ICFO COLLOQUIUM PETRA SCHWILLE 'How membranes catalyze protein self-organization'

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July 05, 2019

Friday, July 5, 2019, 12:00. ICFO Auditorium

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Petra Schwille studied Physics and Philosophy at the Universities of Stuttgart and Gottingen. She completed her PhD research at the Max-Planck Institute (MPI) for Biophysical Chemistry in Gottingen, and spent two years as a Postdoctoral Research Fellow at Cornell University. In 1999 she returned to the MPI in Gottingen as a group leader in Experimental Biophysics, before becoming a Professor of Biophysics at Dresden University of Technology in 2002. She relocated to Munich in 2012 to take up the role of Director at the MPI of Biochemistry. She has received numerous prizes, including the Philip Morris Research Award in 2004, the Gottfried

Wilhelm Leibniz Prize in 2010, and the Braunschweig Research Prize in 2011. Petra?s research seeks to understand living systems at their most fundamental scale of interacting molecules. Her work has significantly advanced the development of Fluorescence Cross Correlation Spectroscopy (FCCS), a method of recording molecular processes within biological systems that provides new insight into the biochemical intricacies of living cells.
Living systems employ self-organized protein pattern formation to regulate important life processes in space and time. Although pattern-forming protein networks have been identified in various pro- and eukaryotes, their systematic experimental characterization is challenging due to the complex environment of living cells. In turn, cell-free systems are ideally suited for this goal, as they offer defined molecular environments that can be precisely controlled and manipulated. We demonstrate the power of reconstitution approaches using the E. coli Min system, a model system for protein self-organisation based on the reversible and energy-dependent interaction of the ATPase MinD and its activating protein MinE with a lipid membrane. Patterns formed are dramatically dependent on protein features, such as membrane affinity and ATP turnover, and can be regulated and controlled in many ways, as will be demonstrated in my talk. Intriguingly, the membrane takes the role of heterogeneous catalyst, the composition and shape of which will impact on the formed patterns. Thus, a full de novo design of protein self-organization on desired spatial and temporal scales is within reach.

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