We harness next-generation tools in biology, ecology, data analytics, neutron and computational sciences to translate fundamental understanding into models that advance scientific discovery.

Stan Wullschleger, Interim Associate Laboratory Director
Our Research

**Environmental Sciences**—Our researchers expand scientific knowledge and develop innovative strategies and technologies that help sustain Earth’s natural resources.

**Biosciences**—Our scientists advance knowledge discovery and develop technology to characterize and engineer complex biological systems that benefit the environment and our bioeconomy.

**Systems Science at Every Scale**

BESS is home to DOE’s [Atmospheric Radiation Measurement (ARM) Data Center](#), which provides cutting-edge computing capabilities and data to scientists from around the world. The [Center for Bioenergy Innovation](#), a DOE Bioenergy Research Center, enables high-impact and value-added advances along the bioenergy supply chain. The [Climate Change Science Institute](#) fosters the integration of experiments, measurements, and simulation to achieve a predictive understanding of our changing world. The UT/ORNLI [Center for Molecular Biophysics](#) explores the structural dynamics of biomolecules by uniquely working at the interface of biology, chemistry, and the physical sciences, aided by neutron and computational sciences. The [ORNL Distributed Active Archive Center for Biogeochemical Dynamics](#) provides scientists with access and tools to explore terrestrial ecology data from NASA Earth Science missions.

**Recent Impacts**

Building upon a rich history of breakthroughs in biology and ecology, BESS scientists are proud to have sequenced the first tree genome, pioneered the field of global change biology, and solved the 40-year mystery of how bacteria transform mercury into highly toxic methylmercury. Here are a few recent impacts.

- Identified a missing link in the genetic basis of plant defense tradeoffs against different classes of pathogens
- Developed new multimodal bioimaging technologies for correlating chemical and structural information
- Determined that soil geochemistry influences rate and magnitude of greenhouse gas production in tundra soils
- Developed a revolutionary data discovery portal using modern data science capabilities for the Atmospheric Radiation Measurement community
- Used the Summit supercomputer to analyze gene expression data in patient lung tissues and propose a role for bradykinin in COVID-19 inflammatory response
- Determined that warming and drying of carbon-rich wetlands lead to dramatic increases in fine-root growth, especially of shrub vegetation, in northern peatlands

**CONTACT:**

Stan Wullschleger, Interim Associate Laboratory Director
Biological and Environmental Systems Science Directorate
wullschlegsd@ornl.gov
865-574-7839
One Bethel Valley Road, Oak Ridge, TN 37830

www.ornl.gov/bessd

The Spruce and Peatland Responses Under Changing Environments experiment assesses changes in northern peatland ecosystems from increased temperature and elevated levels of CO₂.

The Advanced Plant Phenotyping Laboratory uses an array of imaging capabilities to aid scientists in connecting plant gene functions to observable traits.