Dr. John Lenhart, Associate Professor in Civil, Environmental and Geodetic Engineering at The Ohio State University recently completed a project funded by the Ohio Water Resources Center. The main goal of this project, titled "**Discriminating Biotic and Abiotic Arsenic Release Processes under Highly Reduced Ground Water Conditions**", was to increase knowledge about conditions governing arsenic release to ground water, therefore aiming to help identify sites in Ohio with the potential for high ground water arsenic levels. This knowledge will help to protect the health of residents in Ohio since roughly 40% of the population depends upon ground water as their source for drinking water and 17% of public supply wells contain arsenic levels exceeding the safe limit.

The project combines bench-scale laboratory experimental work with atomic-level spectroscopy and molecular techniques to evaluate arsenic release and sequestration under transient redox conditions. A series of batch microcosm experiments were conducted with solids and ground water collected with the assistance of researchers from the USGS Ohio Water Science Center from three redox zones in a single aquifer system identified as iron-reducing, sulfate-reducing, and methanogenic. At the same time a parallel set of experiments was conducted using dissolved organic matter amended microcosms and acetate amended microcosms (Figure 1).

Figure 1 Preparation of laboratory microcosm samples.

Over the course of the 70-day study, concentrations of total arsenic were observed to roughly double from an initial concentration of approximately 5 ppb to 10 ppb (Figure 2). Most of this increase occurred over the first forty days and coincided with the rapid increase and subsequent decline in iron as well as a decrease in total sulfur. Overall these trends are consistent with release of arsenic concurrent with the reductive dissolution of iron. Experiments conducted with the organic matter and acetate amended microcosms demonstrated arsenic release over longer periods of time depended upon the formation of iron and arsenic sulfides, which is consistent with sulfate reducing conditions.

Researcher: Dr. Lenhart pursues research directed at elucidating the fundamental physical and chemical mechanisms that determine the fate of chemical compounds in natural and engineered systems. This information is necessary for accurate risk estimation, cost-effective selection of remedial options for contaminated sites, and efficient treatment of water and wastewater. The systems he examines are inherently heterogeneous, typically composed of a mixture of several mineral, organic, biological, water and gaseous phases. Accordingly, much of his work emphasizes reactions occurring at phase boundaries, or interfaces. His work is interdisciplinary in nature and combines careful experimentation, mathematical analysis and fundamental theory.

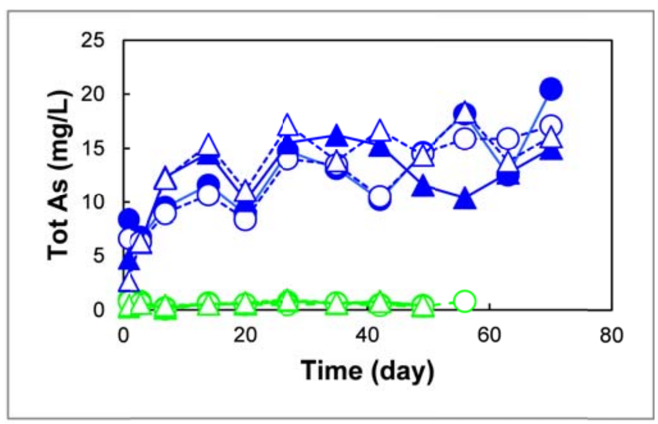

Figure 2 Concentration of total arsenic released during the incubation of groundwater and sediments from iron reducing aquifer. The green symbols are for abiotic control and the blue symbols are for different carbon amendments.