CFEL SCIENCE

SEMINAR

17th October *2018 - 10:00 a.m.*

CFEL-bldg. 99, seminar room IV (O1.111)

Prakash Kara

University of Minnesota, Minneapolis, USA

Two- and three-photon imaging of neural and vascular circuits in the brain

The brain has a mechanism for increasing blood flow locally to regions with increased neural activity. This increase in blood flow generates signals that can be measured when using functional magnetic resonance imaging (fMRI). However, the precise spatial scale over which neural and vascular signals are correlated is unknown. Furthermore, the relative role of synaptic and action potential activity in driving hemodynamic signals is controversial. My laboratory has been using two-photon imaging of the brain to measure sensory-evoked responses of individual blood vessels (dilation, blood velocity) while imaging neural activity in the surrounding tissue using fluorescent glutamate and calcium sensors. We also setup three-photon imaging for deeper access into neural tissue and optogenetics to directly modulate single-neuron and single-vessel activity.

I will first present published two-photon imaging data where we showed that local neural and hemodynamic signals are partly decoupled (O'Herron et al., 2016 Nature). These findings suggest that intrinsic properties, such as propagation of vascular dilation between neighboring brain regions, need to be accounted for when decoding hemodynamic signals. I will also present our approach to imaging deeper in the brain using three-photon imaging. I will then show preliminary data of directly activating neurons and blood vessels by using two-photon optogenetics as a more general strategy to study neurovascular coupling across brain regions. Further details on our research, including movies of two-photon and three-photon imaging, are available at my lab website karalab.org.

Hosts: Franz Kärtner, CFEL and CLASS 5 Photonics GmbH