“Exploring archael ecology and metabolism within engineered freshwater environments”

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Over the past two decades, environmental microbiology has witnessed major advances in the understanding of microbial communities. Among these findings, the discovery of new processes and players involved in ammonia oxidation have been enabled by the combined application of physiological and molecular techniques to a variety of terrestrial and aquatic environments. This talk will demonstrate how two seemingly distinct studies converged on the exciting finding that Archaea catalyze ammonia oxidation in both aquarium biofilters and municipal wastewater treatment systems. In particular, based on the abundance of bacterial and archaeal ammonia monooxygenase genes, several aquarium biofilters were demonstrated to be composed solely of archaeal nitrifiers and lack any detectable representation by nitrifying bacteria. In the wastewater treatment plant, the abundance of ammonia-oxidizing archaea showed a strong correlation with ammonia concentration along the flow path of rotating biological contactors. This talk will demonstrate how the combination of both molecular (fingerprinting, sequencing, quantitative PCR, lipid analysis, metagenomics) and cultivation-based (enrichments and microscopy) approaches can best explain the ecology and metabolism of Archaea in engineered freshwater environments.