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Research Interests:
Biogeochemistry of Arsenic and Trace Metals in Natural Waters, Nitrogen Cycling, *In situ* Mass Spectrometry

Teaching:
Chemical Fate and Transport in the Environment
Limnology and Wetland Ecology

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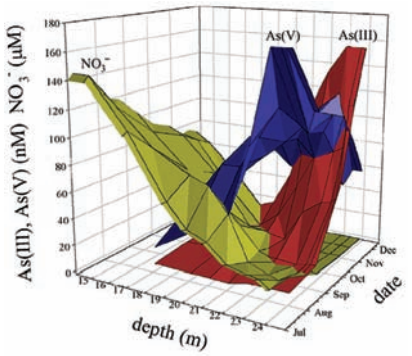
What Controls the Movement and Chemical Speciation of Arsenic in the Environment?

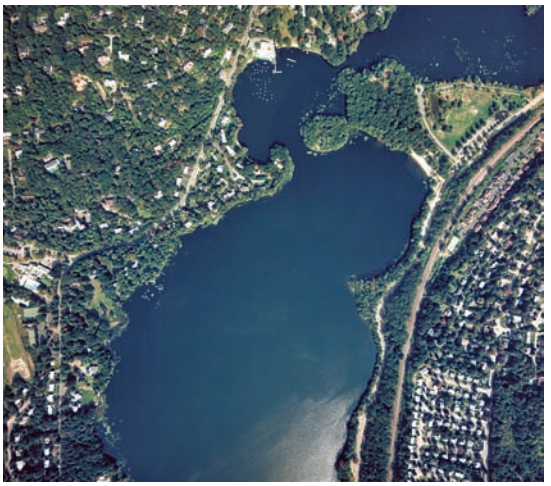
In the form of an artist's' pigment, a pesticide, a curative drug, and an agent of accidental poisoning as well as homicide, arsenic in its various forms has been significant to humans for millennia. Today it is again much in the news. In the US, issues such as lowered arsenic limits for drinking water, and arsenic use in wood for playground equipment, are of current concern. In Bangladesh, arsenic in well water is a severe nationwide health problem.



Arsenic species vs. nitrate in Mystic Lake

Arsenic occurs in the environment in numerous forms of differing mobility and toxicity, having several oxidation states and notable affinities for iron and sulfur. Predicting its behavior is thus as difficult as it is necessary. Professor Hemond`s group has studied arsenic speciation extensively in both surface and subsurface waters of the Aberjona Watershed (the real-world setting of the movie, *A Civil Action*), as well as collaborated in Professor Harvey's Bangladesh project. One important finding is that arsenic behavior can be strongly linked to one of the most abundant by-products of human activities, namely nitrogen pollution.

Definitive evidence of the nitrogen-arsenic connection emerged in the Upper Mystic Lake, where both elements are delivered from a highly-developed watershed via the Aberjona River. The most important part of the interaction may be an indirect one, in which nitrate, a form of nitrogen, drives the oxidation of naturally-occurring iron, which in turn absorbs arsenic (Senn and Hemond, *Science*, 28 June 2002). Interestingly, the interaction of these two pollutants can be favorable; in the particular case of the Mystic Lakes the result is a suppression of seasonal arsenic release into the water. Current work is directed to elucidating details of the chemical interactions, which are likely controlled by microorganisms in the lake.



Upper Mystic Lake