



Physical Sciences at ORNL

Oak Ridge National Laboratory's Physical Sciences Directorate is home to highly integrated basic and applied research programs whose mission is to deliver scientific discoveries and technical breakthroughs for solutions in energy and national security, providing economic benefit to the nation. Our portfolio includes materials, chemistry, nuclear physics, and isotopes R&D and spans the research spectrum from fundamental research to Technology Readiness Level 4 (and beyond). We continually seek opportunities to integrate our research with other signature activities at ORNL, particularly in the areas of computational and data-intensive science, and we are committed to becoming the clear world leader in neutron scattering research in materials and chemical sciences.

Where Discovery Meets Application

PSD has primary responsibility for accelerating the discovery and design of new materials and chemical processes for energy and for enhancing strategic capabilities in isotope production and R&D. This is enabled by research in the following:

Modern Materials and Chemistry

By coupling basic and applied research with state-of-the-art synthesis, characterization, and computation, we deliver new materials designed with tailored functionalities and chemical processes for energy use, storage, and production, particularly under extreme environments.

Extreme Tools for Extreme Science

We use advanced characterization tools that deliver highly innovative material science solutions that can be readily translated to high-impact applications.

Extreme Quantum

We harness quantum mechanics to calculate nuclear, chemical, and materials properties to create and control quantum materials and their behavior.

Advancing Theory

We use theory, modeling, and simulation to design new materials with superior properties to address the world's energy and national security needs, provide insights to chemical properties of matter, and enable descriptions of nuclei and stellar nucleosynthesis.

802

Journal publications
in FY 2019

13

Licenses issued
in FY 2019

4

Governor's
Chairs

58

New industry
partnerships in
FY 2019

907


Research guests
annually

44

Patents issued
in FY 2019

48

Patents filed
in FY 2019



"Our passion is to solve
problems that make a lasting
impact on the world around us."

Phillip Britt, Acting Associate Laboratory Director
Physical Sciences Directorate

Extreme Physics

We lead experiments searching for extremely rare decays and tiny physical effects that would help solve the puzzle of why the universe has more matter than antimatter. We also develop tools and techniques that enable the discovery of superheavy elements and study the behavior of nuclei under extreme conditions.

Rare Isotopes

We make critical isotopes more readily available to meet domestic US needs and advance isotope science to deliver radioisotopes and stable isotopes.

Programmatic and Technical Leadership

PSD provides leadership at ORNL for the BES programs of the Department of Energy's Office of Science, including research within the divisions of Materials Sciences and Engineering and Chemical Sciences, Geosciences, and Biosciences. PSD also provides leadership of ORNL programs for the DOE Office of Science Nuclear Physics program, which includes both nuclear and low-energy research programs, isotope production and research programs, and the National Isotope Development Center. PSD is home to the Center for Nanophase Materials Sciences, one of five DOE-BES nanoscience centers within the BES Scientific User Facilities Division.

The Center for Nanophase Materials Sciences provides a national and international user community access to expertise and equipment for a broad range of nanoscience research, including nanomaterials synthesis, nanofabrication, imaging/microscopy/characterization, and theory/modeling/simulation. CNMS also acts as gateway for the nanoscience community to benefit from ORNL's neutron sources (SNS and HFIR) and computational resources. All CNMS facilities and capabilities are accessible based on peer-reviewed proposals and are offered at no cost to users who intend to publish their results.

2

Energy Frontier
Research
Centers

514

Employees

4

Research
Divisions

653

Unique Users

\$243M

In revenue
in FY 2018

107

Invention
Disclosures

CONTACT:

Phillip Britt, Acting
Associate Laboratory Director
Physical Sciences Directorate

brittpf@ornl.gov,
865-576-1219

One Bethel Valley Road,
Oak Ridge, TN 37830



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