**Panel: Teaching and Research at Undergraduate Institutions**

**Date:** Sunday, June 14, 2015, 10:00 am to 11:30 pm

**Motivation:** Excelling at a Primarily Undergraduate Institution (PUI) involves distinction in teaching as well as research.Successful programs at PUIs provide resources for students that involve personalized research and educational experiences. This workshop will provide approaches to developing a successful research program at a PUI and examples on how research can be used to enhance teaching, and provide students a unique experience that prepares them for career success. The workshop will present case studies and strategies that apply to undergraduate STEM education at large and small institutions alike, with an emphasis on Environmental Engineering and Environmental Science.

**Description of Workshop:** The workshop will begin with an overview of the expectations for excellence in teaching and research at PUIs. This presentation will be followed by case studies from professors summarizing their experiences in developing successful research and educational programs at PUIs. These summaries will serve as the basis for an open panel discussion.

**Intended Audience:** Faculty and graduate students who are interested in quality teaching and research at the undergraduate and Master’s degree level.

**Workshop Organizers:** Lindsay Soh, Chemical and Biomolecular Engineering, Lafayette College, sohl@lafayette.edu; Robert Sharp, Department of Civil and Environmental Engineering, Manhattan College, robert.sharp@manhattan.edu

 **List of Speakers:**

**Linday Soh, Ph.D., Assistant Professor Lafayette College Department of Chemical and Biomolecular Engineering.** Lindsay Soh is an Assistant Professor at Lafayette College in the department of Chemical and Biomolecular Engineering.   After completing her bachelor’s degree at the University of California, Berkeley, she earned her PhD at Yale University in Chemical and Environmental Engineering.  Lindsay’s research interests revolve around sustainable processes techniques.  Her current research projects involve utilization of biomass feedstocks and/or the application of CO2 as a green solvent.  Additionally, Lindsay strives to incorporate sustainability into her teaching and on the Lafayette campus.

**Title: Primarily Undergraduate Institutions: Motivations, Challenges, and Expectations**

This presentation will introduce the unique aspects of teaching and research that differentiate Primarily Undergraduate Institutions (PUI) from PhD granting institutions.   Discussion will include what to expect when first getting started at a PUI.  Further content will include balancing your time between teaching, service, and initiating/maintaining a research program.

**Session Speaker #2 –**

**Laura MacManus-Spencer, Ph.D., Associate Professor of Chemistry at Union College.** Laura MacManus-Spencer is an Associate Professor of Chemistry at Union College in Schenectady, NY. Laura earned her Bachelor’s degree in Chemistry (minor in Environmental Studies) from the College of St. Benedict in St. Joseph, MN and her PhD in Chemistry from the University of Minnesota, where she worked with Dr. Kristopher McNeill on projects related to the photochemical generation of reactive oxygen species and their roles in the fates of environmental contaminants. After graduation, Laura was a Postdoctoral Associate at Stanford University in the Environmental Engineering Science program, where she worked with Dr. Richard Luthy on projects related to the environmental fate and toxicity of perfluoroalkyl acids. Laura has been at Union College since 2006, and she conducts research in collaboration with undergraduate students on projects seeking a better understanding of the environmental and biological fate of contaminants of emerging concern, such as perfluoroalkyl acids and organic ultraviolet filter chemicals. Laura teaches undergraduate courses in Introductory Chemistry, Analytical Chemistry, Chemical Instrumentation and Environmental Chemistry.

**Title: Environmental analytical chemistry research with undergraduate students at Union College: Case studies and lessons learned**

As a professor at a small primarily undergraduate institution (Union College), I view research with undergraduate students as an extension of the educational experience of my students *and* as a way to advance my research. My students and I have experienced the greatest success when the research project addresses a practical environmental problem, when the overall project can be broken down into smaller units, and when the students are able to get involved in research early, though practicum and/or summer research. A major benefit to the students with whom I have worked is the hands-on experience they gain with a variety of analytical instruments, preparing them for future studies and careers in the field. Research in my lab is focused on the environmental and biological fate of contaminants of emerging concern (CECs), such as the active ingredients in sunscreen products (organic UV filter chemicals, UVFCs) and the chemicals that impart “non-stick” properties to many consumer products (perfluoroalkyl acids, PFAAs). In collaboration with undergraduate research students, I am currently investigating the photochemistry and toxicity of organic UVFCs and the biological fate of PFAAs. We are working to identify and isolate the photoproducts of organic UVFCs in order to assess their relative toxicities relative to the parent compounds, and we are developing more efficient analytical methods to assess the binding of PFAAs to soluble proteins. In this talk, I will present a few case studies of research projects with undergraduate students, focusing on what we accomplished and how both the student and I benefitted from the experience.

**Session Speaker #3 –**

**Kevin Gilmore, Ph.D., P.E., Assistant Professor Bucknell University Department of Civil and Environmental Engineering** Kevin Gilmore is an Assistant Professor in Civil & Environmental Engineering at Bucknell University. He earned a Ph.D. in Civil Engineering from Virginia Tech in 2008 after six years of professional practice in environmental engineering consulting and design for a wide range of municipal and industrial clients. In addition to being an ASCE ExCEEd Teaching Fellow (2010), his research interests include nitrogen cycling in green infrastructure, novel solutions for recovering resources from wastewater, and interdisciplinary integration of sustainability into higher education. He is a registered professional engineer in two states.

**Title: Integrating Research and Teaching at PUIs**

A presentation of options and examples for integrating research into the undergraduate curriculum at PUIs, where specific constraints exist (limited number of Masters students, lack of 'institutional memory' in the labs, etc.). With Bucknell's lab-intensive curriculum, in which almost all engineering courses have an associated lab section, experiments related to research can often be easily adapted into single- or two-session teaching lab exercises. Examples include RO desalination of shale gas well flowback water, quantification of phthalates in drinking water, and biogas production from anaerobic treatment of mainstream municipal wastewater. Finally, some suggestions will be provided about the types of research and funding vehicles that can be particularly well-suited for PUI faculty.

**Session Speaker #4 –**

**Robert Sharp, Ph.D., P.E., The D.J. O’Connor Professor of Environmental Engineering at Manhattan College.** Robert Sharp is the Donald J. O’Connor Endowed Chair of Environmental Engineering at Manhattan College. He runs an active research program in the areas of advanced wastewater treatment and reuse, resource recovery, process control and optimization, anaerobic co-digestion, and corrosion and fouling control. He received his BS and MS degrees in Civil/Environmental Engineering from the University of New Mexico, and his PhD in Environmental Engineering from the Center for Biofilm Engineering at Montana State University. He is a licensed professional engineer in New York State and is active in WERF and New York State WEA, and has served on multiple committees and peer review boards for NAS, EPA, NSF, USGS, WERF and DOE. Mr. Sharp is also an exclusive Senior Process Consultant for Hazen and Sawyer Engineers.

**Title: Developing Research Programs at PUIs through Collaborations, Teaming and Leveraging**

Faculty at PUIs face a number of challenges and obstacles when trying to develop an active research program. This presentation will highlight some of those challenges/obstacles and provide possible ways to over-come them. The discussion will focus on methods for leveraging funding and developing collaborations with other faculty, municipalities, consulting firms, private industry, etc. Specific examples will be provided on how to attract and utilize local/regional funding sources to establish a research program that can support both applied and fundamental research. The presentation will include suggestions and recommendations for young faculty on how to develop a research program using undergraduate and Master’s degree students, while still being able to carry out research that benefits the students, the institution and the faculty member’s career aspirations.