

HOMESTAKE DUSEL AND SANFORD LABORATORY NEWSLETTER

Dear Homestake Collaboration,

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

Important Dates

April 28, 2010 – Internet2 Broadcast from Homestake

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



Figure 1: DUSEL NSF Status Review attendees, outside Surbeck Center, South Dakota School of Mines & Technology

DUSEL NSF Status Review

On April 13-15, over one hundred and fifty people met on the campus of the South Dakota School of Mines & Technology in Rapid City for the DUSEL NSF Status Review. The reviewers included panelists from around the country headed by Dr. Ed Temple of Argonne. The panel was accompanied by NSF program officers, led by Wayne Van Citters, Joe Dehmer, and assisted by David Lissauer, Patti McNamara, Steve Meador, Alex Firestone, Jim Whitmore, Allena Opper, and Mark Coles. DOE officials observing the review included Dan Lehman, Mike Procaro, Eli Rosenberg, Gene Henry, and Jon Kotcher. Participants and observers included essentially the entire DUSEL staff from Berkeley and South Dakota, members of the SDSTA Board,

DUSEL contractors ARUP, Golder, HDR, McCarthy, and Kiewit, Oppenheim Lewis, and university officials from Berkeley and South Dakota. The review panel was welcomed by President Wharton (SDSM&T), Vice Chancellor for Research Graham Fleming (UCB) and NSF Senior Advisor Wayne Van Citters.

The observers included members from essentially all of DUSEL's Scientific Collaborations including DOE's LBNE, AARM, COUPP, EXO, GEODM, LZ, MAX, 1TGE, DAEdALUS and many of the bio/geo/engineering (BGE) experiments. About twenty people attended remotely by teleconference and webex. A separate LBNE Collaboration meeting will be held in Deadwood, South Dakota at the end of May.

The review focused on the status of the DUSEL Preliminary Design, particularly noting the progress since the February 2010 review. The panel reviewed topics spanning from overall project scientific goals to the design of the DUSEL facilities, science integration, education & public outreach, and cost, schedule, and management. The review began with a day-long site visit on 12 April by the Environment, Health and Safety panel members and NSF officials. This visit, which included an inspection of the Ross shaft, 2450 and 4850 Levels, noted the improvements in safety infrastructure and programs, and advances in building a culture of safety across all the staff working at Homestake. The review emphasized the transition of the DUSEL Project and Sanford Lab into a single entity, integrating the Berkeley and South Dakota staff, infrastructure, and effort. The latter is no small task, as the DUSEL staff has quickly grown to nearly one hundred people.

A Science Breakout session highlighted the importance of establishing the experimental requirements from DUSEL's Science collaborations and integrating these into the overall design. Nearly one hundred scientists attended, in observer or review capacities.

At the Review, DUSEL welcomed some new staff. William Griffing has been brought on as the ES&H Director. Some of the scientists already knew "Griff" from his previous position at Fermilab. Jean Souza and Dick Horn are Systems Engineers from Stellar Solutions, and both bring outstanding experience and resumes to the project.

Project funding was a discussion topic at the review. In these economic times, this should be no surprise. Thanks to Governor Mike Rounds' leadership, the Sanford Lab received additional assistance, specifically \$5.4M, from the State of South Dakota. The reviewers actively engaged the Project leadership and the Agency observers to understand the necessary future funding for the Project. A Physics Advisory Committee has also been formed to address some of these issues. More on this group below.

The reviewers expressed appreciation for the progress shown by the Project team, in particular in tackling complex problems such as the merging of DUSEL and Sanford Lab organizations and efforts. Dr. Joseph Dehmer, Director of the Physics Division at NSF, said that reopening Homestake as an underground lab is "one of the boldest, most exciting things going on science."

"I'm very impressed by the progress of the DUSEL Team," Dehmer reported.

DUSEL Physics Advisory Committee (PAC)

At the beginning of April, the DUSEL Physics Advisory Committee (PAC) was formed, reporting to UC Berkeley's Vice Chancellor for Research, Graham Fleming. Mike Witherell, UCSB will be the Physics Chair, and Mark Zoback of Stanford will chair the Earth Science section. An impressive group of scientists has agreed to participate. For Physics, these include Allen Caldwell (Max Planck Institute, Munich), Boris Kayser (Fermilab), Hitoshi Murayama (IPMU and UCB), Peter Parker (Yale), Michael Ramsey-Musolf (Univ Wisconsin), Heidi Schellman (Northwestern), Abe Seiden (UCSC), and Yoichiro Suzuki (Univ Tokyo). The Earth Sciences area includes Don DePaolo (UCB, LBNL), Steve Hickman (USGS), Art McGarr (USGS), and Patricia Sobecky (Univ Alabama).

The group will provide a thorough and critical review of the proposed multidisciplinary science program for DUSEL. Throughout the summer, leading up to the Preliminary Design Report due to NSF in Fall 2010, they will review the science program and the proposed generic suite of experiments to be included in the MREFC. The PAC will also work within the community and agencies concerned to explore and identify additional funding sources within the United States and internationally which

will support the scientific collaborations and experiments proposed for installation at DUSEL.

We extend a warm welcome to the PAC group, with thanks in advance for the effort and contribution they will provide to the DUSEL Project.

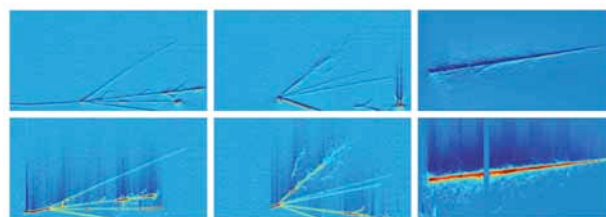


Figure 2: Events in the ArgoNeuT detector running in the NuMI neutrino beam at Fermilab from 2009-2010. For each of the three events from left to right there are two images, top and bottom, showing the topology and the collected charge (bottom) of each event.

DUSEL Science: LAr20 within the LBNE Project

The Long Baseline Neutrino Experiment (LBNE) will measure the last of the unknowns in the neutrino oscillation-mixing matrix. In doing so, scientists hope they can observe CP violation among neutrinos—the broken symmetry between matter and antimatter—by measuring the different behavior of neutrinos and antineutrinos as they travel more than 1,000 kilometers through the earth from Fermilab to DUSEL.

To accumulate enough neutrino interactions, long baseline neutrino oscillation searches require lots of neutrinos in the neutrino beam, massive detectors, and very efficient detection techniques. A very promising detector technology under consideration for this program is Liquid Argon Time Projection Chambers (LArTPCs). Charged particles produced from neutrino interactions passing through the Argon knock off electrons in their paths creating "shadows" of the interactions. These shadows are drifted to the edge of the detectors where their images are recorded. Figure 2 shows images of neutrino and cosmic ray interactions in a much smaller version of LAr20 called ArgoNeuT. Multiple planes readout the same image giving, in ArgoNeuT's case, two views which show the topology of the event and one view (the bottom view) which shows the energy deposited along the track, indicated by the color. The combination of topological signature and energy deposited differentiate between particle species in

HOMESTAKE DUSEL AND SANFORD LABORATORY NEWSLETTER

the detector, making these ideal detectors for long baseline neutrino oscillation physics. In addition to neutrino oscillation physics, these detectors can be used to search for proton decay, neutrinos from the cosmos, and neutrinos from the earth.

The goal for the LBNE program is to build these detectors on a massive scale in 20 kton modules up to a total of 60 ktons. Development of these detectors from the smallest scales such as ArgoNeuT (0.3 tons) up to these massive scales is underway. The LAr20 group within the LBNE collaboration is developing a conceptual design for this detector as shown in Figure 3. Siting of the modules at the 300 ft, 800 ft, and 4850 ft depths are being considered.

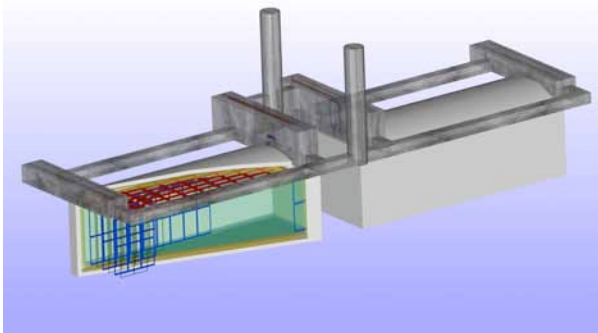


Figure 3: Conceptual design for two LAr20, 20 kton LArTPC modules. Personnel, Equipment, and exhaust shafts, drifts, and assembly halls at the top of the membrane Liquid Argon cryostats allow for access and assembly inside to the modules. The TPC readout planes are hung like curtains within the modules. Each module is 19m wide by 20.4m high by 68m long.

DEDC Update - Transition from DEDC to a Users' Association (DuRA)

DUSEL Experiment Development and Coordination (DEDC) will morph from its current format to a users' group. On April 9, a letter was sent to the DUSEL mailing list to solicit input on this transition. Details of this proposed transition, the proposed charter for the "DUSEL Research Association", and the opportunity to comment on this transition are included at: <http://dusel.org/DEDCDURA.html>

NSF and USGS Briefing

On April 16, members of the DEDC visited NSF-EAR and the USGS in Washington DC to present the current BGE science plan and to brief both agencies on the current status of DUSEL. At USGS, opportunities for the agency to participate more fully in the DUSEL laboratory were discussed.



DUSEL IN THE NEWS

To read about DUSEL stories:

www.sanfordlab.org/ - Go to "Twitter updates" in lower left hand column for KELO TV story about the DUSEL Review

The Deep Underground Science and Engineering Lab - How it Works Issue Six, Imagine Publishing, Bournemouth, England, 54-55.

Rapid City Journal

Hunting WIMPs in the Black Hills – March 24, 2010
Sanford Lab communications system – March 25

<http://www.duselwatch.com/> - Wendy Pitlick

Lab funding approved – March 16

Lab video draws from statewide, national talent pool – March 30

LUX scientists explain dark matter experiment to standing-room only crowd – April 5

SANFORD UNDERGROUND LABORATORY AT HOMESTAKE



Figure 4:

Water Plant Chief Operator Ken Noren, center, checks pipes in the sand-filter quonset with consultant Jim Whitlock, left, and Maintenance Tech Duane Ennis. Filters in these blue tanks remove iron from the water.

Water Plant

The South Dakota Department of Environment and Natural Resources has awarded the Sanford Lab water treatment plant team the 2009 Operation and Maintenance Excellence Award.

Announcing the award, DENR Secretary Steve Pirner said, "The people who maintain and operate the systems that collect and treat our wastewater, 24 hours a day and seven days a week, are on the front lines of protecting public health and the environment." The award was presented at the Wastewater Operators Seminar in Rapid City.

Sanford Lab Environmental Manager John Scheetz pointed out that the engineering and operational challenges treating the Sanford lab water were unique. "It takes a lot of skill and ability to manage these problems," Scheetz said.



Figure 5: Computer screen shot shows a graphical user interface that illustrates the Ross Shaft and underground pump rooms

Chief Water Plant Operator Ken Noren, who has more than twenty years' experience in the industry, says the past two years at the Sanford Lab have been the most interesting of his career. "This is a constantly changing environment," he said. Noren and his team of operators can control the entire process by computer, but making it all run smoothly also requires personal inspections of the entire plant -- at all hours and in all weather. (Both of Noren's sightings of mountain lions were in predawn hours during twelve-hour night shifts.)

The Sanford Lab plant can treat five million gallons of water a day, but Noren said some of the biggest challenges come when water flow from underground is lowest and temperatures up top plummet below zero. Noren and his colleagues have devised ways to keep the plant operating in the severest weather.

Everyone on the treatment plant team brought experience with them. Noren operated municipal plants at Spearfish and Whitewood. Plant Operators Jackson Pahl and George Krebs were operators at Ellsworth Air Force Base. Richard Reif operated this same plant for twelve years during Homestake days. Pat Hasson brought experience from another gold mine. Duane Ennis is a twenty-year Homestake veteran. Environmental Manager John Scheetz ran the treatment plant during mining days.

Consultant Jim Whitlock helped design the Homestake plant in the early 1980s. The original facility won national awards for an innovative system to remove cyanide from mine process water. The Sanford Lab team modified the plant in an equally innovative way to remove iron from the water.



Figure 6: LUX Collaborators at Sanford Lab

LUX Collaboration meeting

More than fifty researchers from the LUX dark-matter collaboration met at Sanford Lab from March 26-28. Prior to the main meeting, a four-day workshop for graduate students and postdocs took place.



Figure 7: Texas A&M students Ty Stiegler (left), Rachel Mannino and Clement Sofka with the LUX detector, ready for assembly,

Public Science Lecture

On March 30, while in South Dakota for the LUX collaboration meeting, Dr. Rick Gaitskell of Brown University and Dr. Tom Shutt of Case Western Reserve University discussed their experiment during a free evening public lecture, "Hunting WIMPs in the Black Hills," at the Golden Hills Resort in Lead, S.D.

They are installing a dark-matter detector 4850 feet underground in the Sanford Underground Laboratory at Homestake in Lead. The LUX dark-matter detector will be the first major physics experiment at the Sanford Lab.

"We need the unique opportunity this facility gives us," Dr. Gaitskell said. So far, no one has detected a "weakly interacting massive particle," or WIMP, which is a leading candidate for dark matter. "It's truly one of the great challenges of the early 21st Century," Dr. Gaitskell says.

In December, dark matter made headlines when researchers announced they had discovered a possible hint of the substance in an experiment deep in a former iron mine in northern Minnesota, but those results were inconclusive. Dr. Gaitskell and Dr. Shutt previously worked on that Minnesota experiment.

Dr. Shutt said that if WIMPs exist, we should be able to detect them on earth--if the detector is sensitive enough. "Some 30 percent of the universe is in the form of a dark matter fundamentally different from ordinary matter," Dr. Shutt reports.

So far, Sanford Lab's "Deep Science for Everyone" lecture series has introduced more than 3,000 people to some of the world's top scientists.

To read or watch the full talk on video:
<http://lux.brown.edu/news.html>

Education and Outreach

Planning for the Sanford Center for Science Education

At the NSF DUSEL Review in Rapid City, Education and Outreach reviewers met for updates on plans for the Sanford Center for Science Education facility, its

institution and the programs and exhibits that will be housed there. The review went very well.

The mission of the Sanford Center for Science Education is to draw upon the science and engineering of DUSEL, its human resources, its unique facility, and its setting within the Black Hills to develop and facilitate rich, innovative learning experiences that engage and connect diverse audiences of students, educators, scientists, engineers, and the general public, that inspire and prepare future generations of scientists, engineers, and science educators, and that deepen understanding of science.

Education Advisory Committee

The Education Advisory Committee (EAC) has been reconstituted and broadened. The new Committee met for the first time in early April in order to review a revised mission and vision for the SCSE. Members of the EAC include Jacquelyn Bolman (Dir. Center for Indian Education, Humboldt State Univ.), Willi Chinowsky (Prof. of Physics Emeritus, UCB), Rose Emanuel (Physics and Astronomy Teacher, Lead-Deadwood High School), Bob Jacobson (Prof. of Physics, UCB), Keith Moore (Dir of Indian Education, USD), Tom Oster (Sec. of Education, State of SD), Nigel Smith (Director, SNOlab), Susan Van Gundy (Dir. of E&O, National Digital Science Library), Jack Warner (Executive Director, SD Board of Regents), and Luann Werdell (Dir. of Indian Education, State of SD).

Ongoing Education and Outreach Activities

The 2010 Dave Bozied summer interns have been announced. These ten-week Sanford Laboratory internships--sponsored by the SDSTA--are named in memory of SDSTA Board Member, Dave Bozied. The 2010 interns and their departments are:

- Katie Aurand, SDSMT (Environmental Engineering)
- Mandi Durch, Montana State (Science)
- Shannon Jones, BHSU (Science)
- Jake Russell, SDSU (Engineering)



Figure 8: George Campbell, DUSEL Cultural Coordinator at

the Sanford Lab booth

Lakota Ominiciye Wacipi

The DUSEL Cultural Affairs Committee sponsored a table at the Lakota Ominiciye Wacipi, a pow-wow held on the Black Hills State University campus April 16-18. George Campbell, Peggy Norris and other members of the Committee talked with interested attendees about Sanford Lab, the plans for DUSEL and careers in science and engineering.



For more information:

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

ENVIRONMENT, HEALTH & SAFETY

Environment, Health & Safety efforts have been re-organized for DUSEL and Sanford Lab, unifying the two organizations into a single entity, and establishing the EH&S Oversight Committee, chaired by Craig Ferguson (SLAC). The EHSOC reports to UC Berkeley's Vice Chancellor for Research Graham Fleming. DUSEL has also added significant staff to EH&S, in particular William Griffing and Richard Hislop.

Dr. Kevin Lesko has requested that the EH&S Advisory Committee establish several task forces to assist Griff and Richard Hislop focusing on the science safety programs as well as incident investigations and reporting.

The DUSEL Project wishes to express its appreciation to Susan Von Stein for her dedicated efforts in breaking ground on DUSEL's EH&S programs and to wish Susan well in her future endeavors.



Spring Cleaning Safety

Wear comfortable clothes and shoes. Use proper lifting techniques. If you feel tired or dehydrated, stop to take a break. Be cautious on ladders. Block small children's access to wet floors. Keep stairs, landings, and walkways clear of boxes, bags and other clutter. Don't carry too much at once, especially on stairs. Cleaning supplies can create toxic fumes, so make sure you get some fresh air by opening windows. Keep cleaning supplies away from children and pets.

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

NEW STAFF



William (Griff) Griffing has been recently brought in as EH&S Interim Director. This follows on a thirty-five year career in the EH&S field working for OSHA, the Department of Energy (DOE), and two DOE-funded national laboratories: NREL and Fermilab. Griff was the ES&H Director at NREL for eight years and the ES&H Director at Fermilab for thirteen years before retiring in 2009. After a year of retirement, he accepted the interim assignment of EH&S Director at DUSEL.

Griff considers the DUSEL project a challenging assignment and a rare opportunity to build an EH&S Program at a facility with the potential to rise to national laboratory status in the U.S.



Mandy Knight accepted a position with Sanford Lab at Homestake in December 2007 and joined the DUSEL team as Senior Project

HOMESTAKE DUSEL AND SANFORD LABORATORY NEWSLETTER

Specialist in December 2009. She provides administrative support to the project staff including planning and supporting workshops and conferences. She is the first point of contact at the DUSEL SD Project Office. She also assists the South Dakota Science and Technology Authority Board of Directors. She earned her Bachelor of Science degrees in Biology and Environmental Science with an emphasis in business at Northern State University in Aberdeen, SD. Mandy's experience in business ownership, office management and administration helps her contribute to the success of the DUSEL project. Mandy and her husband, Chad reside in the beautiful Northern Black Hills of South Dakota with their chocolate Labrador, Caffrey.

Upcoming Events and Announcements

Calling on DUSEL Science groups in the Washington, DC area: The Inaugural USA Science & Engineering Festival, the country's first national science festival, will descend on the Washington, D.C. area in October 2010. "The Festival promises to be the ultimate multi-cultural, multi-generational and multi-disciplinary celebration of science in the United States. The culmination of the Festival will be a two-day Expo in the nation's capital that will give over 500 science & engineering organizations from all over the United States the opportunity to present themselves with a hands-on, fun science activity to inspire the next generation of scientists and engineers."

For more information: usasciencefestival.org

DUSEL/Sanford Lab will have a tent at the Expo in the Mall on Saturday and Sunday, October 23-24. We will have several hands-on activities set up, and need some enthusiastic and energetic volunteers. If you live close to the DC area, please consider sending some of your postdocs and graduate students to volunteer for a few hours in the DUSEL tent, or even participating yourself. Contact Peggy (pnorris@sanfordlab.org) for more details.

Nominations Sought for DuRA Executive Committee

DEDC is seeking nominations for members of the DUSEL community to serve on the DuRA Executive Committee. This committee will represent the sub-surface science community and liaise with the facility and the funding agencies. Details of the roles of the committee are available at:

<http://dusel.org/DEDCDURA.html>

Please send nominations to Derek Elsworth (elsworth@psu.edu) before Friday May 7th including e-mail contact information for the nominee. They will gather a slate of names, confirm that individuals are willing to serve and process an online vote to select the initial membership. They expect that the installed DuRA will write a proposal in support of their various activities.



JOBS

Postdoctoral Position in Experimental Dark Matter Physics. Southern Methodist University. Contact Jodi Cooley, cooley@physics.smu.edu. For more details:

http://www.physics.smu.edu/web/jobs/supercdms_postdoc.html

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

Postdoc Research position in neutrino physics, Physics Dept, Stanford. Contact Ms. Marcia Keating, Varian Physics, Stanford, CA 94305-4060; email: 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.Guiseppa@usd.edu

HOMESTAKE DUSEL AND SANFORD LABORATORY NEWSLETTER

Newsletter Editor: Melissa Barclay

Contributors: Kevin Lesko, Bill Harlan, Bonnie Fleming, Derek Elsworth, William Griffing, Mandy Knight, Peggy Norris, and Ben Saylor.

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NEW ADDRESS

UC Berkeley
DUSEL Project Office
2440 Bancroft Way, Suite 303
MC 1295
Berkeley, CA 94720-1295
Fax: 510-642-2258

HOMESTAKE DUSEL CONTACT INFORMATION

University of California at Berkeley

Kevin T. Lesko: 510-642-0147

KTLesko@berkeley.edu

Melissa Barclay: 510-642-2244

mbarclay@berkeley.edu

<http://www.dusel.org/>

South Dakota Science and Technology Authority

Ron Wheeler, Executive Director

Mandy Knight, 605-722-8650, x222

MKnight@sanfordlab.org

<http://www.sanfordlab.org/>

South Dakota School of Mines and Technology

William Roggenthen: 605-394-2460

William.Roggenthen@sdsmt.edu