Dr. Daniel Petras "Of Microbes and Molecules - Illuminating the Ocean’s Community Metabolome"

Abstract: The chemical composition of natural products within the ocean’s community metabolome represent a fascinating source of chemical entities that are fundamentally important for understanding marine microbial community dynamics and global element cycling. However, the chemical complexity of the environmental metabolome has made only incremental advances possible with respect to identifying molecular interaction pairs. To address this challenge, we developed a non-targeted tandem mass spectrometry workflow that allows for a highly resolved and scalable analysis of small molecules in marine environments. In this talk, I will discuss some of our analytical developments by focusing on an environmental dataset collected as part of the California Current Ecosystem Long Term Ecological Research Program. Here, these tools allowed us to track the chemical shifts during a phytoplankton bloom and to prioritize molecular drivers for different stages of this bloom event. Ultimately, this analysis provides us with a connection of molecular families and microbial community members and shows how natural products structure marine environments. In order to gain a mechanistic understanding of the multitude of possible molecular and biological interactions, I will give a perspective of our recent developments of a functional metabolomics approach as well as future directions towards microbiome model systems that allow for a rational and high-throughput testing of the molecular functionality of small molecules in complex ecosystems.