CeMMP Centre for Cryo-electron Microscopy of Membrane Proteins

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Doreen Matthies is an Earl Stadtman tenure-track investigator and the Head of the Unit on Structural Biology in the Division of Basic and Translational Biophysics at the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) at the National Institutes of Health (NIH). She obtained her diploma in Molecular Biology (2008) and her Ph.D. in Biochemistry (2014) from the University of Frankfurt in Germany while performing her research work in the group of Thomas Meier at the Max-Planck-Institute of Biophysics in the Department of Structural Biology lead by Werner Kühlbrandt. She joined the group of Sriram Subramaniam in the Laboratory of Cell Biology at the National Cancer Institute (NCI) at the National Institutes of Health (NIH) for her postdoctoral work (2013-2018) followed by two years in the Cryo-EM Department at the Howard Hughes Medical Institute (HHMI) Janelia campus before starting her own lab within NICHD in late 2020 focusing on the structure and function of membrane protein complexes in their native lipid environment.

Cryo-EM of membrane proteins: What have we learned in the last decades and what are the current challenges?

In the last decade the field of Structural Biology has made great advances in using electron microscopy to solve structures of protein complexes including membrane proteins to high resolution. Best practices of how to use Single Particle Cryo-EM and more importantly how to optimize a membrane protein sample such as an ion channel or a transporter will be discussed. Most membrane protein structures are currently resolved in a detergent micelle, but cryo-EM also makes it possible to look at membrane protein complexes in a lipid bilayer, such as synthetic or native lipid nanodiscs, liposomes, or even inside cells now. A brief introduction to each of these techniques will be discussed with examples of the conformational landscape of magnesium channel CorA, voltage-gated potassium channel Kv1.2-2.1, a human excitatory amino acid transporter and more.