assistant Jaye Conrad provided support. More details on this project will appear in future issues of the SURF newsletter. Also see http://atlas.ch/planetarium/

SURF Newsletter Supplement Articles

The second in the series of SURF Newsletter Supplement articles, "The MAJORANA DEMONSTRATOR Project at the 4850 Level Davis Campus" is now available at:
http://www.dusel.org/html/early-science-progress.html

SURF IN THE NEWS

Physicsworld.com: Dark-matter hope fades in microwave haze (Colin Stuart, September 10)

Black Hills Pioneer: An eye-opening experience (Wendy Pitlick, September 8)
Scientists install dark matter detector underground (Wendy Pitlick, September 5)

Rapid City Journal: *Funding Universities an Investment* (Editorial, September 2)

For twitter updates see: www.sanfordlab.org

Recent Reports Available

Prepublication version of the report of the decadal study by the Committee on the Assessment and Outlook for Nuclear Physics (NP2010 Committee):
http://sites.nationalacademies.org/BPA/BPA_069589

The National Research Council report – "An Assessment of the Deep Underground Science and Engineering Laboratory":
http://www.nap.edu/catalog.php?record_id=13204

Marx-Reichanadter Committee report to DOE:
http://science.energy.gov/~/media/np/pdf/Review_of_Underground_Science_Report_Final.pdf

SANFORD UNDERGROUND LABORATORY NEWS

Ross Shaft Construction Update

The Ross Shaft steel replacement began on August 4, marking the beginning of the five-year project. LBNL Project Engineer Sydney De Vries reports that the work is on schedule.

The initial construction involves the steel sets that stabilize the shaft that consist of box-like frames (see Figure 5). The old sets, constructed from H beams, were installed every six feet in the 5000-foot deep shaft. The new sets, of hollow structural steel, will be 18 feet apart.

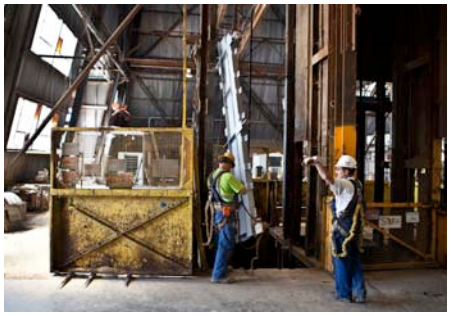

Figure 5: Infrastructure Techs Tom Ventsam left) and Kyle Ehnes lower new steel down the Ross Shaft

The detailed steel replacement process starts with stripping out the old steel. Next, crews will lower the new steel beamsm then level and align them and bolt them into place. Finally, they will install new shaft guides.

By the end of August, the first six old steel sets near the top of the shaft had been removed. The fourth new steel set had been installed as of August 27 (shown in Figure 6).

Figure 6: One of the new steel sets installed in August

The Ross Shaft was commissioned in 1934; so much of the H-beam steel consists of original material that is nearly 80 years old.

“This will be a huge improvement over the existing steel,” said De Vries. The Ross Shaft, which had been operating at reduced loads, will now be up to full operating capacity, according to De Vries.

The crew of 22 includes De Vries, as well as Project Manager Will McElroy and Technical Support Lead George Vandine. The team includes two top landers, who work at the top of the shaft, and four crews of four infrastructure technicians (shown in Figure 7), each working in the shaft itself. They work two 12-hour shifts a day, six days a week.

Figure 7: Infrastructure techs Dan James (left) and Rowdy Roberts secure new steel to the shaft, using a jackleg drill

Safety at Sanford Lab

In August, the Emergency Response Team’s (ERT) monthly practice scenario at Sanford Lab involved Lab ventilation and potential fire underground. The team searched for and extinguished an underground “fire” (shown in Figure 8) in the Tramway. ERT Coordinator Woody Hover, creator of the scenarios as well as the fictitious name of “Barking Spider 2” mine where the exercise supposedly occurred, tested the team’s ability to locate a fire by analyzing ventilation patterns. The problems presented included approaching a closed air door. “You have to really think about how changing the ventilation could affect an underground fire,” Hover said.

Figure 8: ERT member extinguishes an underground “fire” in this safety scenario

Like Sanford Lab on Facebook (and also see Sanford Lab’s Photo of the Day): http://www.facebook.com/SURFatHomestake

EDUCATION AND OUTREACH

Public Outreach

Education and Outreach staff and friends traveled across the state of South Dakota for multiple public science events recently.

On July 28, SURF Education Specialist Julie Dahl, Communications Director Bill Harlan, and Teacher-in-Residence Ann Hast went to Sioux Falls for the first annual *Northern Plains Science Festival*, which took place on the campus of the Sanford USD Research Center. Bill Harlan gave a presentation that included a videoconference to the 4850 Level to talk with scientists underground. He later assisted Julie and Ann at the Sanford Lab booth, where several hundred learners of all ages (of the estimated 3500 who attended the festival) participated in science and engineering activities related to the Sanford Lab.

Julie and Ann also took their show to Spearfish, South Dakota for a Friday night street party that took place on August 17.

On August 17-19, Deputy Director of Education and Outreach Peggy Norris took part in the first annual *Badlands Astronomy Festival*, giving daily workshops on cosmic rays, a talk on Sanford Lab, and participating in panel discussions on outreach, diversity, and the need for dark skies in order to optimize night-time sky viewing. The festival, patterned after a successful model used at Bryce Canyon National Park, featured a keynote talk by former astronaut Story Musgrave (which attracted more than 320 people to the campground amphitheater), as well as nightly star parties.

Students and Teachers

Peggy Norris worked with Sanford Lab Science Liaison Director Jaret Heise and Professor Kara Keeter of BHSU to host an experiment at the Kirk Portal on August 15. Four South Dakota teachers from the BHSU center, together with Kris Whelan, a member of the QuarkNet national staff from the University of Washington, carried two different muon counters 90 meters into the drift, to see if they could map the overburden of rock by measuring the number of cosmic ray muons making it through. The group thanks Sanford Lab Motor Operator Neil Engle for setting up the generator to deliver power to the experiment.

Figure 9: Bridge-program students from BHSU explore tiltmeters, an instrument that measures the movement of rock in the underground mine, by measuring how the sensitivity of a tiltmeter varies with distance covered (Steve Babbitt, BHSU)

Members of The Center for American Indian Studies at BHSU visited Sanford Lab on August 23, bringing with them 30 entering freshman. The students, from the Summer 2012 'Bridge' program (an expanded orientation program for American Indian freshmen students), did a science experiment with tiltmeters (shown in Figure 9), and also toured the Hoist Room. Peggy Norris, Julie Dahl and Multimedia Specialist Matt Kapust helped with the activity and tours.

ENVIRONMENT, HEALTH & SAFETY

Autumn Safety

- Please drive slowly (~10 mph) in the area near Sanford Lab (Summit Street) and watch for the neighborhood kids on bikes.
- Wear appropriate clothes and shoes while doing fall yard work. Wet leaves and ground can be slippery. When lifting heavy leaf bags, pay close attention to your back and arms.

- When you are raking leaves, wear gloves or use an ergonomic rake. Protect your eyes if you are using a leaf blower.
- Keep children and family pets away from toxic plants such as mushrooms and autumn crocus, or herbicides and rodenticides.

Safety pages on Sanford Lab website:
www.sanfordlab.org - Use the left hand menu

UPCOMING CONFERENCES AND WORKSHOPS

Underground Science Experiments & Research Seminars (USERS) continue bi-weekly on Thursdays, 1:30-2:30 PM. Alternate sessions will be held at LBNL and UC Berkeley, 325 Old LeConte Hall. If you are interested in attending these seminars please subscribe to this email list for future announcements:
http://dusel.org/mailman/listinfo/ugsseminars

NNN12: Next Generation Nucleon Decay and Neutrino Detectors - October 4-6, 2012, Fermilab, Batavia, IL.
http://conferences.fnal.gov/nnn12/

DURA Events: Please send information regarding upcoming meetings of interest to DURA members to Richard_Gaitskell@brown.edu or jswang@lbl.gov.

JOBS

Assistant Professor position in Experimental Particle Astrophysics, Dept. of Physics & Astronomy, University of South Carolina. Collaborate with ultra-low background searches for dark matter, zero neutrino double beta-decay, and axions. Prof. Frank T. Avignone, Chair of Particle Astrophysics Search Committee, USC Physics & Astronomy, 712 Main St., Columbia, SC 29208. avignone@sc.edu. Deadline: 11/30/12. http://www.physics.sc.edu

Assistant Professor position in Experimental Nuclear Physics, Duke University. Research in electroweak interactions, neutrino physics, hadron structure, and nuclear astrophysics. Queries to: Calvin Howell, Chair of the Search Committee, howell@tunl.duke.edu with message subject "NP Search". Deadline: 11/30/12.
http://www.tunl.duke.edu/web.tunl.2011a.jobs.php

Postdoctoral positions – Experimental Particle Astrophysics, Queens University. Research on DEAP-3600 dark matter experiment with possible travel to SNOLAB. Mark Boulay, Associate Prof. & Canada Research Chair in Particle Astrophysics, DEAP Project Director, Dept. of Physics, Queen's University, Kingston, ON K7L 3N6 CANADA, c/o Louise Segsworth. louise.segsworth@queensu.ca http://www.sno.phy.queensu.ca/group/

Postdoctoral Associate – Center for Neutrino Physics, Virginia Tech. Study of neutrino oscillations, working primarily on the Daya Bay Reactor Neutrino Experiment in China. Prof. Jonathan Link, jmlink@vt.edu, Virginia Tech Physics Dept., 317 Robeson Hall, M/C 0435, Blacksburg, VA 24061. Job #0121584. http://www.jobs.vt.edu

Postdoctoral Research Associate in Astroparticle Physics – Purdue University, Indiana. Participate in XENON Dark Matter search. Design calibration systems, analyze data from the XENON100 experiment. Dr. Rafael Long, c/o Emjai Gregory, Purdue University, Dept. of Physics, 525 Northwestern Ave., West Lafayette, Indiana 47907. egregor@purdue.edu. Deadline: 9/28/12.

Wilson Postdoctoral Fellowship – Fermilab, Batavia, Illinois. Self-directed research in experimental physics for candidate with at least 2 years of postdoctoral experience. Deadline: 10/26/12. Wilson_fellowship@fnal.gov.
https://academicjobsonline.org/ajo/jobs/1802

Process Development Engineer – Fluke Corporation. Knowledge of Physics, Electronics, and Material Science will be relevant. Position is at corporate headquarters in Seattle.
https://danaher.taleo.net/careersection/external/jobdetail.ftl?lang=en&job=FLU000738

Newsletter Editor: Melissa Barclay
Contributors: Kevin Lesko; Bill Harlan (Planetarium show; Sanford Lab local news); Peggy Norris, Ben Sayler (Education and Outreach)

Photo Credits: Figs. 1-5,8: Matt Kapust; Fig. 1: Kathy Hart; Figs. 6,7: Sydney De Vries; Fig. 9: Steve Babbitt (BHSU)

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