CNS/NIST SEMINAR

Tuesday, Aug. 20, 2019

3:00 p.m.

366 Colburn Lab

"How Multivalent Cations Tune the Phase Behaviour of Proteins: Insights from Scattering Experiments"

Protein phase behaviour is of importance for structural biology, rational drug design, protein condensation diseases and several processes in cell biology. Multivalent cations can induce a rich protein phase behaviour including liquid-liquid phase separation (LLPS) [1]. Under certain conditions, LLPS can promote the growth of protein crystals [2], with obvious implications for structural biology. Understanding the microscopic details of the phase behaviours described above is thus both crucial and a challenge for scattering experiments. Here, an attempt is made to shed light on this complex subject.

In the case of bovine serum albumin (BSA), LLPS induced by multivalent cations has a lower critical solution temperature (LCST). This unusual phenomenon is shown to be of entropic origin [3]. Further, using SAXS and complementary methods, a cation-specific tunability of the phase behaviour of BSA is revealed [5]. Finally, cation mixtures are shown to have a strong influence on the phase separation kinetics of BSA [6]. The results presented indicate that cation-specific effects can be used to fine-tune protein interactions and phase behaviour. Our results are of strong relevance for a fundamental understanding of protein and soft matter thermodynamics.

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Dr. Matsarskaia completed her Ph.D. studies in December 2018 in Frank Schreiber's group at the University of Tübingen, Germany. Her research focused on the influence that multivalent cations have on the thermodynamics of proteins in solution. Her main methods involved various X-ray and neutron scattering techniques. Currently, she is a post-doctoral fellow in Bela Farago's neutron spectroscopy group at the Institut Laue-Langevin in Grenoble, France, and focuses on the dynamics of proteins in crowded environments using neutron backscattering and complementary methods.

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[7] M. Grimaldo et al., JPCL, **10**, 1709 (2019).