

UC SAN DIEGO NANOENGINEERING  
SPECIAL SEMINAR  
Thursday, May 16, 2019  
Seminar Presentation: 2:00pm – 3:00pm  
**SME 348**

**“Label and Sound: Protein- and Cell-Engineering for Optoacoustic Label Development”**

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**Abstract:** Photo- or Optoacoustic (OA) imaging combines optical contrast with ultrasound resolution enabling high-resolution real time *in vivo* imaging well-beyond the 1 mm penetration depth typical of purely optical methods. While OA already successfully employs endogenous contrast like blood or lipids to inform on tumor states, vascularization, inflammation or metabolic processes, targeted labels similar to those used in fluorescence imaging are few. This scarcity, particularly of labels that can be expressed as transgenes, limits the full exploitation of OA in life science applications.

Our group studies the photophysics of OA signal generation from major classes of chromophore-bearing proteins (GFP-like, Bacteriophytochromes and Phycobiliproteins) using OA, absorption and fluorescence spectroscopy under ns-pulsed laser excitation as in OA imaging [1]. We use the insights from these analyses to engineer novel OA labels through screening- and structure-based rational design [2]. A focus of our group is on photocontrollable labels to overcome the abundant signal from natural absorbers during OA imaging *in vivo* [1,3-4]. In parallel, we explore ways to develop cell-based sensors, e.g. our recent work in tracking macrophage activity within tumors using changes in the spectra of bacteriochlorophyll [5].

Our long-term goal is to provide a varied toolbox of OA labels and sensors that will allow researchers to exploit the penetration depth and non-invasiveness of this powerful imaging technique for their basic and preclinical studies of neural signaling, metabolism, cell physiology and tumor biology in entire organisms.

**Biosketch:** Andre C. Stiel is the head of the Cell Engineering group at the Institute for Biological and Medical Imaging (IBMI) at the Helmholtz Zentrum München – German Research Center for Environmental Health. He focuses on the development of innovative transgene labels for optoacoustics and other optical imaging methods. After receiving his Diploma in Biology from the Ruhr University Bochum, he conducted his Ph.D. studies at the Max Planck Institute for Biophysical Chemistry, Göttingen, in the group of Nobel Laureate Stefan Hell where he developed reversibly switchable fluorescent proteins for super-resolution imaging. After receiving his Ph.D. from the Ruprecht-Karls University, Heidelberg, in 2008 he moved for a postdoctoral stay to the Max Planck Institute for Developmental Biology, Tübingen, where he worked on computer aided protein engineering in the group of Birte Höcker until he started his own group in Munich in 2015.