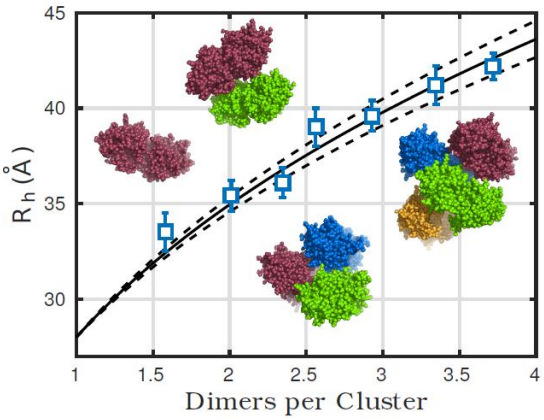
Physics of Molecular and Biological Matter
Research group Prof. Frank Schreiber

EBERHARD KARLS
UNIVERSITÄT
TÜBINGEN

## Master and Bachelor Projects:

## Statics and Dynamics of Protein Clusters

The study of static and dynamic properties of protein clusters is of high importance because they serve as precursors for protein condensation related phenomena, such as the aggregation, crystallization and fibril formation. In our research group we use multivalent ions to tune the effective interactions in protein solution and their phase behavior. In particular, the bridging effect of multivalent metal cations can generate a series of competing interactions which is essential for the formation of protein nano-clusters with lifetimes ranging from nanoseconds to seconds.



Characterization of protein cluster formation and their static & dynamic properties by SAXS, SLS/DLS and neutron spectroscopy.

In this project, we apply dynamic and static light scattering to reveal the collective diffusive behavior of the protein particles in solution. Moreover, SLS / DLS can help us determine the percentage of protein monomers and clusters. This project will complement studies on the self-diffusive behavior of proteins via neutron spectroscopy in Grenoble, France.

The projects listed below are suitable for students of various backgrounds with an interest in interdisciplinary work for their Bachelor's or Master's thesis.

## Topics and Methods:

- Characterization of phase behavior of a protein-salt system: The phase boundary may either be approached by varying the salt concentration or the temperature.
- UV-vis spectroscopy: protein concentration determination, absorption & transmission of protein solutions;
- Static and dynamic light scattering (SLS/DLS): diffusion coefficient, hydrodynamic radius of protein clusters;
- Small angle x-ray scattering: characterization of effective interactions and the correlations in protein solutions.

**Contact:** fajun.zhang@uni-tuebingen.de or frank.schreiber@uni-tuebingen.de

**Address:** Auf der Morgenstelle 10, C-Building, 7th floor

## References and further information:

http://www.soft-matter.uni-tuebingen.de (see under publications and open positions)

1. F. Zhang et al., Pure Appl. Chem. **86** (2014) 191.
2. D. Soraruf et al.,Soft Matter **10** (2014) 894.

3. M. K. Braun, et al. J. Phys. Chem. Lett. **8** (2017) 2590.