Jena School for Microbial Communication
Graduate School of Excellence

Project title: Molecular communication involving membranes and lipid rafts

PhD Student: Moemi, Kawashima
Supervisors: Prof. Dr. Axel Brakhage, Prof. Dr. Christian Eggeling

Abstract:
A balanced microbiome is necessary to retain a healthy state, and it strongly depends on the exchange of molecules that shape microbial consortia. We have identified several elements of such exchange that all require structural changes of involved cellular and organelle membranes and even the involvement of extracellular vesicles (EVs). In this project, we will address two important aspects of intercellular communication: 1) the importance of membrane fluidity and lipid rafts for signal perception from outside and signal transduction within a cell; and 2) the analysis of the change of membrane fluidity and lipid raft composition by observation technology (e.g. super-resolution and spectral imaging) and compounds (e.g. dihydroxynapthalene (DHN) melanin or other membrane-active compounds) identified in our groups. DHN melanin changes by so far unknown mechanisms the lipid raft formation, whereas bacterial marginolactones are membrane-active compounds that have a major effect on the communication between microorganisms, such as the activation of fungal silent gene clusters and formation of a novel structure – we denoted gloeocapsoids – by the green algae Chlamydomonas reinhardtii. By detailing lipid membrane ordering, organization and content, and the elucidation of involved key proteins, we aim at identifying the active or passive role of the named compounds as well as in general the lipid membrane environment. Such insights are not only key in understanding microbiome-related processes but they also tackle essential pathways for treatments against pathogen infections and influence by the microbiome.