



## “Optogenetic control and visualization of GPCR pathways, or a journey from mouse brain to bioluminescent and fluorescent fish”

### Speaker

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### Time

**Thursday, 1<sup>st</sup> June 2023**

*12 o'clock*

### Location

**Center for Biostructural Imaging of  
Neurodegeneration (BIN)**

*Von-Siebold-Straße 3a, 37075 Göttingen  
Seminar Room*

#### **Abstract**

*G protein-coupled receptors (GPCRs) in neuronal circuits modulate intracellular signaling cascades and are involved in regulating action potential (AP) firing, synaptic transmission and plasticity. GPCR signal duration, specificity and adaptation depend on the precise trafficking and localization of the GPCR within its subcellular signaling domain. However, precise control and visualizing traffic-dependent GPCR signals in neurons is difficult, but important to understand the contribution of GPCRs to synaptic plasticity and to elucidate how this is altered during neurodegenerative and neuropsychiatric diseases. In general, GPCRs couple to the four main G protein families  $G_{i/o}$ ,  $G_s$ ,  $G_{q/11}$  and  $G_{12/13}$ . Synaptic plasticity is in particular controlled by the  $G_{i/o}$  and  $G_{q/11}$  pathway. We have established various optogenetic tools to control and visualize these two signaling pathways using different vertebrate opsins including rod/cone opsins, parapinopsin and *opn7b* for controlling the  $G_{i/o}$  pathway, and melanopsin for controlling the  $G_{q/11}$  pathway<sup>4-6</sup>.*

*Besides my interest in understanding the modulation of neuronal circuits I also became interested in understanding the role of bioluminescence and fluorescence for animal behavior. We are in particular interested in the neuronal processing of bioluminescent signals in flashlight fish and how these signals are used for intra- and interspecific communication. In addition, we started to investigate the role of fluorescence in various types of fish including lizardfish.*

*Thus, I will present and summarize our results about the control of synaptic plasticity in GPCR specific domains in mouse brain and the fascinating world of marine bioluminescence and fluorescence of flashlight and lizard fish from Indonesia.*