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Education

B.S. (Anthropology), University of Illinois, 1981

B.S. (Microbiology), University of Illinois, 1984

Ph.D. (Microbiology), Purdue University, 1991

Postdoctoral (Microbiology), Purdue University, 1991-1993

Postdoctoral (Microbiology), University of Illinois, 1993-1997

Research Interests**Molecular genetics and biochemistry of methanogenic Archaea; biosynthesis of phosphonate antibiotics; redox cycling of phosphorus by microorganisms**

My research program centers on the investigation of two unusual microbial metabolic processes with important biomedical, biotechnological and environmental ramifications. The first project examines the metabolism of reduced phosphorus compounds, with particular emphasis on phosphonic acid antibiotics. The long-term goal of this research is to elucidate the genes and metabolic pathways involved in the biosynthesis of phosphonic acid antibiotics and to explore the molecular diversity of natural products comprising this unusual class of bioactive compounds. We are also interested in the metabolic pathways involved in the catabolism of reduced phosphorus compounds. These studies are also expected to enhance our understanding of phosphorus metabolism, which is central to all living organisms. The second project involves the development and application of genetic techniques for analysis of the methane-producing Archaea. These studies impact a number of critically important to human problems including the production of alternative fuels from biological materials, waste treatment, and global warming.

Title: Metabolic engineering of methanogenic Archaea for capture of residual biomass in biofuel waste streams

Abstract: Methane is a clean burning, renewable energy source that has often been overlooked in the development of biofuel strategies. We plan to tap this underexploited resource by developing strains of methanogenic archaea with the ability to produce methane from the residual biomass present in the waste streams of biofuel production processes. Growth of these engineered strains will capture energy that is lost in existing biofuel production strategies. The resulting methane could be used on site to fuel upstream processing steps, or be fed into conventional fuel streams. Our metabolic engineering efforts are guided by cutting-edge metabolic modeling approaches and utilize recently developed methods for genetic manipulation of *Methanosarcina*, augmented by biochemical and molecular approaches. In addition to their immediate impact on biofuel production, these studies may lend new insight into the role of interspecies cooperation in methanogenesis, which may prove useful in efforts to optimize biological methane production in a variety of settings.