

Synchrotron Techniques for Environmental Microbiology and Biogeochemistry

Environmental microbiology and geomicrobiology have emerged as vibrant scientific fields with cross-cutting research themes emphasizing the interplay and energy flow between microbial communities, inorganic and organic contaminants, (bio)minerals, groundwater, and other solutions. Synchrotron (SR)-based techniques are beginning to play important roles in these research areas because of the utility of SR methods for characterizing metal ion and organic molecule speciation under in-situ conditions in complex environmental materials. The purpose of this meeting is to bring together scientists from the environmental microbiology, biogeochemistry, and synchrotron communities to share ideas. Introductory talks regarding synchrotron techniques will be mixed with scientific talks (not limited to SR-based techniques!) to foster interactions between attendees. Topics to be discussed include mechanisms of metal binding by bacteria, microbially mediated redox cycling of metals in the environment and their application to bioremediation, biomineral structures, compositions, and formation mechanisms, and competitive sequestration of metals by inorganic sinks (oxide, sulfide surfaces, solids) and bacteria.

Program:

- 7:30 Registration/ Coffee and Muffins
- 8:00 Welcome and Introductory Comments.
- 8:10 J.R. Bargar (SSRL). Application of X-ray Absorption Fine Structure (XAFS) Spectroscopy in Biogeochemistry.
- 8:50 M.A. Marcus (ALS). Introduction to micro-beam X-ray Fluorescence Imaging (SXRF) and XAFS Spectroscopy.
- 9:30 S.M. Webb (SSRL). Introduction to SR-based X-ray Scattering Techniques.
- 10:10 Break
- 10:25 Nobumichi Tamura (ALS). Introduction to SR-based Microdiffraction Techniques.
- 11:05 Ken Nealson (USC) Topic: Microbial Influences on Metals and Minerals.
- 11:50 Lunch
- 12:50 John Zachara (PNNL) Topic: Biogeochemical Processes in Surface and Subsurface Environments.
- 1:35 Satish Myneni (Princeton University). Topic: Submicron Scanning Transmission X-ray Microscopy (STXM) and Chemical Imaging of Humic Functional Groups in Humic and Biological Materials.
- 2:20 Yuri Gorby (PNNL). The Role of Controlled Cultivation in Systems Biology and Biogeochemical Research.
- 3:05 Break
- 3:15 R. Bencheikh-Latamani (Scripps Institute of Oceanography) Mechanisms of Uranyl Sorption to Bacterial Surfaces of *Pseudomonas fluorescens*.
- 4:00 Scott Fendorf (Stanford University) Mineral Biotransformations and Their Impacts on Contaminant Attenuation.
- 4:45 Alfred Spormann (Stanford University) Molecular Microbial-Mineral Interactions.
- 5:30 Refreshments and Discussions