OUTLOOK **CIVIL & ENVIRONMENTAL ENGINEERING**

ISSUE NO.5

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DEPARTMENT OF CIVIL & ENVIRONMENTAL ENGINEERING



articipating in university-wide events that engage prospective students and parents is one of my favorite activities as department chair. Each year, I meet hundreds of prospective students at annual campus events, such as Discovery Days, held at the Bob Carpenter Center each summer; Blue and Gold Day events held on main campus each fall; and UD's Decision Days, a spring event designed for students that have applied and been admitted to the university. I also occasionally meet and tour prospective students and parents through the department.

HARRY (TRIPP) SHENTON III BCE '82, MCE '84 PROFESSOR AND CHAIR

These opportunities allow me to explain what makes our programs unique; share the accomplishments of our students, alum and world class faculty; showcase our beautiful campus; and describe all that UD has to offer. Believe me it is not hard to sell a world class program at a world class institution!

A common question I hear at open house events is "Do you have a co-op or internship program?"

In fact, we strongly encourage our students to seek out these opportunities and more than half of CEE undergraduates complete one or more internships before

graduation. While not a graduation requirement, co-op or internship opportunities provide students valuable work experience while enabling employers to evaluate a potential future hire. UD's Bank of America Career Services Center supports our students in finding internships and full time employment, as do departmental faculty who often connect students with industry contacts.

Last summer the department piloted a formal <u>co-op program</u> to better prepare CEE students for the increasingly competitive job market. Developed under the leadership of Professor Michael Chajes, the optional program allows participating students to complete a co-op and still graduate in four years. Sixteen juniors participated in the program, a number we expect to double next year. Twenty three companies also participated as founding partners of the program. You can read more about this exciting new initiative on p. 4. If the company you work for would like to join the CEE co-op program, please contact Professor Chajes at chajes@udel.edu.

I hope you enjoy reading about the other activities and achievements of our students, faculty and department in the following pages. As always, please feel free to contact us—we welcome your questions, concerns and suggestions. To stay connected via social media, be sure to follow us on Facebook and on Twitter at UDelawareCEE.

Sincerely,

Harry (Tripp) Shenton III **PROFESSOR AND CHAIR**

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Design, Photography & Writing

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DEPARTMENT NEWS

New UD provost a civil and environmental engineer

The University of Delaware's new chief academic officer, Provost **Domenico Grasso**, who oversees all seven colleges, is a civil and environmental (CEE) engineer. He comes to Delaware with a career steeped in engineering education and leadership, having led programs at the University of Vermont, Smith College and University of Connecticut.

He previously served as dean of the College of Engineering and Mathematical Sciences at UVM, which increased its applications by more than 300 percent, its enrollment by more than 50 percent and its research grant awards by 26 percent under Grasso's leadership.

Before joining UVM, Grasso was Rosemary Bradford Hewlett Professor at Smith College and founding director of its Picker Engineering Program, the first engineering program at a women's college and one of the few in a liberal arts college in the United States.

Grasso, who is also a professor on the CEE faculty, said he is "deeply impressed with UD's faculty, staff, students and facilities and most importantly its upward trajectory towards being recognized as one of the world's great universities."

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Civil and Environmental Engineering

PRACTITIONER IN IN RESIDENCE DAY

NOVEMBER 14, 2013



Roundtable discussions allowed our guests to engage with students

DISTINGUISHED GUESTS WERE:



Guy Marcozzi President DUFFIELD ASSOCIATES



Kris Satterfield Senior Project Manager WHITING TURNER



Ronald C. Moore, Jr. Regional Vice President PENNONI ASSOCIATES



Carolann Wicks Partner RK&K



Workforce Development: Co-op provides UD grads practical experience, alumni connections

A new cooperative work program created by CEE chair *Harry* (*Tripp*) *Shenton* and professor *Michael Chajes* aims to open career doors for graduates entering today's increasingly competitive job market.

Participating students work full-time for six months at one of 23 local engineering firms or organizations, many of which employ UD alums. Evening and online courses allow students to still graduate in four years, but now with practical work experience – making them even more attractive to employers.

Although this is the co-op's first year, Chajes said 30 rising civil and environmental engineering juniors have already expressed interest in the program. Looking ahead, he envisions adding a reflective portion to the program in which students will develop a technical project based on something they saw or did during the co-op and look at it from a sustainability standpoint. Allison Murray, an Honors Program senior majoring in civil engineering, said working with Wohlsen Construction allowed her to apply her knowledge in a different way, and get involved with a variety of job tasks.

wohlsen

DEPARTMENT NEWS

Forum highlights state and regional transportation issues





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"Without a first class transportation system, no community, no state, no nation can possibly have a first class economy," said Delaware **Gov. Jack Markell** during opening remarks at The Delaware Center for Transportation's (DCT) Transportation Infrastructure Forum.

Co-hosted with the Delaware Department of Transportation (DelDOT), the November event focused on identifying crucial issues facing state and regional transportation systems, particularly those that impact travel efficiency, economy and employment, safety, environment, energy, sustainability and health.

<u>DCT</u>, which is housed in UD's Department of Civil and Environmental Engineering, is the research and education arm of DelDOT.

UD President *Patrick Harker*, himself a civil engineer, called DCT a "great partnership with DelDOT that combines research, training and public service — all vital to addressing transportation-related issues within the state and the region."

"We have deep enough expertise—right here in this room—to help solve increasingly urgent infrastructure problems nationally ... even globally," Harker said.





UDconnection.com

Looking for an old friend? Want to share your latest news? Searching for information on upcoming alumni events such as Homecoming? Now you can do it all in one place, **www.UDconnection.com**.

UD and the UD Alumni Association (UDAA) have collaborated to bring alumni a vibrant online community —so register and get active! The online community allows you to search the alumni directory, post class notes, update your contact information, and see if there are any upcoming alumni events in your area. You can also take advantage of networking opportunities and ways to get involved with your alma mater!

Visit **www.UDconnection.com** today!

Zarembski leads new Railroad Engineering and Safety Program



Dr. Allan M. Zarembski has joined civil and environmental engineering as a research professor and head of the department's new Railroad Engineering and Safety Program.

An internationally recognized authority, Zarembski specializes in track and vehicle/ track system analysis, railway component failure analysis, track strength and maintenance planning.

His railway-related experience spans 35 years, encompassing derailment investigations in the U.S. and overseas;

development of safety standards and derailment prevention; understanding of the failure mechanisms of key track components and the dynamic interaction between railway vehicles and the track structure.

Zarembski has collaborated on projects with Amtrak, the Federal Railroad Administration, Network Rail (formerly British Rail), and worked with U.S. and European Railways to improve their operational efficiency. He recently investigated technologies to reduce freight train derailments in Europe and worldwide with the International Union of Railways in Paris.

An expert in rail grinding, Zarembski literally wrote the textbook used to educate others on this important technique, which is employed globally to reduce rail defects and prevent broken rail failures and derailments.

Zarembski views railways and transit systems as a vital part of the world transportation network. He sees a critical need for professional education on transits and rail systems, as experienced engineering and maintenance personnel retire and a new generation is trained to take their place.

He teaches undergraduate and graduate level courses at UD, as well as short courses for professionals from the United States and overseas. His professional short courses on rail problems and maintenance have attracted engineers and professionals from New York City Transit, SEPTA, Washington Metro and Baltimore MTA.

INSPIRED BY A LEGEND

As a doctoral student at Princeton, Zarembski was advised by CEE's beloved *Arnold D. Kerr*, the late professor emeritus of civil engineering. Kerr was a visiting professor at Princeton from 1973-1978. There he organized an international symposium on railroad track mechanics and technology and edited a book of the proceedings. In 1980, Kerr and his wife founded the UD Institute for Railroad Engineering, the precursor to the Railroad Engineering and Safety Program now under Zarembski's direction.

Zarembski comes to UD most recently from ZETA-TECH Associates, Inc., a railway technical consulting and applied technology company in Cherry Hill, NJ, that he established in 1984.

STUDENTS

Bridge in a box: UD team advances to national competition

"What did you do on your summer vacation?"

Thirteen civil and environmental engineering students can say they built a bridge.

A flat, double girder span bridge, to be precise.

The team—members of the University of Delaware chapter of the American Society of Civil Engineers—advanced to the 2013 National Student Steel Bridge Competition hosted by the University of Washington in Seattle in late May.

Their challenge was to use Accelerated Bridge Construction, a method commonly employed in commercial areas to reduce time and money spent on construction and to decrease the economic impact of construction on traffic flow.

All parts of the model bridge had to fit into a box measuring 3 feet long by 6 inches wide and 4 inches high. Bridges were tested under loads of up to 2,500 pounds, and had to stand up and move only about half an inch in any direction when subjected to 50 pound lateral load in addition to the vertical load.

"It's very precise and a good practice in discipline," Mark Wisniewski, junior civil

engineering major and captain of UD's Steel Bridge team, remarked. "The challenge is finding a balance between cost and durability."

The team placed second in the Mid-Atlantic bridge building competition before competing nationally.

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Road trip: Students collect traffic data for DelDOT

CEE undergraduate and graduate students logged more than 14,000 miles last summer to quantify congestion on beach routes as part of a collaborative research project with the Delaware Department of Transportation (DelDOT).

The students used global position system (GPS) technology to capture travel time, mean travel speed and delay using longitude and latitude measurements taken while driving. They covered all roads leading to and from the Delaware beaches during peak weekend travel hours from mid-June to September, starting at the Pennsylvania border and ending at the Maryland border.

UD professor *Ardeshir Faghri* and a rotating cohort of students have worked with DelDOT since 1995 when he helped automate the transportation system's data collection mechanism. New this year, the team also captured data using GPS smartphone applications, enabling researchers to compare phone app capabilities against high tech GPS data collection methods.

FACULTY

Bridging the Gap: ASCE honors UD composites team for novel hybrid composite beam technology

CEE professors *Dennis Mertz* and *Jack Gillespie*, also director of UD's <u>Center for</u> <u>Composite Materials</u> (CCM), and CCM associate scientist *Nick Shevchenko*, were honored with the 2013 Charles Pankow Award for Innovation from the American Society of Civil Engineers alongside inventor John Hillman for their role in bringing Hillman's hybrid composite beam (HCB) from concept to construction.

HCBs are lightweight, strong, corrosion-resistant, simple to fabricate, and inexpensive to transport and erect. And thanks to a collaboration between its inventor and CCM researchers, hundreds of cars, trucks and trains travel daily over bridges made with these novel beams, which are expected to last 100 years or more – much longer than those made of traditional concrete or steel.

"I knew that Delaware was the only university that had strong capabilities in bridge engineering and every facet of composites characterization, design, analysis and manufacturing."

- JOHN HILLMAN, INVENTOR OF THE HYBRID COMPOSITE BEAM



UD's Jack Gillespie (left) and Dennis Mertz (center) work discuss the Hybrid Composite Beam with John Hillman in 2005. The team, which also includes CCM researcher Nick Shevchenko (right), won ASCE's 2013 Charles Pankow Award for Innovation.

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2012 Young Engineer of Year

Christopher Meehan, Bentley Systems Incorporated Chair of Civil Engineering, was named the 2012 Young Engineer of the Year by the Delaware section of the American Society of Civil Engineers.

Meehan is nationally recognized for his geotechnical engineering research program, which studies problems with soil and rock. His recent research on intelligent compaction and rapid construction bridge technology has brought new technologies to the Delaware Department of Transportation. Additionally, he is developing tools for improved analysis and design of levee systems, such as those that were damaged in Hurricane Katrina.

He recently returned from Tampere University of Technology in Finland where he studied ways to integrate geothermal heat pump technology into civil engineering structures as a 2012-2013 Fulbright Scholar.

Dentel considered "prince" by Cameroon village



CEE professor Steve Dentel is considered an "oumbé," or "prince" among Cameroon villagers and highly regarded closer to home by Delaware lawmakers, as well, for his work leading the Engineers Without Borders University of Delaware (EWB-UD) student

chapter project in the Republic of Cameroon. Delaware State Reps. John Kowalko and Paul Baumbach, both of Newark, recognized the professor for his work which led to the City of Newark and the village of Bamendjou, Cameroon, voting to become "sister cities."

In 2013, EWB-UD completed a potable water project in Cameroon that includes a 20,000-liter ferro-cement tank constructed near a hilltop school. The completed network now includes three borehole wells, six pumps powered by 24 solar panels and seven tapstands serving potable water to more than 2,000 people in three villages. Another group of EWB-UD students completed a 60-foot steel-reinforced concrete bridge in San José Petacalapa, Guatemala, that successfully withstood a 7.3 earthquake.

"Over the course of these projects, we sent over 50 students to represent UD and our country in places where many people had never met an American before," said Dentel. "They represented our very best — in their skills, in their warm manners, and even in their resilience when we had to solve problems on the fly."



FACULTY



Rachel Davidson

Victor Kaliakin

On the move

Congratulations to *Rachel Davidson* and *Victor Kaliakin* who were promoted to professor of civil and environmental engineering in September.

Davidson is a core faculty member in the university's Disaster Research Center. Her research on natural disaster risk modeling and civil infrastructure systems focuses on lifelines (e.g., electrical power and water supply) impacted by earthquakes and hurricanes.

Kaliakin specializes in computational geomechanics, constitutive modeling of geomaterials and geosynthetics.

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Allen named ACS Fellow

Herbert E. Allen, professor emeritus of civil and environmental engineering and former director of the Center for the Study of Metals in the Environment, was named a 2013 American Chemical Society Fellow.

Allen, who retired from UD in 2008 after 19 years as a member of the engineering faculty, is highly regarded as an expert on the effects of metals in the environment. His groundbreaking research on the fate and effects of pollutants in water, sediment and soil helped develop environmental standards still in use today.

Although technically retired, Allen remains active within the UD community. He is currently collaborating with *Dominic Di Toro*, Edward C. Davis Professor of Civil and Environmental Engineering and CSME director, on two Strategic Environmental Research and Development Program grants aimed at understanding and predicting the interactions between military explosives and other munitions and the environment.



FACULTY

Leshchinsky honored in Italy for life's work



More than 110 friends and colleagues of **Dov Leshchinsky** gathered at a conference in Bologna, Italy, this fall to honor the professor of civil and environmental engineering's achievements in the field of geotechnical engineering.

Leshchinsky is widely regarded as an expert in slope stability engineering, soil mechanics, soil reinforcing and ground improvement. His research led him to develop several software programs that aid in the design of geosynthetic reinforced slopes in collaboration with the U.S. Army Corps of Engineers, the Federal Highway Administration and private industry companies.

His work has concentrated mainly on methods for developing and maintaining mechanically stabilized earth walls and slopes for use in retaining structures such as bridges, dams, retaining walls, levees and seawalls.

In Bologna, he was presented with a book containing more than 70 papers contributed by former students and peers, as well as heartfelt stories and memories of Leshchinsky as told by friends, family and colleagues.



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Groundwater expert named Unidel Chair

Holly Michael, assistant professor of civil and environmental engineering, has been named the Unidel Fraser Russell Chair for the Environment.

This five-year appointment allows her continued research on coastal groundwater dynamics, submarine groundwater discharge and associated chemical fluxes, groundwater-surface water interaction, water supply sustainability, water resources in developing countries and hydro-economics.

Michael, who holds joint appointments in the Department of Geological Sciences in the College of Earth, Ocean, and Environment, the Department of Geography and the School of Marine Science and Policy, is a 2012 recipient of the National Science Foundation Faculty Early Career Development Award. Her research has been published in *Nature* and *Science*, among other journals, attracting media coverage from *The New York Times* and other international outlets.

The Unidel Fraser Russell Chair for the Environment is a career development chair named in honor of T.W. Fraser Russell, Allan P. Colburn Professor Emeritus of Chemical and Biomolecular Engineering.

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UNIVERSITY OF DELAWARE

RESEARCH

Maresca, Schumacher study microbes as biomarkers for concrete damage

Concrete is the most widely used construction material in the world. Yet, many concrete roadways and bridges crack due to internal chemical reactions, temperature fluctuations or external chemical and physical stresses.

CEE assistant professors *Julie Maresca* and *Thomas Schumacher* are designing a microbial method to identify the internal chemical reaction known as alkali-silica reaction (ASR) before visible cracks appear. They analyze DNA from samples provided by the Delaware Department of Transportation (DeIDOT) from roadways, shoulders and overpasses throughout the state to identify specific strains of microbes that could be early indicators of ASR damage.

The researchers hope to identify microbes that are exclusive to the damaged samples. They believe this data could lead to a set of microbes associated with ASR-damaged concrete that could be used as biomarkers to reveal damage before visible cracking occurs.

"Our approach may fundamentally change the way we inspect and maintain our deteriorating civil infrastructure network," said Schumacher.



UD professors are working to design a method to use microbes to identify ASR-damaged concrete before visible cracks appear.

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Thank you to all the faculty and staff that support the great efforts of our students! It is really wonderful to see them have such success, and they couldn't do it without your support.

— **Tripp Shenton**, *department chair*

UNIVERSITY OF DELAWARE

RESEARCH

Photos courtesy of Dave Gatley/FEMA News and NOAA





UD team models hurricanes to improve evacuation plans

Funded by a \$3 million Science, Engineering and Education for Sustainability grant from the National Science Foundation, *Rachel Davidson*, professor of civil engineering, and *Tricia Wachtendorf*, associate professor of sociology, are creating a fundamentally new approach to modeling hurricanes.

Davidson, a core member of the University's Disaster Research Center (DRC) is working with co-principal investigators from the University of North Carolina-Chapel Hill, Cornell University, University of Oklahoma and Stony Brook University to integrate a set of hurricane scenarios into an engineering model to support evacuation decisions.

Meanwhile, Wachtendorf, who is associate director of the DRC, examines the decisions people make over the duration of a hurricane—and specifically, at what

points during a storm—the information generated from Davidson's model would be most useful to the "end users," such as residents, emergency responders and government officials.

"This project is a leap forward in understanding and improving management of evacuation and shelter for hurricanes. To the extent that can be done, we hope to reduce deaths, injuries and unnecessary expenses associated with ill-planned or ill-executed emergency response in the future," said Davidson.

RESEARCH

Puleo studies tidal flow, sediment movement to protect wetlands from sea rise

CEE associate professor *Jack Puleo* is part of a three-member team of UD scientists studying tidal water flow and sediment movement in a Delaware salt marsh to better understand changes to the marsh ecosystem due to a rising sea level.

Increasing rates of sea level rise could convert this tidal wetland to an intertidal flat, an environment where muddy sediment can be quickly eroded. This conversion has the potential to alter water quality by releasing large quantities of sequestered carbon, nutrients and pollutants, and could affect wildlife that live in coastal marshes and waters.

"Developing new methods to quantify water and sediment movement in these wetlands, on marsh surfaces and in small tidal channels will provide critical information related to marsh stability," said Puleo.



The team developed an innovative imaging system that includes thermal infrared sensors.

According to Puleo, this is the first experiment of its kind to simultaneously record imagery and millimeter-scale velocity profiles in this type of soft, muddy environment.

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Jack Puleo (center) with graduate students Thijs Lanckriet and Aline Pieterse at work in the Brockonbridge Marsh.

Alumna encourages RISE graduates to take flight

The story of Orville and Wilbur Wright's first flight in 1896 is one of perseverance, hardship and ultimately engineering triumph.

It's also an apt illustration of what it takes to succeed as an engineering student, according to UD alumna *Marlyse Williams*, B2004, M2006, who addressed attendees at the 21st annual University of Delaware Resources to Insure Successful Engineers (RISE) student achievement convocation last spring.

RISE recruits and encourages academically prepared minority students who are underrepresented in engineering, and assists them in attaining an engineering degree.



Williams—once a RISE student herself—is now a first lieutenant in the U.S. Air Force. She supervises more than 1,100 military and civilians, and assists in the maintenance and repair of more than 4,000 buildings and facilities at Joint Base McGuire-Dix-Lakehurst.

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Lee named university president in Taiwan

Suen-Zone (Jack) Lee, PhD1993, has been named president of Chia Nan University of Pharmacy and Science in Tainan City, Taiwan.

Lee is a leading expert in environmental engineering in Taiwan, particularly in groundwater contamination.

At UD, he studied soil heavy metal chemistry—how soil reacts with

heavy metals—in order to establish soil cleanup standards under the advisement of Herbert Allen, professor of civil and environmental engineering.

Lee returned to campus last spring for the first time in 20 years to receive the Department of Civil and Environmental Engineering's Outstanding Alumni Award.

Though it has been two decades, he said it felt like only days since he had last entered 151 DuPont Hall, the laboratory where he once combined dirt and metal solutions to study heavy metal absorption rates.

Alumni Weekend Awards

The department recognized two exceptional alumni for their professional and community contributions at the annual alumni reception May 31, during the University's Alumni Weekend celebration.



SUEN-ZONE LEE, PhD1993, received the department's Outstanding Alumni Award for his exceptional leadership, commitment to education, contributions to the advancement of science and for his dedication to the engineering profession. He is president of Chia Nan University (CNU) of Pharmacy and Science (see story p15.)



SHANTE HASTINGS, B2000, chief of Performance Management at the Delaware Department of Transportation, was honored with the department's Citation for Outstanding achievement for her achievements as an engineer, project manager and leader for the state of Delaware, her commitment to public service and her longstanding devotion to the department and university. The department awards the *Outstanding Alumni Award* to graduates who have distinguished themselves through sustained dedication, leadership, and service to the profession and society.

Also, the department awards the *Citation for Outstanding Achievement Award* to graduates who have exhibited great promise in the early stages of their career.

Nominate someone you know today!

You too can make a significant impact by giving back to the Department of Civil & Environmental Engineering. For information on creating your own scholarship, please contact Barbara Maylath, director of Development, at (302) 831-7273 or by email to bmaylath@udel.edu.



For further information they can contact Marikka Beach at 302-831-2442 or marikka@udel.edu

CIVIL AND ENVIRONMENTAL ENGINEERING

Alumni and Friend Golf Outing

Friday, June 6, 2014 Deerfield Golf & Tennis Club Newark, Delaware

All will be held in conjunction with Alumni Weekend.

The golf outing will be Friday, June 6, 9:00 am start at Deerfield Country Club.

The reception will be 4:30-6:00 pm in 301 Du Pont Hall.

Dare to be first.



www.udconnection.com/Alumni-Weekend

2014 Reunions at UD **VOLUNTEERS ARE NEEDED**

If you're interested in volunteering time to help make your reunion celebration extra special, please contact Alex Hoffmaster at arhoff@udel.edu or 302-831-6340.

Welcome UD Alumni, Family & Friends

Save the date June 6 - 8, 2014

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ALUMNI

Make a Gift ONATE Alumni & Friends

We wish to thank the many CEE friends and alumni who have made generous contributions over the past year. Your gifts are used for many worthwhile purposes, including support of our research and educational programs.

Please visit <u>www.engr.udel.edu/alumni</u> to learn how you can make a difference. To make your gift today, click *Donate* and if you wish to designate your gift to CEE, select other from the list provided and specify Civil and Environmental Engineering.

> You may also forward your gift to:

Development & Alumni Relations Office 83 East Main Street, 3rd floor Newark, DE 19716 Attn: Gifts Processing

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