Internship in Biophysics.

**Location:** Juelich Center for Neutron Science (FRM II, Garching)
**Qualifications:** bachelor/master student in Physics
**Hours per week:** 8
**Duration:** 3-6 months

**Description of the project:**
X-ray and neutron crystallography are the main tools to achieve the three-dimensional structure of biological macromolecules at atomic resolution, essential for drug design and for the understanding of fundamental physiological mechanism. Because of the nuclear interaction between neutron and atoms, neutron crystallography is able to give unique information about the hydrogen atom positions. Furthermore, neutron crystallography allows locating water molecules, whose position is important for the biological macromolecules functionality. Unfortunately, because of the lower flux of neutron beam compared to that of X-ray beams, bigger crystals are necessary (around 0.5mm³). The production of sufficiently big crystal is still the main obstacle for successful neutron experiments even at efficient neutron sources such as FRM II in Garching.

The crystallization process is a delicate and complex phase transition. It can be described as a path along the phase diagram of the specific protein, which is a multidimensional graph as a function of the temperature, pH, protein and precipitant concentration. The main goal is to bring the initial protein solution in the supersaturated zone, where the nucleation starts. Thereafter one drives it into the metastable zone, where the nuclei grow. In order to improve the growth of new interesting protein crystals and facilitate successful measurements at the neutron diffractometer BIODIFF (FRM II, Garching) a new crystallization device for large protein crystal growth has been designed and built in the framework of the European project SINE2020. This apparatus is able to control at the same time the temperature and the precipitant/protein concentration, allowing us to keep the protein solution in the metastable zone as long as possible. This should result in the growth of sufficiently large protein crystals.

**Specific task:**
The candidate will use the crystallization device in order to explore the phase diagram of different proteins. He will try to optimize and modify relevant parameters in order to grow large protein crystals which are suitable for a measurement at standard neutron protein crystallography beamlines such as BIODIFF.

Contact: Dr. Marialucia Longo, m.longo@fz-juelich.de, phone: 089–289-11684