Probing Structure Function Relations of Ion Channels Using Fluorescence Spectroscopy

The concerted action of various voltage-gated ion channels forms the basis for the neuronal activity in the brain as well as the beating of the heart. Accordingly, mutations in genes encoding for these ion channels lead to severe neurological and cardiac diseases. We use fluorescence spectroscopic methods to determine the molecular mechanisms that underlie ion channel function and its dependence on the environment. In other words, we are reverse engineering the proteins to figure out how they work.

Fluorescence spectroscopy has proven a powerful tool in this endeavour. The fluorescence properties of the probes are highly sensitive to its immediate environment, and we can thus sample the physicochemical parameters of its environment. By simultaneously measuring the electrical function using electrophysiology, we can link the global function of the protein with site-specific intramolecular structural rearrangements. In this talk, I will give an overview of the different methods that we use to probe ion channel movements and how these results help to understand the proteins’ function.