VRG10-011 - Multi-scale Understanding of Biological Function

Zusammenfassung

Our brain comprises ten billion neurons, each of which making thousands of connections with other neurons through their synapses. A wide range of brain functions, such as the mechanisms underlying the storage of memories or the generation of motor behavior relies
on the dynamic interaction of sensory inputs with neuronal circuits. Understanding the wiring diagram of these circuits represents one of the major challenges in current neuroscience. Given the large number neurons and the fact that each of them makes thousands of connections with other neurons, this task to a great extent has been hindered by the available tools.

Recently, optical methods combined with genetics and molecular techniques have provided new tools for both stimulation and recording of neuronal response. Nevertheless, there are still a large number of technical challenges that need to be overcome. Thus, the proposed research will focus on developing new optical tools that address these challenges. While it is expected that these techniques find broader application in the neuroscience community, these methods will also be applied in the Vaziri research group to the study of defined neural circuits and behaviour in C. elegans to understand how the dynamic interaction of neuronal circuits with sensory information generates behaviour.

Keywords:
non-linear optics, ultrafast optics, imaging, optogentics, neuronal circuit mapping

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