

Exploring user facilities

By **Lori A. Wilson**

User facility events and exhibitors took a front seat at the 2019 Materials Research Society (MRS) Fall Meeting in Boston. A growing number of early-career members seeking career paths outside of academia in both government and national laboratories and industry, and also students seeking access for their research and internships led to large attendance numbers at various events.

Many students struggle to gain access to external facilities for their research sometimes without guidance to write effective proposals to perform experiments. There are several types of user facilities across the United States and internationally that feature many capabilities and expertise that researchers can utilize and access. Typically, a federally sponsored research facility is available for external use to advance scientific or technical knowledge.

“The main thing we want people to know is that we exist,” said Heather Brown, program manager at the user facility Center for Integrated Nanotechnologies, which is a joint center between Sandia National Laboratories (SNL) and Los Alamos National Laboratory (LANL). “These facilities are national resources. They are free of charge for those doing nonproprietary research, with excellent expertise capabilities. They were built to further research, so they are an external face to the community.”

Focus on research opportunities

The MRS Student Engagement Subcommittee hosted a workshop, “How to Develop an Effective Proposal for User Facilities.” Simranjit Grewal, University of California, Merced, led the workshop. The event helped attendees to properly research facilities to attain their goals, develop a support system to navigate the proposal process, and receive advice on writing a successful grant.

DOE user facilities overview

Linda Horton, from the US Department of Energy, said the Office of Science supports the majority of DOE’s user facilities. The mission of the DOE Office of Science is to deliver scientific discoveries and major scientific tools to transform the fundamental understanding and to advance energy, economics, and national security. There are 27 facilities serving more than 36,000 researchers annually. Some examples include supercomputers, high intensity x-rays, particle accelerators, and atmospheric monitoring capabilities.

The Idaho National Laboratory hosts the Nuclear Science User Facilities (NSUF), which provide access to world-class nuclear research facilities, technical expertise from scientists and engineers, and assistance with experimental design, assembly, and post-irradiation examination. NSUF has 49 user facilities at 21

partner institutions, including a microscopy and characterization suite, transient reactor test facility, and an irradiated materials characterization laboratory.

Each DOE user facility manages the allocation of facility resources through merit-based peer review of submitted research proposals. Calls for proposals take place at regular intervals, as indicated on each facility’s website. Prospective users may propose independent or collaborative research. There is no charge for users who are doing nonproprietary work, with the understanding that they publish their results.

The goal of the Office of Science Graduate Student Research program is to prepare graduate students for STEM careers. US graduate students are able to pursue their graduate thesis research at DOE laboratories/facilities in areas that address scientific challenges central to the Office of Science mission; they are also eligible to apply for supplemental research awards.

Writing a successful proposal

At the MRS workshop, Terry Law, Deputy of User Services at the Environmental Molecular Sciences Laboratory, Pacific Northwest National Laboratory (PNNL), provided tips on writing a successful proposal. One of the first things to do in this process is to use facility websites to dig into the areas of expertise and capabilities offered at a particular site. Each facility has different types of proposals—some can be submitted any time, and others are based on a defined call for proposals. These call cycles vary. Access is increasingly competitive, so potential users need to ensure their submission stands out.

- Start with a good idea and focus on clarity. Be concise.
- Frame your idea to emphasize what is novel about it, and what knowledge gap are you addressing?
- Have a definable and actionable hypothesis and specific science objectives. Describe why your research requires specific resources.

Another course of action is to contact a facility scientist to ask about opportunities for collaboration and to get advice. The staff can provide details about equipment



The Careers at Government Laboratories and User Facilities panel discussion at the 2019 MRS Fall Meeting & Exhibit.



and its capabilities, availability or subscription rate, and facility research goals.

User facilities in Europe

David Mueller, Peter Gruenberg Institute, Research Centre Juelich, Germany, discussed some of the 31 facilities in Europe, which span 28 countries and 30,000 users. These include the ALBA synchrotron facility in Barcelona, Spain, which has eight beamlines and accepts proposals biannually; the MAX IV synchrotron laboratory in Lund, Sweden, with 12 beamlines and accepts proposals biannually; and Helmholtz-Zentrum Berlin in Germany, with 45 beamlines and accepts proposals biannually. He identified general procedures and requirements in the process.

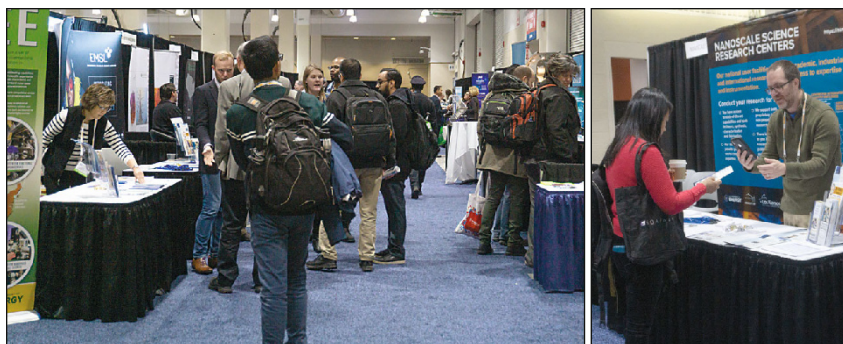
- Identify a suitable beamline/experiment.
- Contact the scientists or discuss funding/personnel with colleagues/PI.
- Write and submit a proposal.
- Panelists will evaluate the proposals after technical and safety reviews.
- Receive evaluations and an allocated beam time.
- Plan the experiment.
- Communicate.

None of the European facilities charge for academic access, and EU-based users often receive financial assistance for travel.

Panel discussions

Emory Chan, Molecular Foundry, Lawrence Berkeley National Laboratory (LBNL), moderated a panel discussion on user facilities. There are five DOE Nanoscale Science Research Centers: Molecular Foundry, LBNL; Center for Nanoscale Materials (CNM) at Argonne National Laboratory (ANL); Center for Functional Nanomaterials at Brookhaven National Laboratory; Center for Integrated Nanotechnologies at SNL and LANL; and the Center for Nanophase Materials Sciences at Oak Ridge National Laboratory (ORNL).

Panel members Flavio Leandro de Souza, Brazilian Nanotechnology National Laboratory; Kathleen Carrado Gregar, CNM ANL; Heather Brown; Terry Law; Ryan Reeves, International Space Station, US National Laboratory; and Ashley White, Advanced Light Source, LBNL,



User Facility Row at the 2019 MRS Fall Meeting & Exhibit.

described the facilities where they work, their capabilities, history, and how to become a user.

A student panel, consisting of moderator Araceli Hernández Granados, Instituto de Ciencias Físicas—Universidad Nacional Autónoma de México; and panelists Benjamin Derby, University of Michigan—Ann Arbor; Simranjit Grewal; and Daniel Stadler, University of Cologne, discussed their user experiences at a variety of facilities.

Focus on careers

There was also a panel discussion hosted by the Early Career Professionals Subcommittee on “Careers at Government Laboratories and User Facilities.” Jagjit Nanda, ORNL, served as the moderator for a panel of experts in the field: Karren More (ORNL), Dean DeLongchamp (NIST), Kenneth Herwig (ORNL), John Mitchell (ANL), Peter Sushko (PNNL), and Haimei Zheng (LBNL). The panel provided valuable insights on careers, opportunities, training, and work–life balance in national laboratories.

User Facility Row

In partnership with the Society for Science at User Research Facilities (SSURF), MRS sponsored a User Facility Row at the 2019 MRS Fall Exhibit. It highlighted a wide variety of user access models and capability offerings available to the research community, and gave attendees the opportunity to hold one-on-one conversations with facility representatives to learn about capabilities and expertise available to support their research. The Exhibit featured 16 different booths

representing more than 100 user facilities. User facility representatives engaged with a large number of attendees during the Exhibit. The staff from the Nanoscale Science Research Centers Booth engaged with more than 300 attendees, a 50% increase in booth visitors compared to the 2018 MRS Fall Exhibit.

All booth representatives were able to interact with student attendees. Discussions ranged from capabilities and expertise that could benefit their research, to career options at user facilities. A large number of visitors were from academia (78%) but also included attendees from industry (12%) and government institutions (7%) as well. The categories include an equal interest from both US and international institutions.

User Facility Flash Talks

The main goal of the flash talks (3 minutes in length) was for facility representatives to highlight their unique capabilities, expertise, and how people can gain access to conduct their research. Facility representatives were also able to address questions from the audience at the end of the session. SSURF also sponsored a refreshments break to allow attendees an opportunity to stop by and learn about research facilities that are free to access. From the perspectives of the organizers and through feedback received from exhibitors, the event was a resounding success.

The various user facility events had many interested attendees and plenty of opportunities to engage in one-on-one discussions. For more information, visit mrs.org/fall2019/activities-events/user-facilities-events.