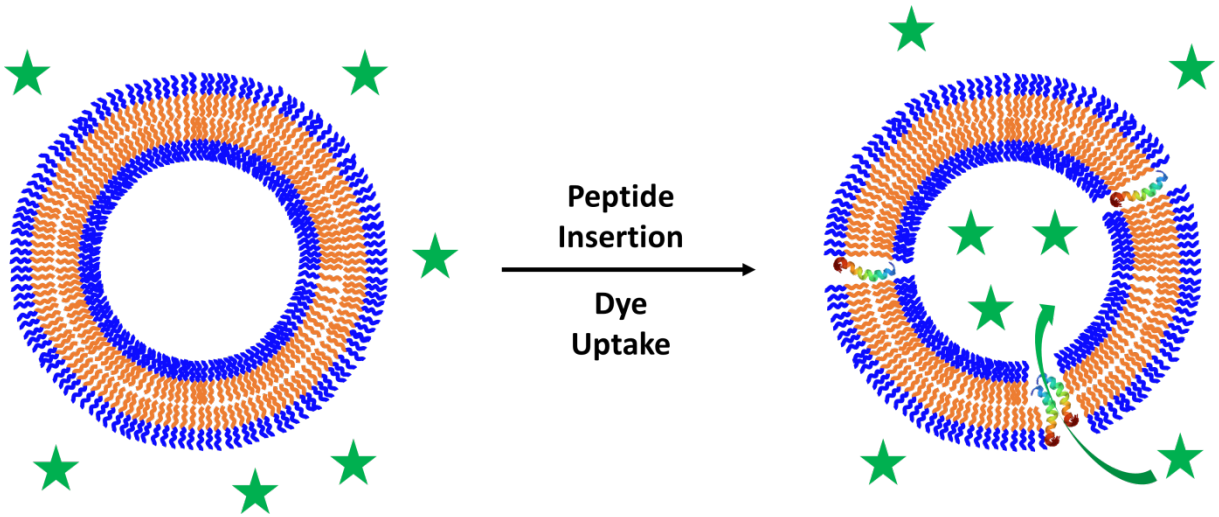
Insertion of a pore-forming peptide into polymersome membranes for controlled permeabilization

Amphiphilic block copolymers are able to self-assemble in aqueous media into several morphologies. From those, polymersomes (micro- or nanometer-sized hollow spheres) are of special interest for biomedical applications such as drug delivery, nanoreactors or cell mimics. In order to enable permeability for specific substrates through the polymer membrane, the insertion of peptides or membrane proteins has been investigated intensively.[1] Pore-forming peptides are of high biological relevance particularly as cytotoxic agents, but their properties are also applicable for the permeabilization of lipid membranes. This approach can then be translated to the more stable and versatile polymeric membranes. Successful pore formation was shown with ABA triblock copolymers and was dependent on curvature and thickness of the membrane.[2] However, some basic characteristics of the insertion remained unclear so far. Especially the insertion into vesicles based on different AB diblock copolymers is of interest in order to broaden its applicability. A promising alternative to the commonly used PDMS-*b*-PMOXA copolymer is the recently published PBO-*b*-PG copolymer, which is equally able to form polymersomes.[3]



The project includes the following experiments, which can be modified according to personal interest and the duration of the internship:

- synthesis of a model peptide using a microwave assisted solid-phase peptide synthesizer
- purification and characterization of the peptide *via* HPLC and mass spectrometry
- insertion of the peptide into different polymersomes
- analysis of dye uptake in dependence on polymer composition, membrane thickness and peptide concentration *via* Fluorescence Correlation Spectroscopy (FCS)

We are looking for a student with interest in industrial techniques applied on small scale and interested to dive into a single molecule spectroscopy technique. Please contact Dimitri Hürlimann (dimitri.huerlimann@unibas.ch) or Riccardo Wehr (riccardopascal.wehr@unibas.ch) for information and application. Please state in a few sentences your scientific background and which part of the project is of most interest for you. The internship can be held in German or English.

[1] M. Garni *et al*., *Biochimica et Biophysica Acta,* 2017, 1859, 4, 619-638, https://doi.org/10.1016/j.bbamem.2016.10.015

[2] A. Belluati *et al*., *Biomacromolecules*, 2020, 21, 2, 701–715, https://doi.org/10.1021/acs.biomac.9b01416

[3] R. Wehr *et al*., *RSC Adv*., 2020, 10, 22701, https://doi.org/10.1039/D0RA04274A