## Scientific Advancement

Here at Oak Ridge National Laboratory (ORNL), we vigorously pursue advancement of our science program using the unique strengths of neutron scattering to investigate the structure and dynamics of materials, with a focus on quantum materials, catalysis, alloys, polymers and soft matter, biological systems, and the energy materials needed to deliver the carbon-free economy of the future.

The Spallation Neutron Source (SNS) and High Flux Isotope Reactor (HFIR) user facilities at ORNL enable scientists to address some of the most pressing challenges of our time, leveraging our facilities to deliver an increasing number of high-impact publications.

We welcome researchers from around the globe to use our instruments for research that helps to provide answers to big science questions about the fundamental nature of materials at the atomic scale. By answering these questions, neutrons help spur innovations that improve our daily lives: more powerful computers, more effective drugs, longer-lasting batteries, new structural materials, including key components in automobiles, buildings, bridges, and more.

Download a copy of this calendar and read about the research featured here at neutrons.ornl.gov/2023scienceposter.

## Focus on our User Community

To maximize the value of neutron scattering to our vast and important user community, ORNL continues to make improvements to the user experience through expansion of our neutron scattering applications with various initiatives for developing new techniques and cutting-edge sample environment equipment. We are investing in instrument upgrades and tools for data analysis and data analytics, including delivering new data analytics capabilities and semi-autonomous experiments that maximize value to our users. We are closely coupling neutron scattering data to computational results and results from complementary experimental methods. And, perhaps most importantly, we are strengthening engagement of the scientific community in identifying needed advances in neutron scattering capabilities.

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Proposal Call 2023-B closes at noon on February 22.

SNS instruments will not be accepting proposals in the 2023 proposal calls due to the planned Proton Power Upgrade (PPU) outage starting in August 2023.



## The Future: HFIR, Proton Power Upgrade (PPU), Second Target Station (STS), VENUS

ORNL continues to deliver cutting-edge science while prioritizing planning for the future, remaining on track with the Proton Power Upgrade (PPU) and Second Target Station (STS) construction projects. These two projects -- as well as the continued safe, reliable operation of HFIR -- are essential to fulfilling the laboratory's 3-source strategy for neutron production. To that end, ORNL is preparing to replace HFIR's beryllium reflector and other key reactor components. The beryllium reflector helps drive neutron production by reflecting stray neutrons back into the core as they are generated.

Progress continues to be made on the construction of the VENUS instrument at the SNS. Planned for completion in a few years, VENUS will be a state-of-the-art beamline for neutron imaging that will enable exciting new ways of studying a wide range of diverse materials currently not possible for open research programs in the US.

The PPU project will double the power capability of the SNS linear accelerator, from 1.4 to 2.8 megawatts, to facilitate new types of experiments and discoveries and allow the STS to be built. PPU early completion is planned for 2025. The STS reached a major milestone in November 2020 when the US Department of Energy (DOE) officially gave the project Critical Decision 1 (CD-1) approval. CD-1 status affirms the project's conceptual designs, cost and schedule range, and general acquisition plans, and allows the team to pursue design and development. Working closely with the scientific community, ORNL will continue to refine the design, including the accelerator, target

system, and instruments. The project is targeting a combined CD-2/3 approval by the end of 2024 to enable the start of construction, with early completion in 2032.

The Second Target Station will feature:

- The ability to simultaneously probe the structure and function of complex materials across broader length and time scales, contributing to the understanding and design of novel, complex materials.
- Neutron beams ideal for exploiting the magnetic interaction of neutrons with matter to unravel the structure and dynamics arising in complex magnetic materials.
- High-brightness cold neutrons suited for experiments with smaller samples than what is currently possible using the SNS First Target Station (FTS).
- Experiments that will be complemented by other ORNL capabilities, such as high-performance computing (HPC), that can contribute to all areas of research.

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Proposal Call 2024-A closes at noon on August 30.

SNS instruments will not be accepting proposals in the 2023 proposal calls due to the planned Proton Power Upgrade (PPU) outage starting in August 2023.



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