

# NSF-REU: Microbiology in the Post Genome Era Visiting Speaker Series

FRI  
AUG  
09  
2013



Dr. Brian Hedlund  
University of Nevada, Las Vegas

10:00AM

VBI Conference Center

*Nitrogen Cycling in Terrestrial  
Geothermal Systems and  
Genomic Exploration of  
“Microbial Dark Matter”*

Microbial dark matter | Ecology of high-temperature ecosystems  
Nitrogen cycling | Single-cell genomics and metagenomics | US Great Basin

Thermophiles have been studied by microbiologists for decades; however, only a few studies have measured microbial activities in natural geothermal systems. As a result, our knowledge of the ecology of high-temperature ecosystems remains limited. We have studied the nitrogen biogeochemical cycle in geothermal springs by using a combination of approaches and have defined apparent upper temperature limits for ammonia oxidation (~82-85°C) and nitrite oxidation (~65°C). These limitations regulate the supply of oxidized nitrogen for denitrifiers.

We have also found that many springs in lower-temperature geothermal areas (e.g. away from Yellowstone) host abundant novel lineages that have never been cultivated in the lab – so-called “microbial dark matter”. Currently <50% of phylum-level lineages of Bacteria and Archaea have been cultivated and studied in the laboratory. The biology of these organisms is a major frontier in microbiology. We have combined single-cell genomics and metagenomics synergistically to reconstruct near-complete genomes from several “microbial dark matter” groups, allowing development of models on their evolution, cell architecture, physiology, and ecology. Our work on candidate phylum OP9, now called “Atribacteria”, will be discussed as an example.

For additional information, please contact:

Biswarup Mukhopadhyay, [biswarup@vt.edu](mailto:biswarup@vt.edu)

Maureen Lawrence-Kuether, [mlawre04@vbi.vt.edu](mailto:mlawre04@vbi.vt.edu)

*-Limited faculty/post-doc/graduate student meeting slots are available-*

 **VirginiaTech**  
Virginia Bioinformatics Institute