

# HOMESTAKE DUSEL AND SANFORD LABORATORY NEWSLETTER

**Dear Homestake Collaboration,**

Welcome to the March 2010 monthly newsletter for Homestake DUSEL and South Dakota's Sanford Laboratory. We are always glad to receive your input on news, links to news articles, upcoming workshops, conference notices, scientific updates, information concerning the Collaboration, and other highlights relevant to our shared goal.

## Important Dates

**April 13-15, 2010: NSF DUSEL Status Review--Rapid City, South Dakota**

**May 25-29, 2010: LBNE collaboration--Deadwood Convention Center, South Dakota**



Figure 1:

*AARM Collaboration meeting group photo*

## AARM Collaboration Meeting at Berkeley

On March 19-20, 2010, the AARM Collaboration (Assay and Acquisition of Radiopure Materials, one of the Initial Suite of Experiments receiving S4 funding) held a collaboration meeting at the DUSEL Berkeley Office with over twenty participants coming from the United States and abroad. The goal of the meeting was to discuss the layout and cost of the laboratory facility (FAARM), shielding designs, progresses in  $\alpha$ -,  $\beta$ -,  $\gamma$ -screening devices, as well as plans for the next generation large-scale ultra-low level assay detector system. Preliminary but interesting characterization results for the Homestake site were also presented. The requirements for biological and engineering

applications, options for ICPMS, and NAA, underground copper electroforming, were all part of the agenda. Local DUSEL staffs discussed the baseline plan and schedule for the ISEs.



Figure 2: Dr.

*T.C. Onstott discussing biological applications with FAARM*



Figure 3: Dr.

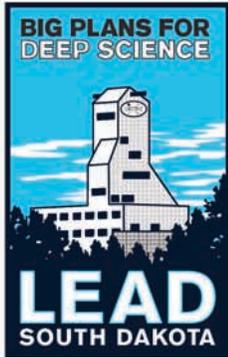
*P. Loaiza addressing questions about low-background counting at Modane*

The meeting was organized by Prisca Cushman (PI) and the CoPIs (Dongming Mei, Kara Keeter, and Richard Schnee). International members, including V. A. Kudryavtsev (Univ. Sheffield), P. Loaiza (Laboratoire Souterrain de Modane), and R. Ford (SNOLAB) presented assay plans elsewhere relevant to the FAARM project.

The collaboration would like to thank the local DUSEL Office staff for helping to turn this into a very useful and successful meeting.



## DUSEL IN THE NEWS



*Science opportunities deep underground* - Symmetry Magazine, March 3, 2010

Scientists are rushing to Lead, South Dakota. Find out why at:  
<http://www.symmetrymagazine.org/cms/?pid=1000785>

### BHSU Professor speaks on dark matter

Dr. Kara Keeter, the first professor of astroparticle physics at Black Hills State University in Spearfish (South Dakota), said competitive ice skaters pull their arms closer to their bodies in order to speed up their spins. If gravity is consistent throughout the universe, galaxies should operate the same way. But they don't. This is Keeter's analogy for one primary piece of theoretical evidence for dark matter....♦

### To read about these and other DUSEL stories:

*Rapid City Journal*

*BHSU Professor speaks on dark matter* – February 18, 2010

<http://www.duselwatch.com/>

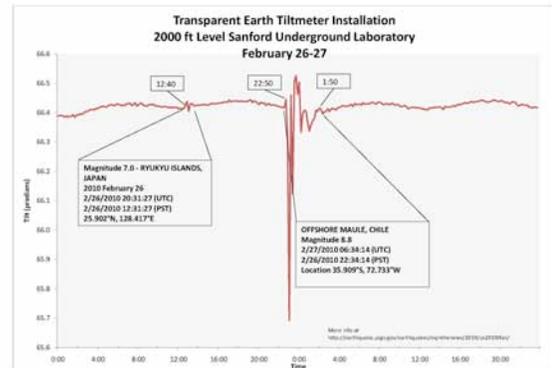
*BHSU reaping benefits of DUSEL* – February 23

*Lab receives signals of seismic proportions* – March 11

*Lab education center to be first of its kind* – March 11

*Saylor takes reigns* – Black Hills Pioneer - March 5

## Science News



*Figure 4: Output from Transparent Earth experiment for the Chilean Earthquake*

**The Transparent Earth Group** has installed sensors at four locations within the Sanford Underground Laboratory. The above plot (Figure 4) shows the effects of a Magnitude 7.0 earthquake in Japan and the Chilean 8.8 earthquake on one of the installed tiltmeters. As the P and S waves move away from the earthquake's epicenter, they deform the rocks through which they are traveling; this tiltmeter records the changing angle of the ground relative to horizontal. In much the same way, a kayaker on the ocean could detect a wave traveling underneath by observing luggage sliding towards either the back or front of the boat.

### Discovering “microbial dark matter” at DUSEL

A pilot study by Ramunas Stepanauskas from Bigelow Laboratory for Ocean Sciences in Maine suggests that the Homestake gold mine is also a “gold mine” for previously unknown forms of microbial life. New research tools, developed at Bigelow Laboratory, enabled the recovery of genomic material from individual microbial cells collected directly from the subsurface environment, something that was not possible until very recently.

New studies indicate that terrestrial and marine subsurfaces contain an enormous, previously unrecognized profusion and diversity of microbes. Although invisible to human eyes, unicellular microorganisms are the oldest, the most abundant, and the most diverse forms of life on our planet. They dominate many functions of the biosphere and have a significant impact on Earth's geology.

Microorganisms also harbor an enormous potential for novel natural product discovery and bioenergy production. However, over ninety-nine percent of microbial species remain uncultured. This “microbial dark matter” is inaccessible to classical microbiology research methods.



*Figure 5: Fracture water sample collection at 300' Level*

Using novel, cultivation-independent techniques, Stepanauskas recovered genomic DNA from individual microbial cells collected at the 300' level at Homestake mine. Among the obtained single amplified genomes (SAGs), twenty-two belonged to the elusive candidate phyla OP3, OP11 and OD1, for which so far there is not a single cultured representative. Another six SAGs were identified as Archaea that likely form three previously undiscovered phyla. Based on their biological novelty, the DOE Joint Genome Institute selected eight of the Homestake SAGs for whole genome sequencing, as part of the Genomic Encyclopedia of Bacteria and Archaea (GEBA) initiative. The obtained genomic information will provide first insights into the metabolism, evolutionary history, biogeochemical roles, and biotechnology potential of these mysterious microbial groups. This pilot study also helps designing future DUSEL experiments at the lower levels of the mine, which will provide information about interactions between biological and geological processes and about depth and thermal limits of life in the subsurface.

### **Hank Sobel, UC Irvine, wins Pontecorvo Prize**

The award is given annually to a distinguished scientist for the most significant investigation in particle physics. Dr Sobel has worked on many notable neutrino experiments, including Savannah River, IMB, CHOOZ, Super-K, K2K, and T2K Long Baseline Neutrino Oscillation Experiments. Most recently, he is involved with DUSEL as a member of

the DUSEL User Research Association and the Experiment Development committee.

*Einstein right on time*, February 17, 2010 – <http://plus.maths.org/latestnews/jan-apr10/einstein/>  
Also **Nature** — [www.nature.com/nature](http://www.nature.com/nature) - February 18 issue



### **DUSEL Project meetings**

The Science Liaison Group, headed by Dr. Steve Marks, is now meeting weekly at the Berkeley DUSEL Project Office.

During the weeks of March 22 and March 29, Dry Run presentations will be held in preparation for the NSF Status Review in April.

In March, Sanford Lab hosted seven separate meetings: HDR surface campus cultural meeting, two other HDR related meetings, DUSEL Cyber Infrastructure Advisory committee, OSHA meeting on the Yates Shaft, AHJ meeting, and LUX EHS Engineering Review.

Look for further details on some of these meetings in this and future newsletter issues.

### **SANFORD UNDERGROUND LABORATORY AT HOMESTAKE**

**4850 Level:** As of March 1, the secondary access drift to the Davis Cavern is complete. The large Transition cavern grows daily. The new 4850 Level substation will power the pumps on the 5000 Level as well as the new deep-water submersible pump.



Figure 6: Mike Heinrich of Hydro Resources checks out the transformer. Steel wall in background is 6 Winze.

On March 10, engineers from Hydro Resources worked at 6 Winze on the 4850 level, installing two transformers and three “variable frequency drives” that will power the 1500 horsepower deep-water pump.

The pump will lift water from below the 7400 Level to the 5000 Level, driven by two 750 horsepower pumps.

According to Engineer Randy Badger of Hydro Resources, the oil industry uses this same kind of pump in the North Sea, and similar pumps are used in geothermal wells in Nevada. Pumping is expected to start mid-April.

**The Oro Hondo substation** has been upgraded so that it will be in phase with the Ross substation. This is part of the transition from Homestake gold mine to Sanford Laboratory. Having the two substations in phase will improve power quality and reduce costs. Sanford Lab infrastructure facility techs Mark Javersak and Jason Rath and Karl Besler of Besler Inc. performed the work with Engineering Director Rick Labahn.



Figure 7: Karl Besler of Besler Inc. at the 69kV Oro Hondo substation



Figure 8: Facilities Techs Mark Javersak (left), Jason Rath (ladder) and Engineering Director Rick Labahn, working on Oro Hondo phase swap

## Education and Outreach

### Planning for the Sanford Center for Science Education

Initial cultural and community workshops were held on March 9 and 10, 2010 in Rapid City and Lead, respectively, to gain community input at an early stage into the site design principles for the DUSEL surface campus, including the Sanford Center for Science Education. The workshops were organized and facilitated by HDR CUH2A, the contractor for the surface campus, and their landscape architecture subcontractor, Wyss Associates. Themes that resonated in both workshops included attention to the environment and attention to the historical and cultural context of DUSEL’s location in the Black Hills. Public meetings are planned to continue throughout the spring in order to keep local, regional and statewide communities informed and engaged in the planning process.

### Ongoing Education and Outreach Activities

Sanford Lab/DUSEL was represented at several events across South Dakota recently introducing careers in science and/or engineering to middle and high school students:

1. Tessa Jones and Brendan Matthews took part in the Sturgis school career fair.
2. Peggy Norris and Wendy Zawada participated in a panel discussion on careers for women in science and engineering in Madison, sponsored by the American Association of University Women. About fifty middle, high school and undergraduate girls took part.

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3. Peggy Norris took part in Women in Science Day in Aberdeen. One hundred and fifty middle and high school girls participated in the event.
4. The following day, Peggy also attended the Women in Science Day in Sioux Falls, which attracted 650 eighth grade girls.

The Davis-Bahcall Scholars and Homestake-Fermilab Scholars have been announced for 2010 (see Figure 9, Table below). The twenty successful students (out of eighty applicants) are among the top-achieving science and math students in South Dakota. The Davis-Bahcall Scholars will spend a week at Sanford Lab, a week in Europe (CERN and Gran Sasso) and three weeks studying physics at Princeton. The Homestake-Fermilab Scholars will spend two weeks at Fermilab followed by a week at Sanford Lab. In the future, the national laboratory program will alternate years between Fermilab and Brookhaven. The programs are successful due to a generous donation by 3M Corporation.

**Figure 9: 2010 South Dakota Science Scholars**

Davis-Bahcall	School	Hometown
<b>Bailey Breems</b>	Roosevelt High School	Sioux Falls
<b>Nicole Dejong</b>	BHSU	Avon
<b>Jerald Farke</b>	SDSMT	Armour
<b>Bryce Frentz</b>	Washington High School	Sioux Falls
<b>Andrew Gaspar</b>	O’Gorman High School	Sioux Falls
<b>Steven Harding</b>	USD	Jefferson
<b>Louis Kjerstad</b>	St. Thomas More High School	Rapid City
<b>Dexter May</b>	Brookings High School	Brookings
<b>Virginia Price</b>	Montana State University	Rapid City
<b>Stephanie Vedvei</b>	Groton Area High School	Groton

Homestake-Fermilab	School	Hometown
<b>Carlos Beatty</b>	SDSMT	Douglas
<b>Erica Drealan</b>	SDSU	Fulda, MN

<b>Casey Janisch</b>	Clark High School	Clark
<b>Amber Kruse</b>	Mount Marty College	Scotland
<b>Kariah Kurtenbach</b>	Brookings High School	Brookings
<b>Cody Marnach</b>	Lincoln High School	Sioux Falls
<b>Nicholas Padilla</b>	Sturgis Brown High School	Piedmont
<b>Alexander Reid</b>	Spearfish High School	Spearfish
<b>Stephen Shaefer</b>	Home School	Rapid City
<b>Erika Zetterlund</b>	Augustana College	St. Cloud, MN

Several of last year’s scholars are continuing to pursue their interests in DUSEL science and engineering. One student will be interning at Brookhaven working on the Long Baseline Neutrino Experiment, a second at Princeton, and a third will be stationed at Sanford Laboratory working with the Nuclear Astrophysics collaboration. Others are interning around South Dakota at various universities and colleges.

## ENVIRONMENT, HEALTH & SAFETY

### Spring Break Safety

Spring break is a great time for the family to get away from the cold, dark days of winter and have some fun in the sun. Keep your family safe while on your trip. Bring sunscreen, drink plenty of water, and have a good time!

College students: Don’t drink too much. Don’t Drink and Drive. Use a designated driver or choose public transportation.

**FOR INFO ON WEATHER CONDITIONS IN SOUTH DAKOTA, CALL: 605-722-0002**

## Cultural Advisory Committee



### Black Hills State University Annual Pow-wow

During the week of April 12-18, 2010, Lakota Ominici will host the 27th annual "Lakota Ominiciye Wacipi" during American Indian Awareness Week. This event is dedicated to educating the community about Indian culture featuring daily speakers and a variety of events at Black Hills State University.

If you are coming to the April NSF status review in Rapid City, please plan to stay for the weekend and attend the annual "Lakota Ominiciye Wacipi". The Grand Entry starts at 7 PM on April 17 and Wacipi continues on April 17 and 18.

For more information:

<http://www.bhsu.edu/Research/Centers/AmericanIndianStudies/Events/tabid/576/Default.aspx>

## NEW STAFF



**Connie Davis** has accepted the position of Preliminary Design Report Manager, reporting to Kem Robinson. Connie was recently a bank executive with extensive experience in program management, leadership, facilitation and problem resolution. Connie will be responsible for the creation of the Preliminary Design Report, Final Design Proposal, Interim Activities Proposal and the CA2 supplement in addition to a variety of administrative functions that are critical to the successful delivery of NSF/DOE project deliverables. Please join us in welcoming Connie to the DUSEL team.



**Richard Hislop** comes to the DUSEL project with extensive experience in Project Management and Facility Safety Management. His past employers include Exxon Coal and Minerals, Argonne National Laboratory, and most recently, Stanford Accelerator Center. Of particular interest to us are the results of the numerous safety programs he has been involved in developing over the past twenty-five years. His first large project in Saudi Arabia worked eight million hours without a lost time injury, then a Coal Mining Project that worked twelve million hours with only three lost time cases over five years, and the construction of two recent DOE projects with a total of nine million hours without lost time injuries. We look forward to Richard joining us and working with us to help develop our project's safety program. Please share your safety observations and suggestions with him when you have the opportunity to meet him.



**Jennifer Regan** joined the DUSEL team on March 1 as the Document Quality and Management System Improvement Specialist and is assisting Susan von Stein in the Environmental Health & Safety Department. Jennifer has worked in the health care field as a LPN for the last fourteen years during which time she was a member of a multispecialty clinic's Safety Committee, served as an OSHA officer, and assisted in implementing an electronic medical records system. She has also been a certified EMT and looks forward to assisting the Emergency Response Team. Jennifer was born and raised in Lead, SD and is excited to be part of the DUSEL project.

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## JOBS

Tenure-track Assistant Professor in Physics. University of South Dakota. Faculty in the department are involved in the LUX, Majorana, DEAP/CLEAN and AARM collaborations. Apply online at <https://yourfuture.sdbor.edu>. or mail to Chair of Physics Search Committee, Department of Earth Sciences and Physics, The University of South Dakota, 414 East Clark, Vermillion, SD 57069. Deadline: March 31, 2010.

Augustana College (SD) one-year position for Visiting Assistant Professor, Department of Physics, start date: Sept. 1, 2010. Required: Doctorate in physics, a record of successful physics instruction at the TA level or beyond, comfortable with laboratory instructional equipment. Will teach physics curriculum courses including courses for non-majors. Full details may be found at:

[http://www.augie.edu/admin/human\\_res/prospective/facultypositions.html#physics](http://www.augie.edu/admin/human_res/prospective/facultypositions.html#physics)

Postdoc Research position in neutrino physics, Physics Dept, Stanford. Contact Ms. Marcia Keating, Varian Physics, Stanford, CA 94305-4060; email: [mkeating@stanford.edu](mailto:mkeating@stanford.edu).

Postdoctoral Research Associate position: Physics Dept at Brookhaven National Lab. Participate in group's activities including design of Long Baseline Neutrino Experiment at DUSEL in South Dakota. Under the direction of S. Kettell, Physics Dept. For more info: <http://www.bnl.gov/hr/careers/> - Click on Search Job List. Ref: Job ID # 14944.

Postdoctoral Research Position in experimental particle/nuclear physics, University of South Dakota. Apply online: <https://yourfuture.sdbor.edu>. Contact: Vincente Guiseppe, [vincente.guiseppe@usd.edu](mailto:vincente.guiseppe@usd.edu)

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Photo Credits: Figs. 1-3: Yuen-Dat Chan; Fig. 4: Jason van Beek; Fig. 5: Ramunas Stepanauskas; Figs. 6-8: Bill Harlan; Figure 9: Peggy Norris.

## NEW ADDRESS

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