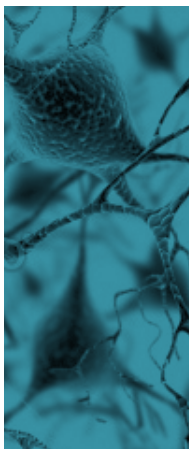
2p-Imaging: High-speed two-photon imaging for in *vivo* analysis of brain disease

Austria Canada Finland France Germany Italy Israel Luxemburg Poland Romania Spain

Project Description Nerve cells exchange electrical signals at high speed. If this signal exchange is disturbed, neurological diseases result. For example, in epilepsy too many nerve cells are active at the same time, so proper information processing is disturbed, and seizures ensue. Similarly, in Alzheimer's disease, nerve cells fail to properly communicate: some fall silent, while others show abnormal levels of activity. Even altered rhythms of activity cause problems, such as the tremors seen in movement disorders.

The central challenge in understanding failures in nerve cell communication is to reveal disturbed activity with single-cell resolution in large networks of nerve cells inside the intact brain. In order to accomplish this, large volumes or brain tissue have to be examined at many sites simultaneously. To do so, novel fast imaging methods need to be developed. Our project aims to meet this challenge for animal models of disease: We want to develop advanced methods of microscopy (known as "two-photon imaging") that can in parallel reveal the activity of hundreds of cells inside the brain of living mice. We will combine two-photon imaging with dyes that convert changes in brain signalling into optical signals. We will develop mouse models of disease with tailored light-based reporters to study the pathomechanisms of Alzheimer's disease, epilepsy and tremor.



Arthur Konnerth (coordinator)

PROJECT**PARTNERS:**

Arthur Konnerth
Technical University Munich \ Munich \ Germany

Thomas Misgeld
Technical University Munich \ Munich \ Germany

Marco de Curtis
Fondazione Istituto Neurologico \ Milano \ Italy

Yosi Yarom
Hebrew University \ Jerusalem \ Israel