

# Environmental Engineering Seminar

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*The Astani Department of Civil & Environmental Engineering presents*



**Dr. Kartik Chandran**  
**Earth and Environmental Engineering**  
**Columbia University**

Date: December 13, 2018

Time: 3 - 4 pm

Place: RTH 211

## **Emerging Models in Microbial Nitrogen and Carbon Cycling**

The engineered nitrogen cycle provides a rich framework to study the structure, function and interactions within mixed microbial communities. The knowledge obtained from such studies also allows us to harness the potential of such communities towards achieving multiple goals including the production of clean water, treatment of drinking water and the synthesis of commodity chemicals and fuels, among others. Within the spectrum of engineered nitrogen cycling processes, autotrophic biological nitrogen removal (BNR) offers an energy and resource efficient alternate to conventionally followed approaches. The successful implementation of autotrophic BNR processes is contingent upon the selective retention of aerobic and anaerobic ammonia oxidizing organisms over nitrite oxidizing organisms. While significant work has been conducted examining the microbial ecology, metabolism and modeling aspects relating to autotrophic BNR processes, the focus has mainly been on the nitrogen cycle. Discussions on organic and inorganic carbon (the preferred substrate for several communities in these processes) are somewhat uncommon. In this work, we first consider the impact of organic and inorganic carbon supply as a driver for interactions amongst different communities present in autotrophic nitrogen removal processes. The metabolic basis for some of these interactions is then evaluated based on a more fundamental look at select members of such communities. Further, the interplay between conventionally understood protagonists of the microbial N-cycle and some newly discovered bacteria, including those catalyzing complete ammonia oxidation (comammox) is also discussed.

### **About the Speaker**

Dr. Kartik Chandran is Professor of Environmental Engineering at Columbia University. The main focus of Dr. Chandran's work is on understanding and re-engineering the microbial nitrogen cycle while exploring its links with the carbon, water and energy cycles. Applications of his work include energy and resource efficient technologies and approaches for biological wastewater treatment and sanitation. More details on Dr. Chandran's work can be found at [www.columbia.edu/~kc2288](http://www.columbia.edu/~kc2288).