

LABORATORY UPDATE for ALUMNI



November
2015



Welcome to new FRIB Laboratory Update for Alumni format

Welcome to the second issue of the FRIB Laboratory Update for Alumni! We have upgraded the newsletter to a new format to increase readability on any device.

Now, you will receive a “teaser” email that will highlight what stories are featured in the latest issue. By clicking “READ MORE” you will be directed to the story in the full newsletter, which will open in a web browser. By making the newsletter web-based, you will be able to enjoy the “responsive” qualities of the template, meaning the newsletter layout will “respond” for maximum readability on whichever device type you are using (desktop, tablet, or mobile phone).

If you prefer to print the newsletter, the template has been enhanced so it will print well from your browser; you may just need to adjust the scaling so the pages break to your liking.

We hope you enjoy the new format. Our goal is to keep you updated about all the latest laboratory news as we transition from the National Superconducting Cyclotron Laboratory and the FRIB Project to the FRIB Laboratory. We also want to feature you and share what NSCL and FRIB alumni are up to since leaving MSU. This issue features a story about Shea and Michelle Mosby, who left NSCL in 2011 and now work at the Los Alamos Neutron Science Center.

Please send comments, questions, and story ideas to alumni@frib.msu.edu. We want to hear from you!



Laboratory commemorates 50 years since the first beam from the K50 cyclotron



Gabe Blosser, son of Cyclotron Laboratory founder Henry Blosser, participated in the celebration. He recounted memories of his father's tenure at the laboratory and shared how his father influenced his professional path. (Photo courtesy of Thomas Baumann.)

The FRIB Laboratory marks a significant anniversary in 2015—50 years since the first beam from the K50 cyclotron.

In mid-1957 the MSU Physics department finalized its decision to build a cyclotron to accelerate heavy ions, like carbon-12, to about 40 MeV. In early 1958, it hired Henry Blosser—after two senior scientists had refused offers—as director of a laboratory with one member (him) to build that device.

It took only until December 1958 to submit a proposal asking for funds to the Atomic Energy Commission (AEC). That was a hard ask: the 30-year-old director was unknown as was the laboratory itself, the university had scant infrastructure, and the federal government was in a budget crunch. It was not until October 1961, following proposals to three different government agencies, that funds finally arrived from the National Science Foundation (NSF).

There followed a chaotic time of hiring staff, building a laboratory, and building a cyclotron. As related in a 1965 proposal to NSF, in January 1965 "all was in place, and in front of a large crowd of the interested—students, wives, children, and girlfriends—the startup began. The magnet, trim coils, and ion source were turned on, and the radio frequency warmup began. But in a few minutes a severe internal water leak interrupted the process. Similar problems occurred for the next ten days, and by a February 11 startup attempt, not one visitor was present. This attempt went exceptionally smoothly. With the computed settings, the beam was soon at the maximum radius." (Excerpted from Sam Austin's book, ["Up From Nothing: The Michigan State University Cyclotron Laboratory."](#))

This achievement gave the laboratory a reputation for the ability to do things quickly and do things well. It permitted the development of a unique research program, with light ions, not heavy ions as proposed, that evolved and grew greatly in strength and influence on the worldwide scene. It opened the door to today's laboratory.

MSU President Lou Anna K. Simon (second from left) and FRIB Laboratory Director Thomas Glasmacher (far right), present Associate Director of Science for Nuclear Physics at the U.S. Department of Energy Timothy Hallman (left), and National Science Foundation Deputy Division Director for the Division of Nuclear Physics Bradley Keister, tokens of appreciation for their support over the years of NSCL and FRIB. (Photo courtesy of Michigan State University.)

To commemorate this significant anniversary in the history of the FRIB Laboratory, a special celebration was held on October 8. Former and current laboratory employees, users and colleagues, and other honored guests joined together to celebrate a half-century of nuclear-physics accomplishments at MSU, and look forward to the next frontier — FRIB.

The morning program included a presentation of "Up from Nothing: The Michigan State University Cyclotron Laboratory," a book about the history of the Cyclotron Laboratory by Sam Austin; original compositions by MSU College of Music faculty and alumni; and memories from those who spearheaded the nuclear physics accomplishments at MSU.

The celebration concluded with special remarks focused on the history of nuclear physics at MSU and how it has fostered strong relationships between the university, the National Science Foundation and the U.S. Department of Energy. Speakers included MSU President Lou Anna K. Simon, National Science Foundation Deputy Division Director for the Division of Physics Bradley Keister and U.S. Department of Energy Office of Science Associate Director of Science for Nuclear Physics Timothy Hallman. The program also included the premiere of the "50 Years of Beam at MSU" video.

Program elements available online

- ["Up From Nothing: The Michigan State University Cyclotron Laboratory"](#) by Sam Austin is available for purchase from MSU Press.
- The ["50 Years of Beam at MSU"](#) video is online.
- View photos of the event: ["50 Years of Beam at MSU" gallery](#).

The composers' music is available online

- ["Chart of the Nuclides" - Mark Sullivan](#)
- ["Separation Anxiety" - Benjamin R. Fuhrman](#)
- ["The Atomic Wait" - Matthew Schoendorff](#)
- ["Three Isotopes" - Mark Sullivan](#)
- ["Mind the Gaps" - Benjamin R. Fuhrman](#)
- ["Kaleisotope" - Matthew Schoendorff](#)
- ["Neutron Star" - Mark Sullivan](#)

Konrad Gelbke honored with symposium, endowment



Several of Konrad Gelbke's former graduate students and postdocs presented him on October 8 with a check representing \$50,000 that had been donated as of that date to an endowment fund in his name. First row: Sally Ejakov (nee Gaff), Konrad's last graduate student; Dave Bowman, postdoc; Konrad Gelbke; Yeong-duk Kim, graduate student; Damian Handzy, graduate student. Second row: David Fields, graduate student, Graham Peaslee, postdoc; Larry Phair, graduate student; Romualdo de Souza, postdoc; Mike Lisa, graduate student. Third row: Thomas Glasmacher, NSCL Fellow and postdoc; Terry Awes, Konrad's first graduate student.

Following the 50 Years of Beam at MSU celebration on October 8, a scientific symposium honoring former NSCL/FRIB Director Konrad Gelbke was held at the Wharton Center. The symposium honored Konrad's remarkable career and outstanding leadership that brought the laboratory where it is today. The speakers and session chairs were Konrad's former graduate students and postdocs who moved on to diverse careers in academia, national laboratories, and industry. In addition, Konrad's broader impact on the U.S. nuclear physics community was highlighted by representatives from the National Science Foundation and the U.S. Department of Energy.

In the evening following the symposium, a special dinner honoring Konrad took place at the Kellogg Center. During the dinner, the Konrad Gelbke Endowment for Science Students was publicly announced. Damian Handzy (MSU PhD '95), one of Konrad's former graduate students and recipient of the 2015 MSU College of Natural Sciences Outstanding Alumnus Award, acted as master of ceremonies for the evening and was involved in arranging the endowment.

Damian said, "When one of Konrad's former post-docs suggested we start an endowment in his name, I immediately jumped on the idea — it's the perfect way to honor the man who taught and trained so many scientists and who spearheaded the tremendous growth of Michigan State's Nuclear Physics program."

While the genesis of the endowment was Konrad's former students and postdocs, many others contributed as well — 50 donors in all established the initial funding.

The endowment will fund science students according to guidelines yet to be established by Konrad. Donations to this endowment can be made by contacting Corey Longley at longleyc@cns.msu.edu.



Civil construction is 10 weeks ahead of schedule



A view of the project from the west.

FRIB civil construction continues to progress swiftly. The tunnel and surface building are 10 weeks ahead of the baseline schedule, with a goal of starting installation of front-end equipment in November. The linear accelerator tunnel lids have been completed, and the surface-building exterior is rapidly developing as masonry, roofing, and metal panel installation take place. Roofing has been completed on the far east end of the building, and is continuing to progress westward. Interior masonry work is progressing on the ground floor, lower subfloor and the upper second floor. Overhead mechanical, electrical, and plumbing installation is occurring on the ground floor and the upper second floor. Interior painting continues, and workers have been fireproofing the structural steel on the first floor.

On the west end of the tunnel lid, vertical ductbank shafts and formed piers are being installed, while backfilling continues in the target area. To date, backfill is 70-percent complete, with 56,250 tons placed so far. Utility trenches in the cryogenic area have been installed, and concrete slab-on-grade in the cryogenic compressor area is partially complete. Fifteen of the 56 substation pieces have been placed on the second floor. Nonconventional utilities piping (NCU) installation began in August, and is currently 25 percent complete. NCU components such as hangers and sections of welded pipe are being prefabricated in an offsite warehouse that has a controlled environment, which is located 10 minutes from the construction site.



A view of cryo line installation in the tunnel.

This fabrication shop expedites production and provides additional storage, allowing for bulk purchase and shipping of NCU materials.

Looking ahead through December, overhead mechanical, electrical, and plumbing installation will continue moving westward on all levels of the building. Additionally, masonry and roofing will continue to progress toward the west end of the building. Backfill will be placed for the target area as well as the remainder of the linac tunnel. Exterior aluminum entrances and exterior metal panels are to be installed, along with switchgear, substations, air handlers, cooling towers, and exhaust fans.

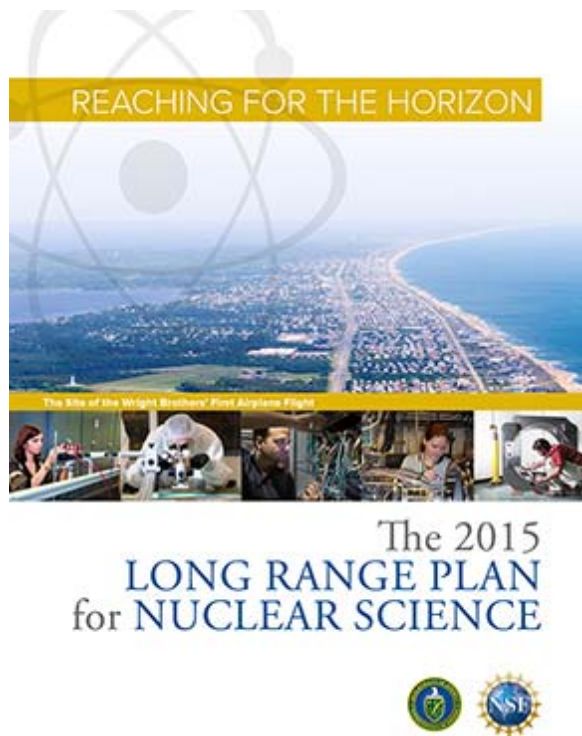
Keep up on construction progress by visiting frib.msu.edu/cameras.



Some of the electrical substation pieces have been set.

▼

2015 NSAC Long Range Plan Report recommends FRIB completion and initiation of its science program and operation of the NSCL user



The 2015 Long Range Plan for Nuclear Science "Reaching for the Horizon" was accepted unanimously at the October 15-16 meeting of the Nuclear Science Advisory Committee.

At the October 15-16 meeting of the Nuclear Science Advisory Committee, the [2015 Long Range Plan for Nuclear Science "Reaching for the Horizon"](#) was accepted unanimously.

The report provides strong support for FRIB completion, initiation of its science program, targeted instrumentation, FRIB theory, and educational initiatives.

The report also identified outstanding opportunities for the National Science Foundation in the effective utilization of NSCL.

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ReA3 is fully commissioned and user program has started

The National Superconducting Cyclotron Laboratory's reaccelerator, ReA3, was fully commissioned in the spring of this year after the installation of the third cryomodule, and the user program has started. This is an important milestone for the NSCL user community, which has sought reaccelerated rare isotope beams for a decade. This also bodes well for FRIB because the laboratory now operates a superconducting linear accelerator for users.

ReA3's third cryomodule has eight superconducting resonators and three superconducting solenoids, and ReA3 can now provide heavy-ion beams with energies from 300 keV/u up to 3 MeV/u for all ions.

The linear accelerator was fully commissioned as well as the three beam lines in the new experimental hall. The new Cooler-Buncher was also constructed with a design based on several existing devices at the laboratory to collect the rare ions produced by the coupled cyclotron facility (CCF) and group them into bunches for the EBIT (electron-beam ion trap) ion source. The EBIT then works to strip the electrons from a batch of the rare ions in order to most efficiently accelerate the ions.

The first experiment was completed in September with the delivery of a rare-isotope ^{46}Ar beam for more than one

week. The rare-isotope beam was produced by the coupled cyclotrons, separated with the A1900, thermalized in a gas cell, passed to the Cooler-Buncher, charge-bred in the EBIT and then reaccelerated by ReA3 and then delivered to the active-target time-projection-chamber (AT-TPC).

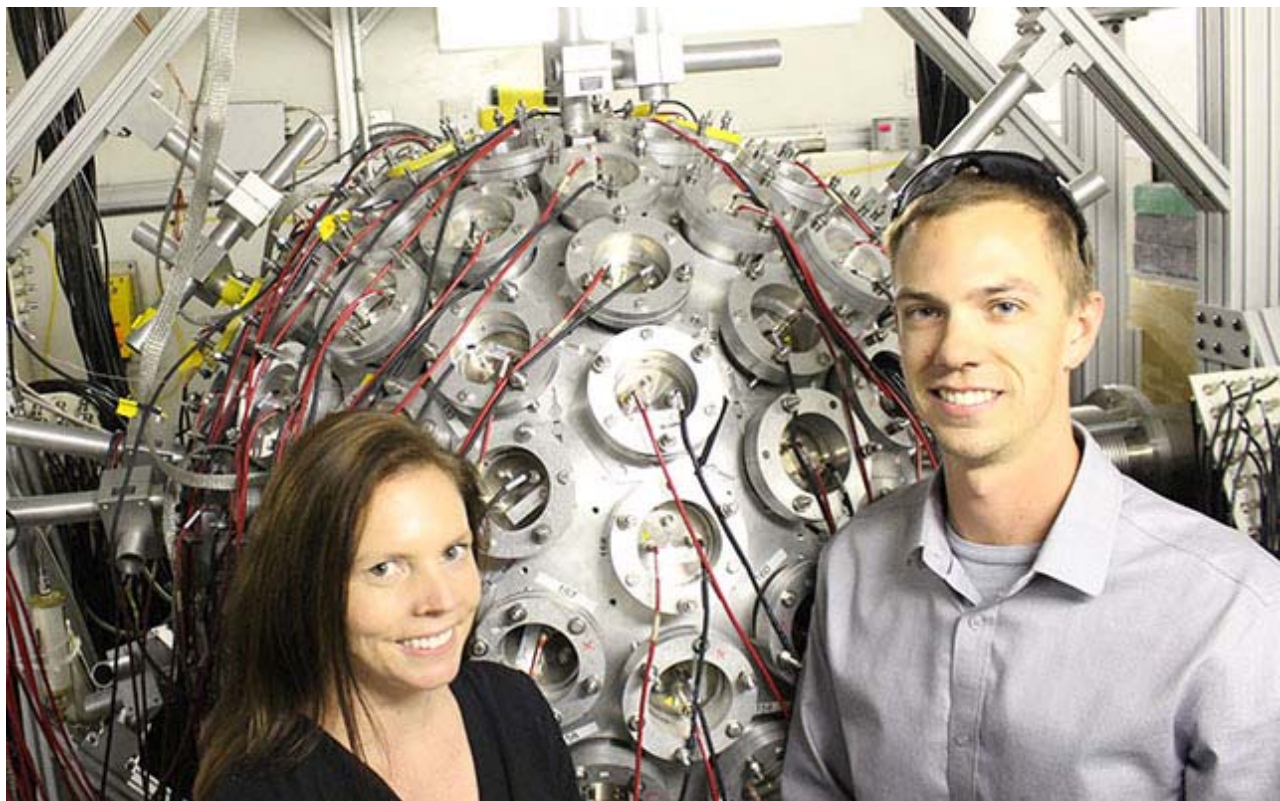
The second experiment was completed in early October. This time a stable beam of 39-K was used to calibrate a new set of fission-fragment detectors and then reactions with a rare-isotope beam of 46-K were measured. This experiment also required the entire CCF/ReA3 facility to run for about a week and was very successful.

Sunday, 20 Sep 2015					11:30
Now	6 hours ago	12 hours ago	18 hours ago	24 hours ago	
CCF Current Experiment	Commissioning of the AT-TPC with radioactive beam				
15503-Daniel Bazin					
K500 $^{48}\text{Ca}^{8+}$ 12.28 MeV/nucleon	K1200 $^{48}\text{Ca}^{20+}$ 140 MeV/nucleon	A1900 ^{46}Ar	Vault N4D	Status Experiment running	
Availability	1 day 100%	7 days 96.27%	30 days 94.41%	180 days 93.69%	
Now	6 hours ago	12 hours ago	18 hours ago	24 hours ago	
ReA Current Experiment	Commissioning of the AT-TPC with radioactive beam				
15503-Daniel Bazin					
ReA ^{46}Ar		Vault ATTPC	Status Experiment running		
Availability	1 day 100%	7 days 77.44%	30 days 88.93%	180 days 89.69%	
Utility Notices	Timeframe	Affected Area(s)			
Electricity	in 2 days (08:00 - 16:30)				
Access Restrictions	K500 vault, K1200 vault, Transfer Hall secured				

ReA3 is now fully commissioned and the user program has started successfully. The experimental program with ReA3 began with an experiment to measure proton scattering by the exotic ion ^{46}Ar with the new AT-TPC (active-target time-projection-chamber). The figure (above) is an image of the hallway display that shows the green bars for the simultaneous operation of both accelerator systems for the AT-TPC experiment.



Alumni spotlight: Shea and Michelle Mosby



FRIB/NSCL alumni Michelle (left) and Shea (right) Mosby pose next to the Detector for Advance Neutron Capture Experiments (DANCE) at the Los Alamos Neutron Science Center (LANSCE).

Shea and Michelle Mosby left NSCL in December 2011 to move to Los Alamos, New Mexico. Shea started a postdoc at Los Alamos National Laboratory while Michelle stayed at home with their then 9-month-old baby boy, Oliver. Since then, Shea has finished his postdoc and is now a scientist at LANL, Oliver has a little sister named Emma, and Michelle has started a postdoc.

Shea works in the Nuclear Astrophysics and Structure team in the P-27 group. His primary research focus is neutron-induced reactions related to the fission process, using a variety of different detector systems. In particular, he is involved in the Chi-Nu project to measure the Prompt Fission Neutron Spectrum (PFNS) for the major actinides, and studies the neutron capture process with the Detector for Advance Neutron Capture Experiments (DANCE). These experiments both take place at the Los Alamos Neutron Science Center (LANSCE) using their neutron beams, ranging in energy from thermal to several hundred MeV. Experiments at LANSCE are conducted in forward kinematics, with all the target constraints that requires. The LANCE experiments are complemented by ones using the Apollo detector at Argonne National Laboratory to study the underlying nuclear structure using transfer reactions in inverse kinematics.

Michelle works in the Nuclear and Radiochemistry group. She is studying methods of unfolding neutron flux distributions using activation foil methods in experimental assemblies where measurements using time-of-flight techniques are not feasible. These measurements are relevant both in experiments at the Nevada test site and to the Isotope Production Facility, which produces medical isotopes for therapy and diagnostic purposes using the 100\~MeV proton beam at LANSCE. Understanding of the neutron flux is critical for capability development for isotope production, as it will allow for production of additional isotopes symbiotically with those produced by the proton beam. The activation foils are analyzed with non-destructive gamma spectroscopy in the Countroom, which houses gamma, beta, and alpha counters for quantitative analysis of samples, some of which date back to the Manhattan Project. The product yields from the activation foils are then used to constrain the neutron spectrum.



We want to hear from you

Send us your story ideas!

Like this issue's story about NSCL alumni Shea and Michelle Mosby, we want to feature at least one story each issue about you—our FRIB/NSCL alumni. Let us know what you are up to!

Email story tips about you and/or your fellow alumni to alumni@frib.msu.edu. Tell us about discoveries, business ventures, partnerships, awards, and other professional developments, and we may feature them in a future issue.

Contributors this issue

- Sam Austin
- Brad Bull
- Shea and Michelle Mosby
- Dave Morrissey
- Witek Nazarewicz

Looking ahead: Important dates for the FRIB Laboratory

December 1-3 Accelerator Systems Advisory Committee (ASAC)

December 7 President's Project Advisory Committee (PPAC)

January 12-14, 2016 DOE Operations Cost Review

The FRIB Laboratory Update for Alumni is published by the FRIB Laboratory and distributed via email. Please e-mail questions, comments, address changes, story tips, contributions, or requests to unsubscribe from this list to alumni@frib.msu.edu. If you are in touch with other NSCL/FRIB alumni, please forward this to them and invite them to contact us to subscribe.



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Michigan State University is establishing FRIB as a national user facility for the Office of Nuclear Physics in the U.S. Department of Energy Office of Science. Operation of NSCL as a national user facility is supported by the Experimental Nuclear Physics Program of the U.S. National Science Foundation.