Design of a polymer membrane-based molecular “hoover”

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In this PhD project we plan to engineer nanolayers and -cells that are based on chemically and mechanically robust block copolymer membranes and that act as molecular “hoovers”. This requires the development of strategies for immobilizing functional polymer membranes on nanoporous substrates and optimizing the insertion of functional proteins [1,2]. Two different types of cellular machines have been selected to provide copolymer-based nanolayers with specific functionalities [3,4]. Firstly, light-driven, spectrally tunable proton pumps will be inserted in the nanocell membrane to convert light to proton gradients. Secondly, molecular co-transporters that use these proton gradients to specifically remove and release molecular components from and to the environment will be inserted in the nanolayer. Reconstituted membranes will be structurally and functionally characterized using spectroscopic and microscopic techniques.

We are looking for candidates with a good background in nanoscience and molecular biology (or biotechnology) and interested in optimizing the chemical composition of block copolymer membranes, reconstitution of proteins, as well as characterization of structure and functionality of molecular ‘hoovers’

1. ‘Solid Supported Polymeric membranes’ S. Belegrinou, et al, ***Soft Matter*** (2011) 7, 2202 - 2210;
1. ‘Highly Permeable and Selective Pore-Spanning Biomimetic Membrane Embedded with Aquaporin Z’ H. Wang, et al. ***Small***, (2012) 8, 1185-1190.
3. ‘High-resolution atomic force microscopy and spectroscopy of native membrane proteins’ Ch. Bippes & D.J. Muller, ***Reports on Progress in Physics*** (2011) 74, 086601.
4. ‘Locating an extracellular K^+-dependent interaction site that modulates betaine-binding of the Na^+-coupled betaine symporter BetP’ L. Ge, C. Perez, I. Waclavska, C. Ziegler & D.J. Muller. ***Proc. Natl. Acad. Sci. USA*** (2011) 108, E890-898.

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