Project Title: Resolving the mode of action of the CRISPR-Cas type I systems inside cells

Supervisor: Prof. Ulrike Endesfelder
Institute/group: Institute for Microbiology and Biotechnology, RG Endesfelder
Webpage: https://www.ifmb.uni-bonn.de/en/research/rg-endesfelder/research-focus

Requirements: interest in microbial cell biology and transdisciplinary research, English as working language

Skills to be learned: dependent on the interests, background knowledge and looked-for research focus of the student, one or several of the following key expertise will be learned: A) molecular wet lab techniques, B) (single-molecule) fluorescence microscopy and/or C) data analysis, coding or modelling.

Project Description (max. 150 words): CRISPR-Cas systems are best known for their unique capacity of genome engineering. Type-II systems based on Cas9 are well studied and have become widely used. In contrast, type-I systems, based on multiprotein complexes termed Cascade and nuclease Cas3, are less studied although they offer unique features, e.g., Cas3 being processive, thus efficiently degrading kilobase-long DNA segments (while Cas9 only provides single cuts). However, their molecular mechanism of action remains vague in various aspects. In our group, we investigate type-I systems from *Escherichia coli*, *Shewanella putrefaciens* and *Haloferax volcanii* by using biochemical and molecular biology tools as well as single-molecule microscopy to resolve the dynamics of the complexes in live cells at high spatiotemporal resolution. The student will join our CRISPR-Cas biology subgroup and will be trained in all skills needed to take over some of our projects aims. The work plan will be discussed individually and dependent on interests.

Support concept (max. 75 words): Full integration into the subgroup working on CRISPR-Cas Type-I biology, including subgroup meetings and slack channel exchange. Flexible working hours, adjusted to the students' study schedule and to the projects' needs. Offer to join the group's conferences with an own poster contribution presenting own results (VAAM, SMLMS). Bimonthly mentoring meetings. Optional: Enlarging the project to a larger format to be able to integrate M.Sc. modules, such as lab rotations and/or the master thesis modules.