



Traveling the world for outdoor air quality research

Assistant Professor **Peter DeCarlo, PhD** and student researchers from the [Drexel Air Resources Research Laboratory](#) have been on the move working on various international and national research projects regarding outdoor air quality. In Fall 2014, DeCarlo, post-doc **Michael Giordano, PhD** and doctoral student **Anita Johnson** traveled to Antarctica ([NSF Grant: 1341492](#)) to collect real-time online measurements of aerosol composition. More information regarding their research and results will be featured in the [Drexel Magazine](#) this summer.

In Spring 2015, DeCarlo, Giordano, and doctoral students **Doug Goetz** and **Ben Werden** traveled to Nepal as part of an NSF funded study ([NSF Grant: #1461458](#)) to research combustion-derived aerosol particles emitted from sources such as brick kilns, trash burning, and residential biomass combustion. South Asia is a major emission region for combustion related aerosol particles and there are currently very few major sampling efforts using modern analytical instrumentation, such as aerosol mass spectrometers. DeCarlo's group traveled with substantial testing equipment in tow, motivated by a need to better characterize the aerosol sources, emissions, and atmospheric processing in this region. While some high quality data was obtained, these research efforts were cut short by the recent earthquake in Nepal. All researchers returned to the United States safely and the continuation of these research efforts is currently on hold.

Regionally, DeCarlo, doctoral student Doug Goetz, with additional independent researchers, published a paper in the [Environmental Science & Technology](#) journal that presents the findings of a two month mobile air monitoring campaign in the natural gas extraction regions in the northeastern and southwestern Pennsylvania. This study has subsequently garnered media attention found on [StateImpact](#) and [PhillyVoice](#).

Ben Werden and Doug Goetz testing measurement equipment in Nepal. Inset is test site that survived the earthquake.



Antarctica—Peter DeCarlo and Anita Johnson far left / Michael Giordano far right



UV Degradation of Polymeric Construction Materials



Siavash Vahidi removing polymeric material samples from the weatherometer.

There has been increasing usage of polymeric materials for structural and transportation applications. Using polymeric materials in construction is relatively new and therefore information on their service life performance is limited. In order to ensure that these materials can achieve the appropriate design life, the mechanisms leading to their degradation should be studied. Professor **Grace Hsuan, PhD** and her doctoral student **Siavash Vahidi** are leading Drexel's participation on a research project titled "Testing, Evaluation, and Specification for Polymeric Materials." Drexel is a collaborator with the University of North Florida and this project is funded by the Florida Department of Transportation. Two undergraduate students, **Kenneth Reyes** (MEM) and **Hieu Nguyen** (MEM), are also helping with this project.

Sunlight is recognized as the most important factor in polymer degradation. When the sunlight radiation is absorbed by the polymer, the chemical bonds can be broken and a chain of reactions are then initiated. Eventually, these reactions will lead to polymer degradation affecting the mechanical properties and causing discoloration. To simulate the sunlight degradation in the laboratory, a weatherometer with Xenon lamp is used. With appropriate filters, the irradiance from the lamp is similar to the sunlight at noon time in Florida. In this study, test materials include high density polyethylene products used in marine environments and five types of composites products complying with American Disability Act (ADA) used in the pavement. Samples from these materials are exposed in the Xenon weatherometer under specified conditions. These samples are retrieved at scheduled time intervals and tested for their material properties. The results will be analyzed to understand the degradation mechanisms in order to predict the service life of these products under the tested conditions.

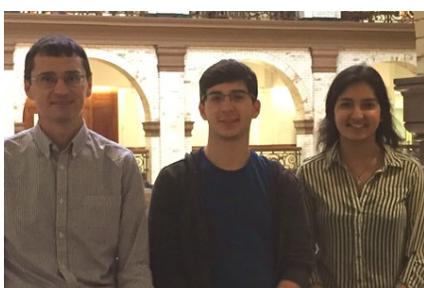
Michael Waring and Jin Wen receive NSF award

Assistant Professor **Michael Waring, PhD** (PI) and Associate Professor **Jin Wen, PhD** (co-PI) are recent recipients of a National Science Foundation (NSF) award titled "[Intelligent Multi-Criteria Building Ventilation Control within Dynamic Urban Environments](#)," in the amount of \$299,666 over three years. Poor indoor air quality (IAQ) substantially impacts human health and productivity especially given that people spend the majority of their time indoors. Maintaining acceptable indoor air quality (IAQ) requires ventilation, so commercial buildings set their ventilation rates according to minimum standards to attempt to ensure good IAQ. However, higher rates may be beneficial since more ventilation air increases occupant productivity and decreases absenteeism, though increasing ventilation does require more energy to move and condition the air, can strain the electricity grid, and can potentially degrade IAQ in highly polluted urban areas.



The goal of this project is to develop a new framework that moves beyond the current minimum ventilation rate paradigm and instead treats ventilation as a multiobjective problem to be optimized that considers all of these competing impacts holistically. This work will identify the next-generation of intelligent ventilation strategies for high performance green buildings. Two Ph.D. students will work on this project, **Adams Rackes** (NSF GRF recipient, who helped conceive aspects of the project) and **Tom Ben-David**.

Students win Research Day undergraduate research award



CAEE Department freshman students **Mehar Kalra** (*far right in picture*) and **Alejandro Ochoa** (*center of picture*) won the [Drexel University Research Day](#) undergraduate research award in the Physical Science & Engineering category. The title of their research project was "Identifying Affordable Rain Gauges for Green Stormwater Infrastructure Research" and their advisors were Associate Professor **Franco Montalto, PhD, PE** and doctoral student **Walter Yerk** (*left in picture*). The goal of this research study was to compare the performance of standard rain gauges used to measure rainfall with a more affordable and easily accessible alternative, off-shelf funnels. The results suggested that in select research environments, these alternative rain gauges (funnels) can be considered a substitute for standard gauges, because they have an accuracy near the 5% recommended by common hydrological practices.

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Students and faculty participate in EPICS projects

Associate Professor **Eugenia Victoria Ellis, PhD** and Assistant Professor **Christopher Sales, PhD** each had a student group that participated in the Drexel College of Engineering's Engineering Projects in Community Service (EPICS) program.

Ellis, PhD and CAEE seniors (left to right in picture) **Antonia Iaconelli, Samantha Forgas, Ashley Willis, Ashley Johnson, and Kevin Mayes (MEM)** were involved in a project titled "Schuylkill River Hub at Bartram's Garden." The goal of this project was to develop a plan to enhance and restore the wetlands and meadow that run along the Schuylkill River near Bartram's Garden, the oldest surviving botanic garden in North America. Enhancements to be made are the construction of boat storage, workshop space, and a café out of shipping containers; design/build of the spatterdock pavilion; an off-grid solar power system; rainwater collection; a green roof; floating dock for fishing and kayaking; a pier, promenade, and Wetlands Walk; and to increase erosion control through a Living Shoreline. Throughout this project the Drexel group also collaborated with Philadelphia University, the Challenge Program of Delaware, and the Workshop School, a carpentry school for teenage students in West Philadelphia. CAEE Department Emeritus Professor **Richard Weggel, PhD** consulted on the design of the floating dock and CAEE Professor **Abi Aghayere, PhD** consulted on structural design requirements.



Sales, PhD and seniors **Achira Amur, Rebecca Barnes, Frank Kivuyo, Yujie Sue, and Bai Xue** partnered with The Dirt Factory, a community scale composting facility located at 43rd and Market Streets, operated by the University City District. The students assessed the current composting system to determine strategies to increase the Dirt Factory's capacity to take in food waste and its efficiency to convert that food waste to compost at the current location through the redesign of the compost collection, aeration, and leachate treatment processes. The group also made recommendations to enhance outreach activities to involve more community members. Lastly, the students identified new, optimally located sites throughout University City to build more Dirt Factory composting facilities. The students provided design recommendations on the most efficient and environmentally friendly composting systems to implement at the potential new locations, including instructions on how to construct low-cost, community-scale aerated

composting bins and a small constructed wetland to treat leachate produced from the composting process.

ASCE updates and new leadership

Drexel's American Society for Civil Engineers (ASCE) student chapter had a very busy spring term! In March the group hosted a Philadelphia Chapter ASCE Young Members Forum (YMF). YMF board members in attendance were Nha Truong, Drew Sirianni, P.E., '96, Paige Glassman, '13, and Adrienne Donaghue, '11, '13. This panel discussed the purpose of the YMF, their own careers in different fields of Civil Engineering, and answered questions from the audience. Approximately 40 students were in attendance as well as ASCE officers **Ajin Fatima (President), Chloe Dye (Event Chair), Dianna Vogel (Secretary), Colleen Hyde (Treasurer), and Danielle Schroeder (Web Master)**. ASCE advisor **Joseph Martin, PhD** shared a few key questions that employers always ask him of students.

During Spring Term, ASCE also hosted site tours to all interested students. The most recent tour was with Allen Meyers, a civil construction and materials company, to visit the expansion of Northeast Extension of the Pennsylvania Turnpike. ASCE had its final academic year general body meeting where CAEE alumnus Travis Mohr, '04 from Kiewit, gave a presentation titled: "The Designer and Contractor as a Team." 2015/16 election results were also announced at this meeting. Officers for the upcoming academic year are: **Belinda Lester (President), Danielle Schroeder (Vice President), Donna Zhang (Treasurer), and Amanda Nogv (Secretary)**. Students interested in joining ASCE should send an email to dsoasce@gmail.com

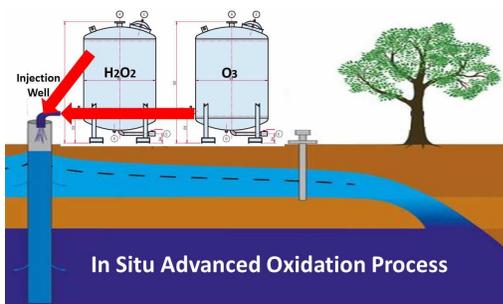


ASCE's Concrete Canoe team placed 2nd overall this year at the ASCE Mid-Atlantic Concrete Canoe competition held in April. The 18 member team placed 2nd in each of the following categories: Final Product, Presentation, and Races. **Alex Gagliardi (MEM)** is next year's Project Manager. Students interested in joining the Concrete Canoe team should send an email to drexlect@gmail.com

Students take 3rd place in the College's Annual Senior Design Competition



A CAEE Department senior design team won 3rd place overall at the College of Engineering's 2015 annual senior design competition. Members of this team were **Nicole Stilwell, Maria Tortorelli, and Amy Wetherby** (shown left to right in picture with **Adam Fontecchio, PhD, Associate Dean for Undergraduate Affairs for the College**). Project advisors were **Charles N. Haas, PhD** and **Christopher Sales, PhD**. The group's project was titled "Remediation of Baghurst Drive Harleysville, Pa." Baghurst Drive is a recent addition to the Environmental Protection Agency's (EPA) Superfund National Priorities list, which is a national list of sites that are known to release or threaten to release hazardous substances, pollutants, or contaminants into their surrounding environments.



Baghurst Drive is surrounded by Miller Farm to the north and the Perkiomen Creek to the west. The longtime disposal of contaminants from Miller Farm has resulted in groundwater contamination that has affected 42 residential drinking wells. The goal was to develop a conceptual design to remediate the contaminated groundwater plume at the Baghurst Drive site in order to minimize contamination concentrations to or below the Maximum Contaminant Level (MCL) established by the EPA. The team evaluated many remediation techniques and found that pump-and-treat and advanced oxidation techniques work best to decontaminate the polluted areas and provide potable water to affected residents. The group factored the final design, cost, and implementation plan into their deliverables. **Melika Riley** was also a member of this senior design project but was unavailable to participate in the College-wide competition.

Student Awards

The College of Engineering and the CAEE Department awarded annual student fellowships to deserving CAEE graduate students. This year's recipients are **Anita Johnson** and **Jacob Price** (Koerner Family Awards for Graduate Students in the College of Engineering), **Ben Cohen** (The Harry Brown, Jr. Endowed Fellowship), **Kaitie Sniffen** and **Bidya Prasad** (The George Hill, Jr. Endowed Fellowship), **Noura Abu Al Faraj, Fuad Khan, Chunyi Wang, and Seungcheol Yeom** (The Kling-Lindquist Partnership Engineering Fellowship), **Lauren Smalls-Mantey** (Professor Wesley O. Pipes Environmental Engineering Student Award), **Eliya Hurd**, BS/MS Civil/Environmental and **Audrey Ryan**, BS/MS Architectural/Civil (The Steven E. Giegerich Memorial Scholarship), **Kerry Hamilton** and **Jacob Price** (The Claudio Elia Memorial Fellowship). **Danielle Schroeder**, BS/MS in civil engineering, structural concentration, was awarded the American Society of Civil Engineers (ASCE) Philadelphia Section Scholarship. **Audrey Ryan** was awarded the Skidmore, Owings & Merrill Foundation 2015 Structural Engineering Travel Fellowship.