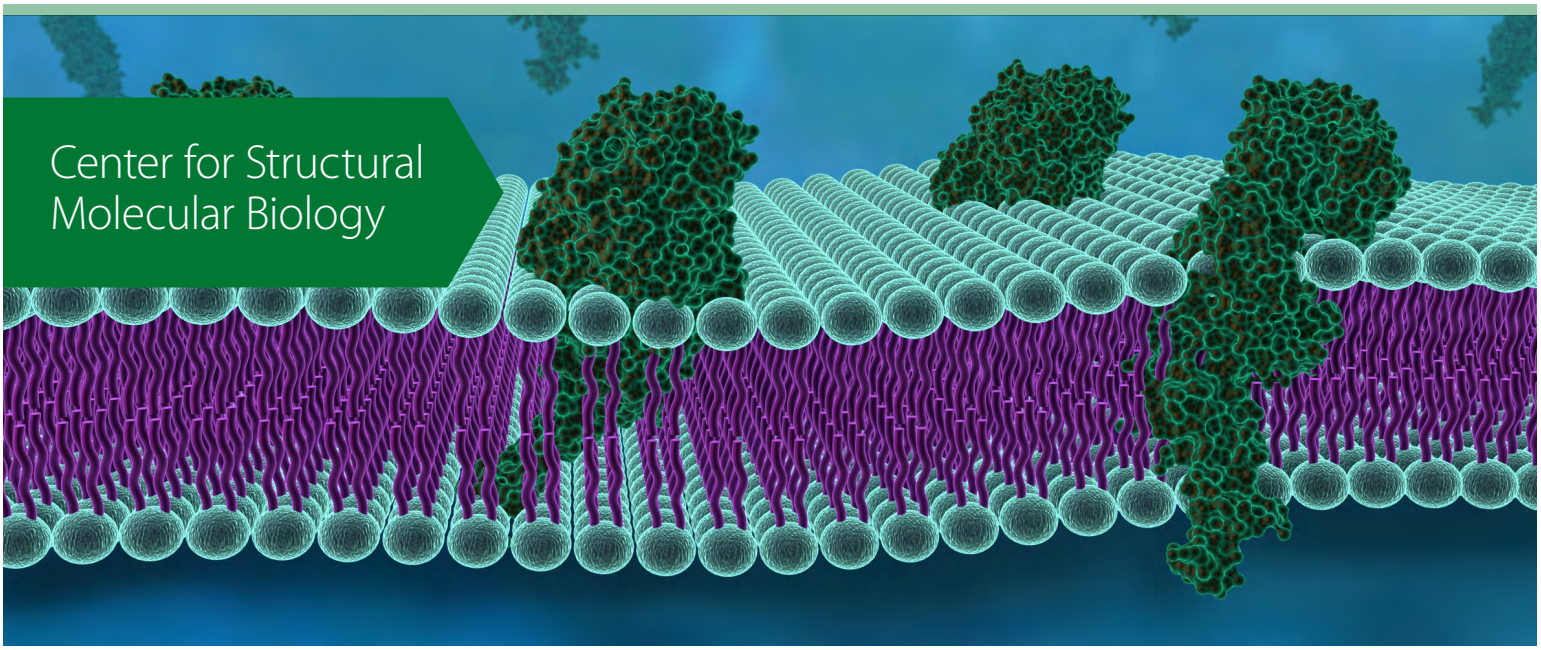


Center for Structural Molecular Biology

Neutrons for Biology

A Resource for Studying Biological Systems

Biomacromolecules and their assemblies

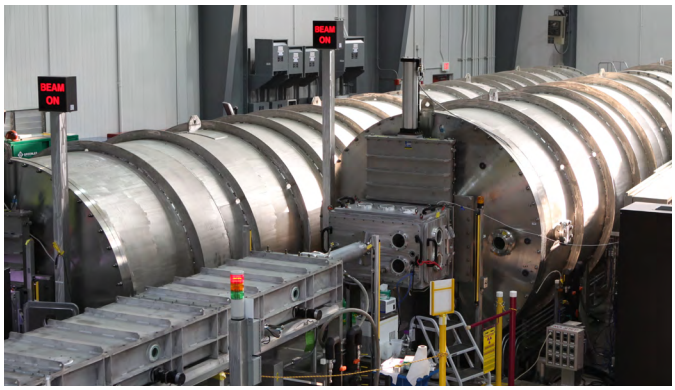
- Protein Complexes
- Viruses
- Protein/Nucleic Acid/Lipid Complexes
- Carbohydrate Complexes

Hierarchical and biomimetic systems

- Gels
- Fibers
- Vesicles
- Membranes
- Microemulsions

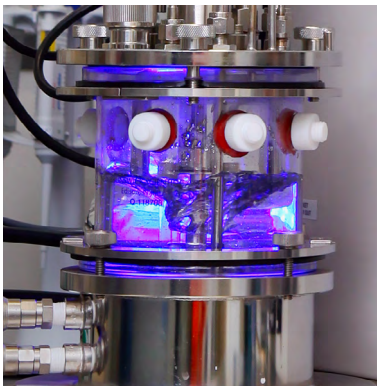
Funding for the CSMB is provided by the DOE Office of Biological & Environmental Research.
ORNL is managed by UT-Battelle for the US Department of Energy

The Center for Structural Molecular Biology (CSMB) at Oak Ridge National Laboratory (ORNL) is an open access user program dedicated to developing instrumentation and methods for determining the three-dimensional structures of proteins, nucleic acids (DNA/RNA) and their higher-order complexes. These tools will help researchers understand how macromolecular systems are formed and how they interact with other systems in living cells. The focus of the CSMB is to bridge the information gap between cellular function and the molecular mechanisms that drive it.



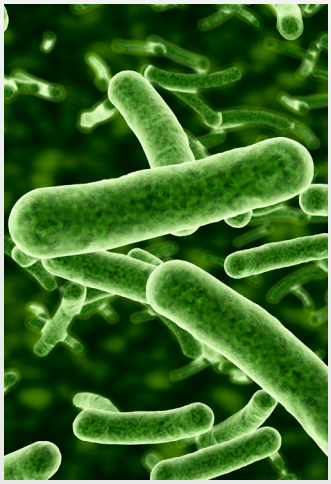
Bio-SANS

The CSMB operates a small-angle neutron scattering instrument dedicated to studying biological samples (Bio-SANS). The CSMB is also closely allied with the Spallation Neutron Source (SNS). The SANS instrument suite at the High-Flux Isotope Reactor (HFIR) and SNS facilities provide new opportunities for studying biomolecular processes on biologically relevant length and timescales.



Bio-Deuteration Laboratory

The CSMB operates the Bio-Deuteration Laboratory for cloning, protein expression, purification, and characterization of H/D-labeled biological macromolecules.



The CSMB welcomes researchers from the biological sciences interested in utilizing ORNL's neutron scattering facilities through the user programs.

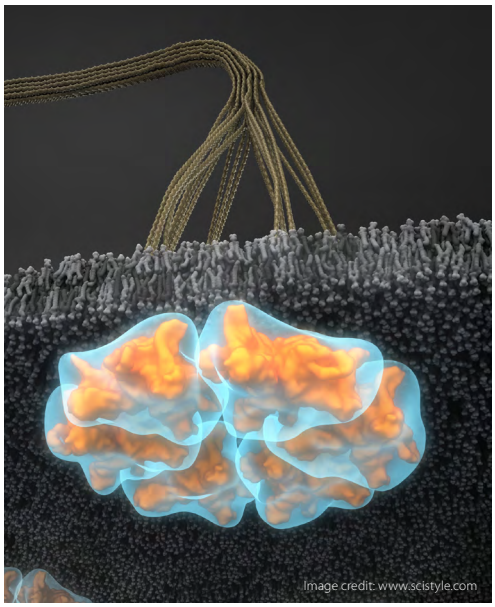
Contact:

Center for Structural Molecular Biology:
csmb@ornl.gov
(865) 574-4600

csmb.ornl.gov

Unique Tools for Structural Molecular Biology

Small-Angle Neutron Scattering can be used to study biological systems under near-physiological conditions. Using deuterium labeling, SANS makes it possible to highlight and map components within larger complexes (e.g., viruses and ribosomes) by selective deuterium labeling and contrast variation. The dual detector configuration of Bio-SANS enables investigation of *in situ* processes using time-resolved SANS, and studies of hierarchical and complex biological systems with simultaneous access to multiple length scales.

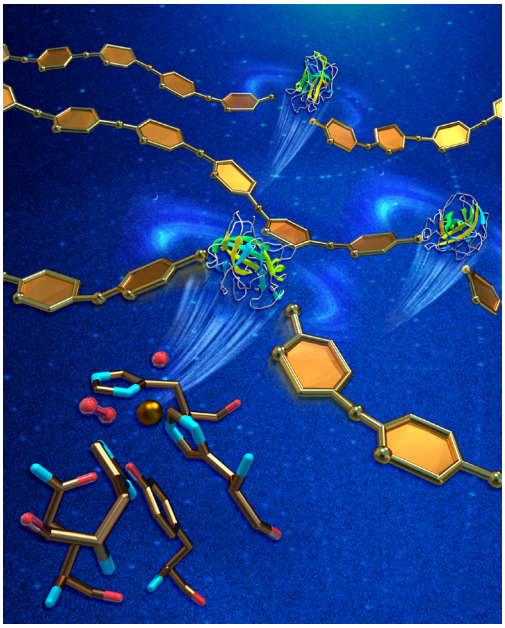


Data Visualization and Analysis tools are being developed for the study of biomacromolecular complexes with SANS. When combined with deuterium labeling, it is possible to develop models of complex systems not obtainable by other techniques.

Neutron diffraction, spectroscopy, and scattering are excellent tools for studying biological systems because neutrons interact differently with hydrogen and its isotope deuterium. As a result, it is possible to

1. pinpoint individual hydrogen positions in proteins;
2. probe the structure and dynamics of proteins, nucleic acids, and membranes; and even whole cells under near physiological conditions;
3. characterize hierarchical materials.

These approaches use neutrons to address questions that cannot be answered by other techniques.



17-G00077_ldh