Reflecting on 2023 and looking ahead to 2024

I hope you are all doing well as we say hello to 2024. As we head into a new year, we pause a moment to reflect and share with you FRIB Laboratory achievements and developments.

User programs delivering results
Since the start of user operation in May 2022:

- FRIB has delivered more than 210 rare isotope beams to experiments and supported 826 participants, including 210 students, across 63 experiments, 234 institutions, and 65 countries.
- Three manuscripts based on FRIB results have been published, two of them in *Physical Review Letters* (Microsecond Isomer at the N=20 Island of Shape Inversion Observed at FRIB published in June 2023), with many others nearing publication.

We continue operating the fee-for-service program with the FRIB Single Event Effects (FSEE) facility, which supports operations while we change targets for the user program. The FSEE facility helps meet a national need for chip testing.

We are grateful for the continued trust the DOE-SC has placed in us to enable forefront discovery science: In August 2023, the DOE-SC awarded a $529 million cooperative agreement over five years to operate FRIB as a DOE-SC user facility.

Enabling a world-class scientific research program and a vibrant user community
Demand for beam time remains high from our 1,800-strong FRIB user community with the facility oversubscribed threefold. To address the demand

and enhance discovery opportunities with high user satisfaction, FRIB has increased rare isotope production rates by ten; was authorized to run user experiments at 10 kW, doubling its primary beam power; brought into user operation in 2023 the high-power electron cyclotron resonance ion source as a second ion source; and started the ReA standalone program that enables unique measurements with long-lived rare isotopes, allowing for multi-user operations.

Additional FRIB endeavors include completing the High Rigidity Spectrometer (HRS) project (for which we were awarded in September 2023 $115M over seven years to establish and operate); constructing the superconducting radio frequency gun for the Linac Coherent Light Source-II High Energy (LCLS-II-HE) Upgrade Project at SLAC National Accelerator Laboratory, establishing isotope harvesting capability (with funding through the DOE Isotope Program), and refurbishing the K500 cyclotron for FRIB's Single Event Effects facility (with funding through the U.S. Department of Defense Missile Defense Agency) with a completion in 2025.

Advancing participation in science and technology through intentional efforts and programs

We are committed to being a place that is respectful, where all are able to be and do their best. In 2022, we introduced the FRIB Research Code of Conduct. Guided by feedback from laboratory community members, we updated our FRIB Code of Conduct in 2023 and will start a pilot training program in 2024 focused on building a community that advances community and belonging.

Developing the workforce: Research and education missions intertwined

With FRIB located on the campus of a top research university—one of only 71 in the prestigious Association of American Universities (AAU) and one of only 146 classified as "very high research activity" by the Carnegie Foundation—we are uniquely positioned to train future scientists and technical experts as we carry out our research mission. In 2023, we established the FRIB Office for Education, Workforce, and Career Development, which Remco Zegers leads. Under this new office we will organize, coordinate and provide support for undergraduate research activities; graduate student and research associate recruiting, education, and workforce development; career development activities; wellness and community building; educational and workforce development collaborations with on- and off-campus organizations and partners; and nuclear and accelerator science curriculum development.

Nuclear science community defines priorities in 2023 Long Range Plan for Nuclear Science

The U.S. nuclear science community developed the 2023 Long Range Plan for Nuclear Science (*A New Era of Discovery: The 2023 Long Range Plan for Nuclear Science*) through the federally chartered Nuclear Science Advisory Committee. The plan was released on 4 October 2023 and provides a roadmap for advancing the nation's nuclear science research programs over the next decade. Accordingly, it articulates the science case for the FRIB400 energy upgrade and the HRS project. On 6 October 2023, 21 sites nationwide (including FRIB) hosted rollout meetings, updating attendees about the plan's local impacts. On 8 November 2023, nuclear scientists from across the United States participated in a Nuclear Physics Day on Capitol Hill to inform elected officials and their staff about the plan. For more information, visit NuclearScienceFuture.org.

Extending FRIB's global reach

In July 2023 the French research organization Centre National de la Recherche Scientifique (CNRS) signed an agreement with MSU to establish at FRIB the International Research Laboratory on Nuclear Physics and Astrophysics (IRL NPA). The IRL NPA will be permanently staffed with French scientists. In its inaugural science meeting 11-13 December 2023 at FRIB, participants discussed consolidating existing collaborations and launching new ones, and shared new proposals and ideas for opportunities to work together.

Hosting international SRF community

FRIB hosted the 21st International Conference on Radio-Frequency Superconductivity (SRF 2023) in June 2023 in Grand Rapids, Michigan. FRIB was selected as a first-time host due to its success in assembling and building —with the international SRF community's support and curation—what is designed to be the most powerful heavy-ion accelerator.

Engaging the public to generate enthusiasm for science

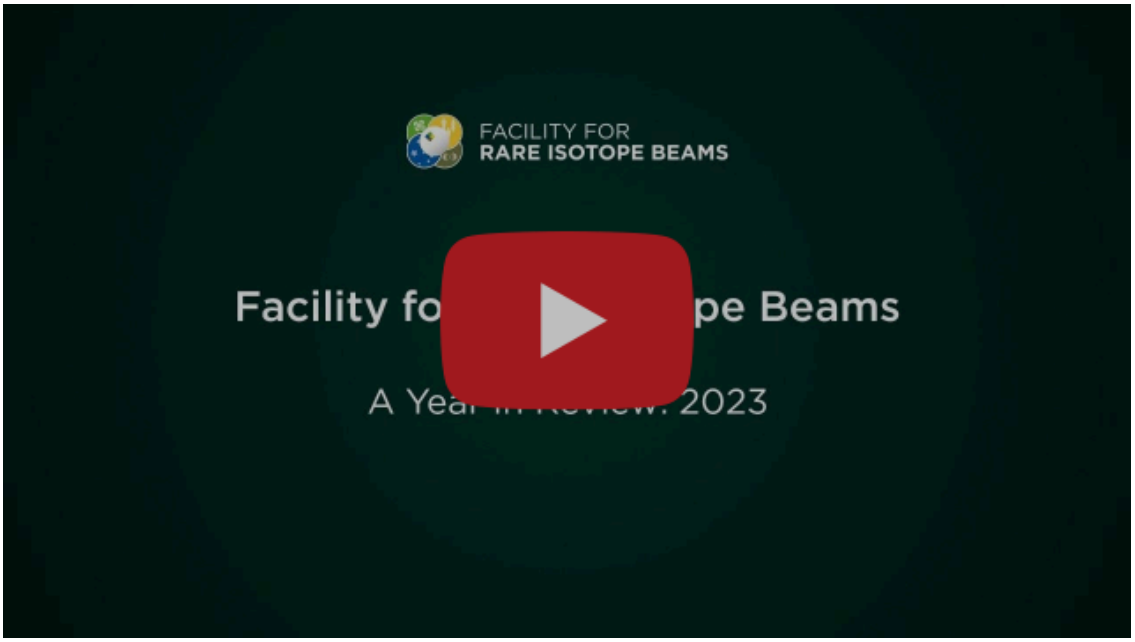
FRIB's outreach program engages the public, generates enthusiasm and learning among young people for scientific careers, and builds innovative collaborations that cross disciplines to illustrate and translate the power of research in physics and other areas. In 2023, FRIB outreach events reached more than 8,300 members of the public. In a milestone achieved just last month, FRIB Outreach Coordinator Zach Constan gave his 2,000th tour of FRIB and its predecessor NSCL in December!

Additional stories since our last issue in November 2023 are included below.

I wish you all the best for a wonderful new year.

Sincerely,

Thomas Glasmacher
FRIB Laboratory Director



A look at FRIB's highlights and accomplishments that took place throughout 2023.

News

Two international artists selected for MSU residency at intersection of art, science and technology
Michigan State University has announced the 2024 MSUFCU Arts Power Up artists-in-residence at FRIB. Abel Korinsky (representative of Studio Korinsky) of Berlin, Germany, will be in residence during the spring semester, and Violeta López López of Ávila, Spain, will be in residence during the fall semester. Korinsky and López will immerse themselves in the FRIB laboratory environment and explore this year's theme of nuclear astrophysics through their boundary-pushing work. This inaugural open call for artists is a collaboration between FRIB; the MSU Museum;
the STEAMpower Project, Michigan State University's art, science and culture collaborative; and Arts MSU. This new residency fosters collaboration, exploration, experimentation and innovation on MSU's vibrant campus,

culminating in the creation of groundbreaking artworks at the intersection of art, science and technology. Read more.

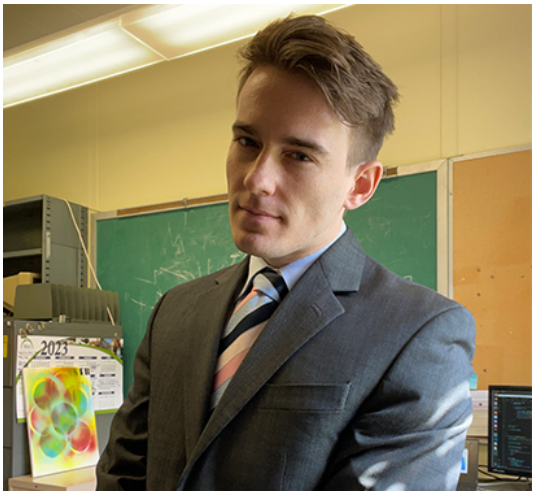
FRIB hosts 'The STEAM Plays' to connect science, technology, engineering, arts, and mathematics

A new musical by MSU Department of Theatre Professor Rob Roznowski explores the relationship between the arts and STEM (science, technology, engineering, and mathematics), focusing on how important creativity and artistic expression are to innovation in STEM fields. FRIB hosted several performances during the semester. After each performance at FRIB, FRIB researchers spoke to the students about the scientific research taking place at the laboratory. Read more.

FRIB faculty members receive awards from MSU's College of Natural Science

Three FRIB faculty members received awards from the Michigan State University (MSU) College of Natural Science (NatSci) at the NatSci Annual Meeting and Awards Ceremony, held 17 November 2023 at MSU's STEM Teaching and Learning Facility. Daniel Bazin, research professor of physics at FRIB, received a 2023 Graduate Academic Advisor Award; Alexandra Gade, professor of physics at FRIB and in MSU's Department of Physics and Astronomy and FRIB Deputy Scientific Director, received a 2023 Research Leadership Award; and Remco Zegers, professor of physics at FRIB and in MSU's Department of Physics and Astronomy, received a 2023 Outstanding Faculty Award. The awards are based on nominations submitted from across the college and are evaluated by the NatSci Awards Committee and the Center for Integrative Studies in General Science staff. Read more.

ALUMNI SPOTLIGHT



Tamas Budner earned a PhD in physics from Michigan State University, and he was at the National Superconducting Cyclotron Laboratory from 2016-2022.

He is currently a postdoctoral researcher at Argonne National Laboratory.

Read more

Upcoming Events

Below is a list of upcoming events. For more, visit the FRIB website.

- 21 January - Advanced Studies Gateway public Zoom talk: Emory Brown of Massachusetts Institute of Technology, Harvard Medical School, and Massachusetts General Hospital (Register here)

Update your information in FRIB Alumni Directory

The FRIB Laboratory has an alumni directory form to communicate with laboratory alumni and to track their career paths. Please take a couple of minutes to fill out or update the form by answering a few simple questions. This will ensure our records are accurate and build a more reliable network we hope you find useful. Visit the online alumni directory form to enter and update information.

We want to hear from you

Send us your story ideas! Let us know what you are up to! We want to feature at least one story each issue about you—our alumni, so please email us 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. Also let us know if

there are other types of laboratory updates you'd like to see in future alumni issues.