



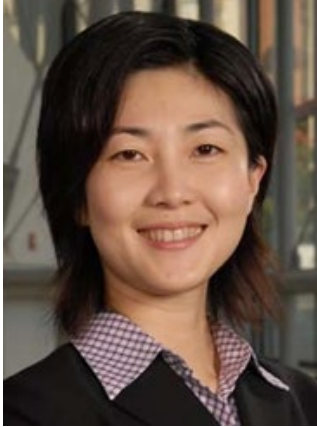
DREXEL UNIVERSITY

# Civil, Architectural, and Environmental Engineering

College of Engineering

Department Newsletter Winter 2019

## Professor Jin Wen Awarded Fulbright U.S. Scholar Grant



*Professor Jin Wen*

Professor Jin Wen has been awarded the prestigious Fulbright U.S. Scholar Grant to Sweden. The Fulbright Program, which aims to increase mutual understanding between the people of the United States and the people of other countries, is the flagship international educational exchange program sponsored by the U.S. government. As a grantee, Professor Wen will join the ranks of distinguished participants in the Program. Fulbright alumni include 59 Nobel Laureates, 84 Pulitzer Prize winners, 72 MacArthur Fellows, 16 Presidential Medal of Freedom recipients, and thousands of leaders across the private, public, and non-profit sectors. Since its inception in 1946, more than 380,000 "Fulbrighters" have participated in the Program.

Professor Wen's project will establish a partnership between Drexel's Building Science and Engineering Group and KTH Royal Institute of Technology's Division of Building Services and Energy Systems, to develop a suite of highly-automated, big-data-driven, and human-centered data analytics algorithms for engineers and technicians working in the building service industry (a.k.a. building doctors). The project focuses on the increasingly critical role of big data and machine intelligence across infrastructural systems with respect to its impact on behavioral integration of building doctors in the decision-making process.

## Professor James Lo Makes Strides with Research on the Indoor Environment

Professor James Lo of the Architectural Engineering program is currently working on a preliminary investigation of using the micro autonomous vehicle to survey building indoor environment. There are very few sensors in occupied spaces, especially in old buildings. The lack of data collected often results in a waste of energy in building operation as well as failure to provide a comfortable environment and good air quality for the occupants. With Professor Lo's work, small robotic sensor packages can roam autonomously in space to collect needed data for building operation without hindering the occupants. With the added information, a building can operate in a more energy efficient and healthy manner.



*Professor James Lo*

Professor Lo is working with Dr. Youngmoo Kim from Drexel's ExCITe center to leverage the existing micro drone capability for collecting data aerially. At the same time, Dr. Lo is working with Dr. James Tangorra of the Mechanical Engineering and Mechanics Department to explore the possibility of using small robotic rovers that can travel inconspicuously in a building. The project is currently prototyping the sensor package and evaluating the delivery vehicles and will start testing the prototype soon. The sensor package is developed with help from the student members of the Drexel Smart House organization.

Professor Lo and his students are also finalizing their work on the virtual wind tunnel automation for building testing. Funded by the National Science Foundation, Dr. Lo's work is producing a software-based testing procedure for finding wind-induced pressure coefficients for various building types. The results of this work can help the estimation of wind-based ventilation and infiltration in buildings and can provide detailed insights for engineers who are interested in more intricate wind and building interaction for their designs.

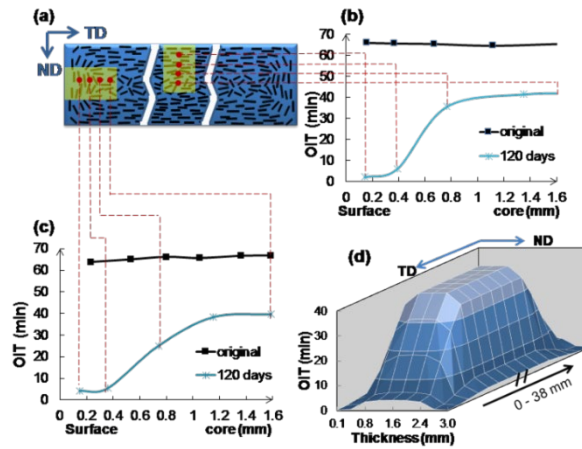
## Professor Grace Hsuan, Expert in Polymeric Infrastructure Materials Durability, Returns to CAEE after a Two-Year Stint at the NSF



**Professor Grace Hsuan**

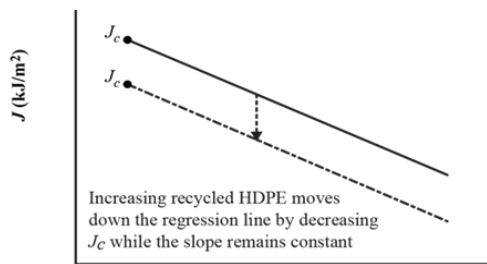
Professor Grace Hsuan returned to Drexel from a rotator appointment with the NSF this past fall. During her time at the NSF, while still working with her PhD students at Drexel, she was very busy with research focusing on the durability of polymeric infrastructure materials, including geosynthetics, plastic pipes, recycled plastic, and nanocomposites. Professor Hsuan's projects have been supported by the NSF, NCHRP, FHWA, State DOT's, and manufacturers.

One research project focused on the effects of nanoclay on the depletion of antioxidants in polyethylene. The project was to investigate the orientation of nanoclay in the injection molded polyethylene samples and its impact on the depletion of antioxidants. The x-ray results indicated that nanoclay platelets were oriented parallel to the surface, lowering the diffusivity of oxygen into the core section and hindering the migration of antioxidants to the surface.

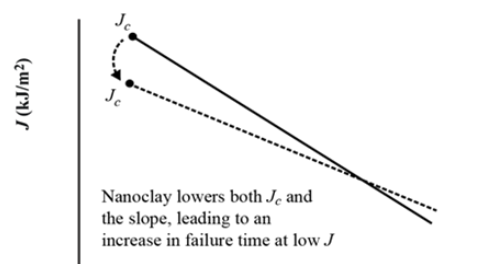


*Antioxidant's profiles along normal direction (b) and transverse direction (c) and their corresponding clay orientation as illustrated in (a) and (d) after 120 days oven aging at 85°C*

Another project focused on fracture behavior of recycled polyethylene and nanoclay polyethylene. The fracture toughness of the recycled polyethylene and nanocomposite was experimentally determined using the Essential Work of Fracture (WEF) method and numerically simulated by XFEM. Also, the slow crack growth behavior was evaluated using the notched constant loads tensile test method (ASTM F2136). A linear correlation was found between the fracture roughness and slow crack growth. The recycled polyethylene lowered the fracture toughness, while the nanoclay lowered both fracture toughness and cracking rate.



Failure time (unit time)



Failure time (unit time)

A third research project, currently being analyzed, studies the effect of sunlight on the degradation of polyethylene using the laboratory xenon weatherometer. The effect of irradiance on the degradation was evaluated and correlated with field exposure in Florida. The laboratory test data were converted to Florida equivalent irradiance to predict degradation in the field.

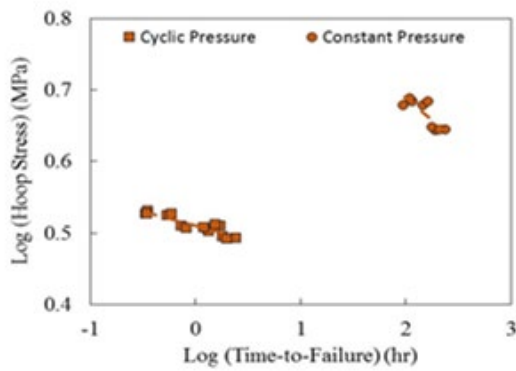
A current project of Professor Hsuan's is studying the fatigue creep behavior of polyethylene tubes. A sophisticated new system was designed to evaluate the stress cracking of thin-wall, small-diameter polyethylene tubes used as flow lines for fluids and gases. The system can determine failure times of the test specimens under either a constant internal pressure or a cyclic pressure at elevated temperatures. Water was used as the pressurizing fluid. Pressure inside each test specimen was measured and monitored by an in-line pressure transducer, which was connected to a data acquisition system. The failure time, due to cracking, was detected by water sensors.



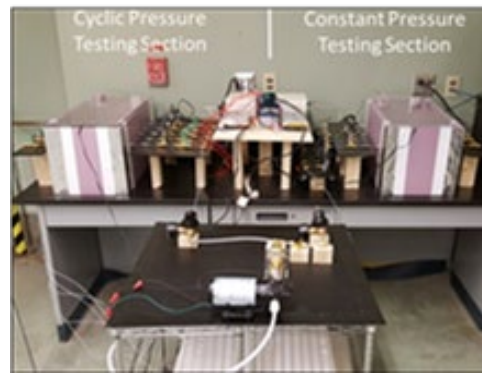
*Polymeric structural piers*



*PhD student, Siavash Vahidi tests samples inside a xenon weatherometer*



*Cyclic and Constant Pressure Test Results at 75°C*



*Pressure Testing Setup*

## CAEE Student Awards

**Mohammad Balapour** (pictured right), a PhD student in Civil Engineering, was selected to receive the 2018-19 Joseph and Shirley Carleone Award from the College of Engineering. This very prestigious award is used to provide financial assistance to graduate students in the College of Engineering and is based on academic merit and financial need.



**Yimin Chen** (picture left), a PhD student in Architectural Engineering, was awarded the 2018 Annual Science and Technology Award from the China Fire Protection Association for his research on electrical fire protection monitoring techniques.

**Saeed Keshani Langroodi** (pictured right), a PhD student in Environmental Engineering, was awarded the Wesley O. Pipes Environmental Engineering Student Award for \$1,000.



## CAEE To Host 2019 Pennoni Alumni Lecture



*John F. Horst*

The next Pennoni Alumni lecture will take place on Thursday, March 7, 2019, featuring alumnus John F. Horst, P.E. John's talk is entitled "The Age of the Agile Engineer and the Lesson of the Square Watermelon."

In this year's talk, the audience will hear how an engineering degree from Drexel paved the way for a STEM career that strayed significantly from the typical path. While engineers are often considered rigid followers of first principles, competent by virtue of their ability to analyze and solve problems that require a physical solution, in today's environment, the term "engineer" is applied virtually anywhere there is a challenge to be solved. Global trends in today's world are transforming the role of engineer such that not only is the function of the engineer executed differently, but engineers are playing a bigger role in business and risk management. This creates an exciting opportunity for engineering students.

John will share personal stories about a highly varied career along with insights regarding the key behaviors and mindsets at the heart of the opportunity for engineering practitioners to distinguish themselves. Finally, a lesson from a bit of engineering ingenuity!

John F. Horst, P.E. is an Executive Vice President and Executive Director of Technical Knowledge and Innovation (TKI) for North America at Arcadis, a global firm that offers design and consultancy services for natural and built assets. John supports all Arcadis North America business lines with the task of incubating solutions for growth markets, onboarding of key technical talent, networking client and technical communities, and driving innovation. In addition, he is the Global Account Leader for a Fortune 100 company.

John graduated from Drexel in 1994 with a degree in Architectural Engineering after participating in a NSF pilot designed to produce engineers better prepared for the business world. He started his career performing structural/mechanical engineering assessments for commercial assets in Philadelphia, then in 1998, joined Arcadis as a Staff Engineer in their environmental business. Prior to his current role and for most of his 20 years at Arcadis, John supported the environment business in a number of leadership positions that included

leader of their "Engineering Center," Director of Geochemistry Services, Director of In-Situ Remediation Services, Innovation Director, and Chief Technical Officer. He has specialized in business advisory, the development, application, and innovative environmental technologies, and the integration of multiple disciplines to address restoration challenges of significant scale and complexity.

John sits in Newtown, PA. He holds one patent and is lead author of *Advances in Remediation Solutions* published quarterly in Ground Water Monitoring and Remediation. He is co-author of *Remediation Engineering: Design Concepts (2nd Edition)* and the *Emerging Contaminants Handbook*.

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