

## Dear Homestake Collaboration,

Welcome to the February 2012 monthly newsletter for Homestake SURF 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 SURF, employment opportunities, and other highlights relevant to our shared goal.

### Important Dates

**February 27-March 2: APS Meeting – Boston, MA**

**March 26-30: LBNE Director's Review – Fermilab**

## SURF: Supplement Articles

Over the next few months, a series of SURF Newsletter Supplement articles will explore some of the science basic to the Sanford Underground Research Facility, e.g., the LUX and MAJORANA DEMONSTRATOR experiments to be housed at the Davis Campus 4850 Level. The first installment, "The Construction of a Low-Background Underground Laboratory at the 4850 Level" will be available on [www.dusel.org](http://www.dusel.org) soon! Figure 1 shows an advance example.



*Figure 1: Laboratory outfitting taking place at the Davis Campus 4850 Level*

## Message from Kevin T. Lesko, SURF Principal Investigator

As many of you are aware, the President's Budget was made public on February 13. The budget reflects the active discussion in Washington that we see everyday in the news regarding the budget

deficits: funding for fundamental physics research is austere, in particular, the funding for new construction projects is challenged. We are working very closely with our colleagues in the Long Baseline Neutrino Experiment project. We are pleased to see significant advances in the development of the project, including making the detector technological choice, preparing for the CD-1 review this year, and we note that the recent experimental measurements of the neutrino oscillation parameter,  $\Theta_{13}$ , emphasizes the importance of this critical domestic high energy physics experiment coupling Fermilab to Homestake. We share their concern over their budgets and will continue to support them in responding to these challenges.

Support for SURF is continued in FY13 in the President's Budget. We are heartened that the support of the administration is there as we prepare for the installation of both the LUX Dark Matter and MAJORANA DEMONSTRATOR experiments in the Davis Campus. We have actively engaged DOE to ensure that they understand the level of support required to complete the installation this year and continue to operate the experiments safely in the coming years, as well as maintaining the facility as DOE contemplates LBNE and other projects. We are very pleased that both the DOE and the NSF have announced plans for further underground experiments: DOE announcing plans to develop Generation-2 Dark Matter experiments, and the NSF a broader program supporting a variety of underground physics experiments. We are working with a number of collaborations and communities to understand how SURF will provide an expedient path to and cost effective facilities hosting these experiments. We are exploiting our earlier NSF work, of course, and using the exceptional design and engineering team that has proven itself so capable over the past six years.

In particular, I want to thank and congratulate the SURF operations and scientific staff for their efforts to complete the outfitting of the Davis Campus by March 2012, and prepare for the installation and commissioning of LUX and MAJORANA DEMONSTRATOR. Their focus on safety, science and proficiency in installing two underground experiments is a great example of the best possible response we can have while we work on understanding and finding meaningful solutions to the next year's budget situation.

We will continue to work with the Office of High Energy and Nuclear Physics to define the plan for the early science program at SURF, and we are pursuing a variety of paths to meet the funding challenges facing us next year. I am confident that with world-leading physics experiments, a talented staff, and a new premier underground research facility, we will rapidly find a satisfactory solution to our challenges.

## MAJORANA DEMONSTRATOR Review and News

On January 26-27, the MAJORANA DEMONSTRATOR (MJD) collaboration met with reviewers in Lead, South Dakota for a safety readiness review. The meeting was held in preparation for the experiment's move to the Davis Campus on the 4850 Level. The review committee included outside observers and members of the Sanford Lab staff shown in the Figure 2 photo (left to right): Rick Labahn (Sanford Lab), John Orrell (Pacific Northwest National Lab), David Taylor (LBNL), Jaret Heise (Sanford Lab), Kim Jeskie (ORNL), John Scheetz and Chuck Lichtenwalner (both of Sanford Lab), M.G. Gilchriese (LBNL/SURF), Maurice Garcia-Sciveres, Steve Marks, Marty White, Torsten Köttig (LBNL), David Phillips (University of North Carolina), and Joe Saba (LBNL).



*Figure 2: MAJORANA collaboration members and safety reviewers in the experiment's new home on the 4850 Level*

The readiness reviewers focused on a number of safety issues. One is the use of liquid nitrogen underground. Other topics included routine activities with a moderate level of risk, such as hoisting, lifting, etching-type chemical work, and use of high-voltage power supplies.

According to Science Liaison Director Jaret Heise, the MJD team plans to start moving into the Davis Campus lab in the first week of March.

MAJORANA spokesperson Steve Elliott of LANL said, "We're very excited about actually starting to work underground, assembling the experiment."

MAJORANA has been working underground since July, electroforming copper at the temporary clean room on the 4850 Level, near the Ross Shaft. Their Davis Campus lab, near the Yates Shaft, will be in the north end of the Transition Area.

## EHSOC meeting in Lead

Over 40 people participated in the Environment, Health, and Safety Oversight Committee (EHSOC) meeting held at Sanford Lab on February 15-17. Sanford Lab and SURF staff met with experts from around the nation to look at current Sanford Lab operations and gather information that will help shape future SURF health and safety operations.

Sanford Lab staff and SURF project team members gave presentations on various aspects of Environment, Health and Safety including: Project Update, Sanford Lab progress, Experiment Safety, construction status at the Davis campus, Ross and Yates Shaft rehabilitation, recent safety performance, and other pertinent topics.

Attendees toured underground on Thursday morning (see Figures 3-4). The tour group traveled to the Davis Campus in covered personal cars. Senior Project Specialist Mandy Knight coordinated hosting and other logistics for the review.



*Figure 3: Electrical Project Engineer Rick Labahn gives an orientation and safety briefing near the Yates Shaft (shaft located far left in background)*



*Figure 4: EHSOC meeting attendees gather in the MAJORANA DEMONSTRATOR machine shop on the 4850 Level*

EHSOC meeting attendees who took the underground tour are shown in the Figure 4 photo. Left to right: Gary Hartman (Department of Energy (DOE)-Oak Ridge National Laboratory), Kim Abbott (DOE-LBNL), Jason Haug (State Historic Preservation Office (SHPO)), EHSOC member Tony Iannacchione (Univ. of Pittsburgh (kneeling)), Chris Nelson (SHPO), EHSOC chairperson Craig Ferguson (SLAC (kneeling)), EHSOC member Mike Andrews (FNAL), Mark Bollinger (DOE-FNAL), Tim Wicker (Claims Associates), Ian Paul (S.D. Office of Risk Management (kneeling)), Kevin Lesko (SURF Head/LBNL), EHSOC member Jack Salazar (LBNL), EHSOC member Mark Freiberg (UC Berkeley), Chuck Lichtenwalner, Jaret Heise and Mike Headley (Sanford Lab), Barry Savnik (DOE-LBNL), John Scheetz, Brendan Matthew (Sanford Lab), Pepin Carolan (DOE-FNAL), and Rick Labahn (Sanford Lab).

## DURA NEWS

### DURA Election Results and DURA Meetings

Richard Gaitskell (Brown Univ.) will serve as the Chair, and Steve Elliott (LANL) as the Past-Chair of the DURA Executive Committee (DURAC) for 2012. With the addition of newly-elected member Kate Scholberg, the committee now has nine members. In future years, the committee will hold an annual election to add three members to the committee, and routinely roll-off three members.

*The DURA annual meeting* took place at Fermilab on January 19-20. More details on the live broadcast between Sanford Lab's 4100 Level and meeting attendees at Fermilab are on page 4. PDF slides of the meeting are available at:

<https://indico.fnal.gov/conferenceTimeTable.py?confId=5102-20120119>

*The American Geophysical Union (AGU) Fall meeting* was held on December 5-9 in San Francisco. DURA member Duane Moser presented a talk on "Some New Windows into Terrestrial Deep Surface Microbial Ecosystems". Derek Elsworth, Tullis Onstott, Larry Murdoch, William Roggenthen, and other DURA members organized a session on "Fractures, Fracture Networks, and Fractured Media Field- and Fault-Scale Studies". Joe Wang organized a session on "Correlation and Coupling from Underground, Surface, to the Ionosphere".



## SURF IN THE NEWS

*Symmetrybreaking: Fermilab plans for a future of discovery* (Kathryn Grim)

*Forging ahead toward the frontiers* (Comments by Jim Siegrist of DOE)

*Nature.com* newsblog: *US physicists call for underground neutrino facility* (Eugenie Reich)

(Forty theoretical physicists, including three Nobel Prize winners, have written to the Department of Energy in support of the Long-Baseline Neutrino Experiment proposed for Sanford Lab's 4850 Level.)

*Rapid City Journal: West River touched by Janklow's hands-on style* (Kevin Woster)

*Open house to include renovated physics lab, projects*

*Black Hills Pioneer: BHSU Physics research helping Sanford Lab* (Mark Watson)

For twitter updates see: [www.sanfordlab.org](http://www.sanfordlab.org)

**Reports Available:** The National Research Council report – "An Assessment of the Deep Underground Science and Engineering Laboratory":

[http://www.nap.edu/catalog.php?record\\_id=13204](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](http://science.energy.gov/~media/np/pdf/Review_of_Underground_Science_Report_Final.pdf)

## SANFORD UNDERGROUND LABORATORY NEWS

### Dewatering Levels



Figure 5: Progress of dewatering at Sanford Lab

The Figure 5 graphic indicates the dewatering progress made at Sanford Lab. As of February 17, the water level was at 5893 feet, its lowest point ever. The high water mark, in August 2008, was at 4350 feet underground.

### Construction Update

During the last week of January, Sanford Lab crews and *Heavy Constructors Inc.* of Rapid City reached significant milestones in the rehabilitation projects of the Yates and Ross Shafts. These shafts will be the main access routes to the underground experiments. In the Ross Shaft, the multi-year project to replace the steel supports to the shafts began with preparation of the shaft itself. Infrastructure techs removed interior lacing in the shaft down to the 3650 Level. The lacing is made of corrugated steel or wood (see Figure 6), which provides a barrier between the skips and the other internal shaft compartments. The old lacing is being hoisted to the surface for disposal. (On an historic note, skips hoisted rock out of Homestake during its mining days.)



Figure 6: Infrastructure Tech Larry Cornella removes wood lacing from the Ross Shaft near the 3650 Level

Infrastructure techs also made preparations at the 5000 Level for removing muck from the sump at the

bottom of the Ross Shaft. A clamshell elevator will be hung underneath the service cage and lowered to the sump, where it will scoop up accumulated gravel and rust. The muck will be dumped into three-ton rail cars for transport to underground storage locations.

In March, the Ross Shaft will be shut down for reconstruction, except in case of emergency. The Yates Shaft will provide the main access to the underground. Currently, a new rope dog safety system (described in the SURF January 2012 newsletter) is being installed to facilitate this.

On February 3, *Heavy Constructors Inc.* installed the first steel beam of the rope-dog tower (shown in Figure 7) that will secure the system's 5200-foot wire ropes, to run the length of the Yates Shaft.



Figure 7: The first steel beam of the rope-dog tower (vertical beam, center right) in the Yates Shaft headframe was installed on February 3

### Safety at Sanford Lab

- Sanford Lab's Environment, Health and Safety Department has set up suggestion boxes in a few locations, such as the Yates Education building and the Ross Dry. Safety forms are attached to each box with spaces to record safety-related suggestions, ideas, or comments.
- Twice a month, mine rescue training sessions take place with Sanford Lab's emergency response team.
- The EHS training schedule includes a monthly eight-hour General Safety class held at Sanford Lab.
- Ongoing Refresher Training courses include such topics as: First Aid, Fire Protection, Environmental hazards, Emergency Response, Incident Reporting, Personal Protective Equipment (PPE), and Energy Control.
- Operations Safety Officer Tom Regan sends out regular safety messages to Sanford Lab staff. If the weather takes a severe turn, a special Alert is emailed to the Project team.

- A “safety minute” is presented by a staff member at each SURF weekly meeting.

## EDUCATION AND OUTREACH

### GEOX™ broadcast from the 4100 Level

On January 19, University of Wisconsin geologist and GEOX™ spokesman Herb Wang led a videoconference presentation directly from the GEOX™ experiment site on the 4100 Level to a DURA meeting session at Fermilab. Sanford Lab’s Multimedia Specialist Matt Kapust and Systems Software Specialist Leif Hage worked with Fermilab’s technical staff to set up the conference.



Figure 8: GEOX™ spokesman Herb Wang, with Steve Gabriel and JoAnn Gage

The GEOX™ team’s goal was to do a series of loading cycles, using a hydraulic jack to exert 100 tons of pressure on rock at the 4100 Level, in order to collect data. University of Wisconsin doctoral student JoAnn Gage reported, “I did seven loading cycles of up to 100 tons at two different locations. We got very good data.”

Gage’s data were recorded by 34 sensors--meter-long fiber-optic sensors and stainless steel strain strips. The sensors measured changes in stress, strain, and temperature of rock as the hydraulic jack applied force. Spearfish High School (South Dakota) science teacher Steve Gabriel, also a member of the GEOX™ team, described a Distributive Temperature Sensing experiment. Underground temperature is important to an experiment’s success and consistency. GEOX™ participants are shown in Figure 8. A more detailed report on Gage’s 100-ton loading experiment and a GEOX™ update will appear in the March issue of the SURF Newsletter.



Figure 9: Site Safety Specialist Pat Kinghorn holds the custom-made steel cylinder that will transfer 100 tons of pressure to the rock above. Luke Scott in center, Wendy Zawada, at right, and Kevin Hachmeister, kneeling

The purpose of GEOX™, with tiltmeters at the 2000 and 4850 Levels, is to measure the mechanical properties of rock at the Homestake mine. The GEOX™ collaboration includes the following institutions: University of Wisconsin, Montana State University, University of South Carolina, and South Dakota School of Mines and Technology. Private companies as well as the University of Tokyo and the Japan Atomic Energy Agency are also involved.

Other participants included Alan Turner from *Micron Optics*, the company which made the fiber-optic sensors at the 4100 Level, Kevin Hachmeister from *Golder Associates*, and Rich Barry, Chief Engineer on the *Crazy Horse Memorial project* near Custer, South Dakota. Sanford Lab’s Infrastructure Technician Luke Scott drilled holes for sensors. (The thin white tubes behind Kinghorn in Figure 9 are fiber-optic sensors.) Sanford Lab’s Science Operations Project Engineer Wendy Zawada directed the operation.

### Brown Bag Seminars

The inaugural session of the planned monthly Brown Bag Lunches took place on February 1, with 17 Sanford Lab staff in attendance. Education and Outreach Director Ben Saylor directed a session on electromagnetism. Through hands-on activities, participants explored magnetism and the workings of motors, drawing connections to the hoist motors at Sanford Lab and the historic use of turbines to generate power (shown in Figure 10). The session concluded with a discussion of science education. Cultural Outreach Coordinator KC Russell brought Native-American specialties--vegetable beef soup and fry bread--each a big hit.



Figure 10: Jeri

Mykelby and Lea Mathis work with Ben Sayler exploring the properties of magnets

The next Brown Bag Seminar will be held on March 14, 11:30-1 PM in the Yates Conference Room, Sanford Lab. The topics will be particle accelerators and Fermilab's neutrino production for, and transmission to its proposed Long-Baseline Neutrino Experiment (LBNE) detector at the 4850 Level.

On February 11, Gale Gengler arranged for Sanford Laboratory to host the monthly meeting of the Northern Black Hills custodial unit. Peggy Norris presented a talk about Sanford Lab and also led a tour of the hoist room for thirteen local custodians and their family members. Many of the attendees had family members who had worked at the Homestake mine in the past.

The STSDA is accepting applications for three Dave Bozied interns for Summer 2012. Interested undergraduate or graduate students in science or engineering must attend a South Dakota university or have a permanent South Dakota address. Please send resume and names of two references to Peggy Norris, pnorris@sanfordlab.org by February 29.

SciGirls of the Black Hills will be starting a monthly after-school program at Spearfish Middle School on February 28. The program is open to girls attending Spearfish public schools in the Fifth to Eighth Grades.

## ENVIRONMENT, HEALTH & SAFETY



### March: Eye Safety Month

- Sit about 20 inches from your computer, with the top of the screen at or below eye level. Choose a monitor that has contrast and can swivel, if needed.

- Take periodic rest breaks so that you do not strain your eyes.
- If you will be in a laboratory or construction environment, wear safety goggles.
- Dogs and cats can cause eye allergies if you are allergic to their dander. Certain breeds are hypoallergenic, so do your research beforehand if you are allergic.

If you are visiting South Dakota, contact (605) 722-0002 for road closure and weather information or check [Safe Travel USA](#).

### Safety pages on Sanford Lab website:

[www.sanfordlab.org](http://www.sanfordlab.org) - Use the left hand menu to open individual pages

## STAFF NEWS

**Rick Labahn** will be leaving Sanford Lab as of March 23 to accept a new position as Chief Electrical Engineer with Stantec in Phoenix, Arizona. He has led the Davis Campus outfitting effort, and provided invaluable project management leadership of the Davis Campus development as well as technical leadership in the advancement of Sanford Lab's electrical and communications systems. We wish Rick the best of success in this next phase of his career.

As of March 23, **Will McElroy** will assume primary responsibility for managing the *Ainsworth Benning* contract to complete the remaining Davis Campus outfitting. **Paul Bauer** will provide technical expertise to ensure that construction is completed according to specifications.

**Steve Acheson** will be leaving his position as UC Berkeley R&D Engineering Manager to take a position as Principal Systems Engineer with Rockwell Collins in Cedar Rapids, Iowa, effective March 2. Steve developed and strengthened the systems engineering effort during his time with the DUSEL and SURF project. Best wishes to Steve and every possible success in his new position at Rockwell.

With Steve Acheson's departure, Systems Engineering will no longer be a SURF department. SE staff members will be reassigned: **Pam Hamilton** will work with the Finance / HR Department and will focus on project planning, scheduling, risk management, and CCB-related activities. **Charing**

Hage will be with the Engineering Department and will focus on LBNE-related RFP / contract development, requirements definition, and subsystem definition activities related to future design work.

## UPCOMING EVENTS & ANNOUNCEMENTS

### Conferences and Workshops

**American Physical Society (APS) March meeting 2012** - February 27-March 2, 2012, Boston Convention Center, Boston, MA. Scientific sessions, Tutorials and workshops, and Exhibit Hall. For registration, abstract submission, and general info: <http://www.aps.org/meetings/march/>

**Black Hills State University Quarknet Center Masterclasses** - March 16 (with U. Cincinnati) and March 21 (with Argonne National Lab). The classes will analyze LHC (CERN) data from ATLAS. If you would like to attend and bring your students, contact Kara Keeter, [Kara.Keeter@bhsu.edu](mailto:Kara.Keeter@bhsu.edu).

**APS April meeting** – March 31-April 3, 2012. Hyatt Regency, Atlanta, GA. Held jointly with the Sherwood Fusion Theory Conference for Divisions of Astrophysics, Computational Physics, Nuclear Physics, Particles and Fields, Physics of Beams, and Plasma Physics. <http://www.aps.org/meetings/april/index.cfm>

**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>

### DURA Events

**IDUST2012 on Inter-Disciplinary Underground Science and Technology International Conference** - May 9-11, 2012, Apt, France. <http://lsbb.oca.eu/spip.php?rubrique267>

**EUROCK2012, Rock Engineering & Technology for Sustainable Underground Construction International Symposium** - May 28-30, 2012, Stockholm, Sweden. <http://www.eurock2012.com/>

**46<sup>th</sup> U.S. Rock Mechanics Geomechanics Symposium** - June 24-27, 2012, Chicago, IL. <http://www.armasymposium.org/>

**AAPG: Fundamental Controls on Flow in Carbonates** - July 8-13, 2012, Saint Cyr-Sur-Mer, Provence, France. <http://www.aapg.org/education/hedberg/france2012/>

**IWAA12: International Workshop on Accelerator Alignment** - September 10-14, 2012, Fermilab, Batavia, IL. <https://indico.fnal.gov/confLogin.py?returnURL=https%3A%2F%2Findico.fnal.gov%2FconferenceDisplay.py%3FconfId%3D4712&confId=4712>

**NNN12: Next Generation Nucleon Decay and Neutrino Detectors** - October 4-6, 2012, Fermilab, Batavia, IL. <http://www-ppd.fnal.gov/conf-w/FermilabSponsoredConferences.htm>

**Note** the recent NSF announcement of funding opportunities for underground experiments and development: [http://www.nsf.gov/publications/pub\\_summ.jsp?ods\\_key=nsf12043](http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf12043)  
The target date for submission is May 1, 2012. Applicants are requested to contact the relevant Program Director in PHY prior to submission.

*Please send information* regarding upcoming meetings of interest or presentations from DURA members, as well as other related events to [Richard\\_Gaitskell@brown.edu](mailto:Richard_Gaitskell@brown.edu) or [jswang@lbl.gov](mailto:jswang@lbl.gov).

### Nominations

**IUPAP Young Scientist Prize for the Commission of Particles and Fields (C11)** – The C11 is soliciting nominations for two 2012 Young Scientists Prizes. Candidates should have a maximum of 8 years research experience following the Ph.D. and not be a previous recipient. Send nomination materials to the C11 Commission Chair: Hiroaki Aihara, [IUPAP-YSP@hep.phys.s.u-tokyo.ac.jp](mailto:IUPAP-YSP@hep.phys.s.u-tokyo.ac.jp) by March 1, 2012. [http://www.iupap.org/youngscientist/page\\_50920.html](http://www.iupap.org/youngscientist/page_50920.html)



**JOBS**

**Postdoctoral Fellow - Experimental Neutrino Physics, MAJORANA group, Lawrence Berkeley National Lab.** Neutrinoless double-beta decay search in the MAJORANA experiment and direct kinematic measurement of the neutrino mass scale in the KATRIN experiment. Dr. Alan Poon (AWPoon@lbl.gov).

<https://lbl.taleo.net/careersection/2/jobdetail.ftl?lang=en&job=73997>

**Physicist Postdoc Fellow - SNO+ Neutrino Experiment, Nuclear Science Division, Lawrence Berkeley National Lab.** SNO+ will search for the neutrinoless double-beta decay of <sup>150</sup>Nd. Job #74020. Prof. Gabriel Orebi Gann, GOREbiGann@lbl.gov.

<http://cjo.lbl.gov/positions.html?jobcode=abc&jobfield=10>

**Physicist Postdoctoral Fellow – Direct Dark Matter Search, Lawrence Berkeley National Lab.** LUX dark matter search experiment. Deadline: 2/29/12. Amy Pagsolingan, AVPagsolingan@lbl.gov.

<https://academicjobsonline.org/ajo/jobs/1326>

**Postdoc position - Stanford University neutrino group.** Activities may include data analysis on the EXO-200 double beta decay experiment, R&D for a multi-ton EXO detector, and R&D toward better technologies to test the behavior of gravity short scales. Prof. Giorgio Gratta, gratta@stanford.edu

**Postdoc position - Direct Dark Matter search, UC Davis.** LUX dark matter search experiment and development of techniques for ultra-sensitive radio-assay of materials. Bill Tuck, Dept. of Physics, One Shields Ave., UC Davis, Davis, CA 95616, tuck@physics.ucdavis.edu.

**Postdoctoral Fellowship - Microbial ecology/geobiology at Desert Research Institute's Las Vegas campus.** Deep subsurface microbiology studies at Nevada National Security site and other sites, including Sanford Lab. Duane Moser, Chair, Postdoctoral Fellow-Microbial Ecology Search Committee (PH: 702-862-5534 or duane@moser@dri.edu. <https://dco.gi.civ.edu/related-postdoctoral-fellow-opportunities>

**Postdoctoral position - Subatomic Physics Group, University of Michigan.** Completion of upgrades to a calorimeter for neutron flux measurement and cold-beam neutron lifetime measurement at NIST. Prof. Tim Chupp, chupp@umich.edu.

**Postdoctoral Fellows - Experimental AstroParticle Physics, Dept. of Physics, Queen's University.** SNOLAB research group positions with DEAP and PICASSO Dark Matter search experiments. Prof. Tony Noble, 99 University Ave., Queen's University, Kingston, ON, Canada, K7L-3N6, noble@queensu.ca.

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