

UniSysCat - Colloquium

Dr. Przemyslaw Nogly

ETH Zürich and soon at the Jagiellonian University, Krakow

Start Time: Wednesday, July 6, 2022 05:00 pm

End Time: Wednesday, July 6, 2022 06:00 pm

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and via Zoom

Time-resolved X-ray crystallography on membrane proteins: Watching ions moving in time and space

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Chloride transport is an essential process maintaining ion balance across cell membranes, cell growth and neuronal action potentials, however, the molecular mechanism of the transport remains elusive. Among chloride transporters, light-driven rhodopsins have gained attention as optogenetic tools to manipulate neuronal signalling. Ion pumping microbial rhodopsins are integral membrane proteins employing a common 7-transmembrane helices architecture to transport different ion types. The specific residue composition impacts the protein dynamics, transport mechanism and ion selectivity.

We combined time-resolved serial crystallography (SwissFEL and SLS synchrotron) to provide a comprehensive view of the structural dynamics and molecular mechanism of a chloride pumping rhodopsin throughout the transport cycle from 10 ps to 50 ms [1]. We traced transient anion binding sites, obtained evidence for the mechanism of light energy utilization in transport and identified steric and electrostatic molecular gates ensuring unidirectional transport. These structural insights unravel the key mechanistic features enabling finely controlled chloride transport across the cell membrane.

[1] Mous, S. et al. Science 2022, 375, 845-851

Prof. Dr. Joachim Heberle

Organizer