

PhD Openings in Protein Biophysics

Static and Dynamic Properties of Proteins in Solution



Two DFG-ANR-funded PhD positions are available for an international collaboration project between the University of **Tübingen** (Germany) and the Institut Max von Laue–Paul Langevin (ILL), in **Grenoble** (France). In a context of great fundamental biophysical interest, the DFG-ANR-funded collaboration will address the static and dynamics of proteins in aqueous solutions. The important control parameters of the samples are the concentration of proteins and other macromolecules in the solution (“crowding”), the charge state of the solution induced by salt ions, and the temperature. By systematically tuning these parameters, complex solution phase diagrams can be explored. These involve dynamic or static protein clusters, liquid-liquid phase separation and gelation regimes, and possibly crystallization. The aim of the project is to contribute to a fundamental physical understanding of these phase diagrams with the prospect of establishing a rational choice of pathways for protein cluster and crystal formation. The model protein at the center of this project is immunoglobulin (gamma-globulin). In view of the peculiar three-lobed conformation of these antibody proteins, the project will in particular be guided by the role of the protein shape. The crowding will be induced both via so-called self-crowding by varying the concentration of the target protein, as well as by external crowding using other proteins or other (deuterated) macromolecules, including e.g. bovine serum albumin and poly(ethylene glycol).

The main techniques used for the static properties will be small angle x-ray and neutron scattering (both synchrotron and lab-source SAXS) and optical microscopy. Complementary techniques including dynamic and static light scattering are available in the lab. For the dynamics part, the principal experimental method is high-resolution neutron spectroscopy. Experiments will be carried out at the ILL as well as at other neutron scattering facilities worldwide. The data analysis requires a strong interest in theory, mathematics, and testing of biophysical models. Moreover, programming, including numerical optimization using e.g. python or MATLAB, will be required. The project furthermore requires regular travels not only to various x-ray and neutron scattering facilities but also to project partner meetings. The PhD projects will closely interact with a postdoctoral project that is equally part of the international collaboration and that will focus on the theory and simulations by modeling inter alia the structure factors, patchy attractions, and diffusion coefficients.

The ANR project will be located in **Grenoble** and involves the ILL and the Institut Interdisciplinaire de Physique in Grenoble. The DFG-funded part will be located in **Tübingen**, the Institute of Applied Physics at the University of Tübingen (Germany) (groups of Profs. Frank Schreiber and Martin Oettel).

Starting time: Applications will be considered until the position is filled.

Working place: University of Tübingen and Grenoble, France

Application: Candidates with a master degree in physics, physical chemistry, or material science with a strong interest in scattering experiments are encouraged to send us their applications, CVs, and preferably contact details of one reference.

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Dynamic part in Grenoble (France): Prof. Dr. Jean-Louis Barrat (jean-louis-barrat@univ-grenoble-alpes.fr) Dr. Tilo Seydel (seydel@ill.eu)

For further information please visit: www.soft-matter.uni-tuebingen.de and www.ill.eu