Humans spend on average more than 90% of time indoors, a chemically and microbially fascinating and complex environment which is much less understood than the outdoor atmosphere. As indoor design and engineering progresses towards higher energy efficiency, poor indoor air quality emerges as a big contemporary issue. Knowledge of indoor air quality is critical to understanding links and factors affecting human health.

Historically emissions from empty houses, indoor materials, solvents, and outdoor sources have received much attention but recent measurements highlight that humans and their activities are often critical contributors to indoor air chemistry and microbiology. The exposure to the sum of volatile organic compounds can be two orders of magnitude higher in occupied indoor spaces relative to outdoors.

This seminar focuses broadly on recent measurements of volatile organic compounds emitted by humans and human microbiomes in the context of indoor air quality. The knowledge of the factors controlling the diverse chemical emissions of common environmental bacteria and fungi is also crucial because they are important signal molecules for these microbes that also could influence humans. Through state-of-the-art mass spectrometric “sniffing” measurements it is possible to characterize and quantify human volatilome (metabolites and exogenous VOCs) which includes thousands of volatile organic compounds including highly reactive ones and earlier unobserved. Future progress in indoor air quality will rely on novel real-time measurements of comprehensive chemistry.

Background

Dr. Pawel K. Misztal is an assistant professor in our department of Civil, Architectural and Environmental Engineering leading novel air quality measurement research as part of the Building, Energy and Environment program. He received his Ph.D. in Chemistry from the University of Edinburgh in 2010. He received his MSc in Analytical Chemistry and BSc in Chemistry and Physics from Maria Curie-Sklodowska University in Poland. He joins us from the NERC Centre for Ecology and Hydrology in Edinburgh, UK where he has served as the Atmospheric Chemist/Physicist since 2018. From 2015 to 2018, he worked as an Associate Specialist for the Department of Environmental Science, Policy and Management in the College of Natural Resources at the University of California at Berkeley where he was also a Postdoctoral Research Scholar from 2010 to 2015. His group focuses on developing “sniffing” analytical techniques for real-time measurements of VOCs and SVOCs for addressing big research questions in indoor air quality and human health. He has authored more than 30 peer-reviewed articles, received Best Reviewer 2018 Award from Biogeosciences, and his opinion on indoor air quality has been featured on CNN.