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Lifesciences: Neutron scattering in life science: capabilities & sample requirements

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Neutron scattering techniques are a powerful tool in life science research. The lack of ionizing radiation damage and the ability to use hydrogen isotope labelling & contrast make neutrons uniquely suited for the study of biological materials. With improving neutron instruments and an increasing number that are well-suited to the study of biomolecules, the expectation is that this community will only grow in the future.
In this presentation, the use of small angle neutron scattering (SANS), neutron reflectometry (NR), and neutron protein crystallography (NPX) will be introduced and specific scientific examples shown. The molecules that are of most interest include proteins, lipids, fatty acids, small organic molecules, surfactants, and even membranes. With neutrons it is possible to investigate the role of these molecules to elucidate mechanistic questions in biology.
For SANS and NR, isotope labelling (deuteration) is most commonly used to enable contrast variation, allowing scientist to selectively "match out" components of complexes. In NPX deuteration is used to boost weak signal-to-noise ratios, reduce the incoherent background due to hydrogen, improve neutron scattering length maps, and enable direct visualization of hydrogen bonds and solvent networks. As deuteration is an essential ingredient in life science research using neutrons, there are now several deuteration support labs established across the globe.

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Dr Zoë Fisher completed her undergraduate studies at the University of Stellenbosch in 2000 before moving to the USA for work and to pursue a PhD degree. After completing her doctorate at the University of Florida in 2006, she became a postdoc and later a staff scientist at Los Alamos National Laboratory in New Mexico. In 2014 she relocated to Sweden to join the European Spallation Source and today leads the deuteration & macromolecules crystallization team.

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