EMBRACING THE SPIRIT OF SERVICE
CEE’s Student Leaders Shine
Dear Alumni and Friends,

Leadership. It requires a set of skills, but even more so a frame of mind. Leadership is critical for advancing the civil and environmental engineering profession, and any professional field. It is also important for advancing one's career and one's community. In addition, it enables a self-directed life. For all of these reasons, we emphasize leadership in our undergraduate and graduate programs in classes, in seminars, and in extracurricular offerings.

The Department of Civil and Environmental Engineering at Carnegie Mellon has long been blessed to have strong student leaders at both the undergraduate and graduate levels. Civil and environmental engineering as a field attracts many students who are motivated to lead in their profession and in their communities. Our undergraduates traditionally lead our chapters of the American Society of Civil Engineers and Chi Epsilon, the civil engineering honor society. At the college and university level, our undergraduates frequently are involved with leadership of the Carnegie Mellon chapters of Engineers Without Borders, National Society of Black Engineers, Society of Hispanic Professional Engineers, Society of Women Engineers, and other organizations. Our graduate students traditionally lead our chapter of the ASCE Environmental & Water Resources Institute, and are quite involved with the Chinese Student and Scholar Association, the Indian Graduate Student Association, and the Graduate Student Assembly at the university level. The groups listed are very active and enrich our CEE community in many ways. As we have reported in CEE News, our ASCE student chapter is consistently recognized as among the top chapters in ASCE Region 2. This issue of CEE News describes some of our outstanding student leaders.

In this issue we also report on the Integrative Design, Arts and Technology (IDeATe) network at Carnegie Mellon, a university-wide initiative aimed at connecting education, research, and creative practice in technology and the arts. Professor Susan Finger of CEE helps lead this unique collection of activities, in which a number of CEE students participate.

Some recent research activities of our faculty and students are featured. The issue includes stories about the work of PhD student Kelly Good and Professor Jeanne VanBriesen on a complex water quality management challenge related to electric power production; of PhD student Yasmin Tari and Professors Matteo Pozzi and Burcu Akinci on development and implementation of a mobile system for detecting and measuring leaks from natural gas distribution pipelines; and of Professor Burcu Akinci and collaborators on use of drones for bridge inspections. Undergraduate and masters students are engaged as assistants in a number of research projects during the academic year, as well as through our CEE Summer Research Assistant program, to supplement the critical efforts of the PhD students.

We also report on our CEE Alumni Awards event held in October. It was a delightful evening in which we celebrated the extraordinary achievements of a number of our alumni.

We will be holding a celebration of the contributions and life of former Professor Larry Cartwright, developer of many creative CEE senior design course projects, on Friday, April 21, at 6:30pm in the Singleton Room, Roberts Hall. All alumni are welcome for the event. Please plan to join us if you will be on campus for Carnival Weekend.

The faculty, students, and staff of CEE thank all of our loyal and generous alumni who support the Department in so many and much appreciated ways. We send our best wishes to all of you.

Dave Dzombak
Hamerschlag University Professor
CEE Department Head
## CEE Fast Facts

### 2017 & 2018 Rankings
- **Civil**
  - UG 11 // Grad 10
- **Environmental**
  - UG 9 // Grad 8

Source: U.S. News & World Report

### Our Faculty
- 14 Full Professors
- 2 Associate Professors
- 8 Assistant Professors
- 5 National Academy of Engineering Members
- 3 Active
- 2 Emeritus

### AY 2016-17
- Bachelors Students 87
- Masters Students 199
- Doctoral Students 81

### 42% of CEE students are women
- 53% Undergrad Women
- 39% Graduate Women

### $7.35M
Total Annual Externally Sponsored Research

### 3 Faculty with Active NSF Career Awards

## Education & Research Areas

### Advanced Infrastructure Systems (AIS)
- Smart / Connected Cities
- Intelligent Transportation Systems
- Information & Communications Technologies
- Building Energy Management
- Structural Health Monitoring

### Environmental Engineering Sustainability & Science (EESS)
- Air and Water Quality
- Climate Change Adaptation for Infrastructure
- Sustainable Design
- Remediation
- Urban Water Systems
- Energy and the Environment
- Environmental Nanotechnology

### Mechanics, Materials and Computing (MMC)
- Modeling & Computer Simulation of Complex Physical Systems & Phenomena
- Practical Application of the Emergent Complex Behavior of Materials
- Design of New, Resilient Materials & Structures

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Embracing the Spirit of Service

CEE’s Student Leaders Shine

Junior Julissa Cruz is an unusually busy student: she was elected president of the Civil and Environmental Engineering (CEE) student chapter of the American Society of Civil Engineers (ASCE) in December after having worked closely with the organization’s past president and serving as the social chair. She was also elected to the CEE Undergraduate Student Advisory Council, where she helps look for opportunities to improve the student experience and the CEE department, and she has been a member of the CMU student chapter of the Society of Hispanic Professional Engineers (SHPE) since her freshman year. She later served as the community outreach chair and is now the internal vice president of the chapter.

“I feel like during my early years, I was able to benefit a lot from the things those organizations were able to offer me,” she said. “Now that I’m on the other side of things,
I'm motivated to give back.” This spirit of service and leadership is a key part of student life for Cruz and many other students in CEE.

“The best leaders are visionary, servant leaders who elevate the unique strengths of their teammates while striving for excellence,” said Sarah Ramp (BS ’13, MS ’13), Design Engineer at Menard Group USA and the CMU ASCE chapter practitioner advisor. “When I was a student working (EPP) to round out her education. “I think I want to work for the government, whether for the Environmental Protection Agency or one of the other environmental policy agencies,” she said. Her many activities are an important part of preparing for that career. “The interactions that being a student leader requires are interactions that help you behave professionally after you graduate,” she said, adding, “And you just meet so many people…you make a lot of friendships.”

Gaining New Insights

As an undergrad, CEE/EPP senior Pierce Sinclair has participated in a service role that has helped shape his professional goal of giving back to the community. As part of the CMU student chapter of the National Society of Black Engineer’s (NSBE) Summer Engineering Experience for Kids (SEEK) program, he spent three weeks mentoring fifth-grade students while introducing them to the science, technology, engineering, and mathematics fields.

The experience also gave him a new perspective on his career choice. “I saw the work full circle,” he said. “I typically see the collegiate level, but it’s the first time I could see how I could turn that around and help youth to be where I am now.”

The experience helped him realize the impact of outreach with K-12 students to get them interested in STEM learning. But it also reinforced his interest in civil engineering; eventually he would like to work on projects related to transportation, whether that’s with a railroad company or with a government agency such as the Transportation Safety Board.

This year, Sinclair is enjoying the heaviest civil engineering course load of his undergraduate years. Nevertheless, he still makes time to serve as treasurer for the NSBE, a role that has been beneficial for both his personal and professional development. In addition to getting budgeting experience this year, he previously served as conference chair for this group.

A student with varied interests, Sinclair is currently chairing a fashion show for the SPIRIT organization, a group that seeks in small groups, whether for coursework or extracurriculars, leaders were those who saw the big picture and empowered each of their classmates to contribute in an effective way. Julissa Cruz is a great representative of student leadership.”

Although Cruz already has a job waiting for her after graduation, she accompanied a group of 29 students to SHPE’s national conference, an opportunity for attendees to connect with hundreds of employers who are interested in hiring Hispanic students. “Most kids walk out with an offer at the end of the conference…I was there to help others fulfill their dreams,” she said.

Cruz, who has a strong interest in environmental engineering, is also earning a degree in Engineering & Public Policy.
Chairing SPIRIT’s fashion event has had the unexpected benefit of serving as a yin to the yang of his technical studies. For example, noticing a nearby roadwork project in which an intersection was going to be merged into a roundabout, Sinclair was inspired to spontaneously begin sketching out his ideas and predicting where a bottleneck in traffic might occur.

“The art side helps me have a more open mind-set about the problems going on around me,” he explained.

Embracing Diverse Experiences

Ahmad Khanzada, an Andrew Carnegie Society Scholar, has taken the time to explore opportunities with a number of campus organizations, beginning with ASCE, for which he served as president of the CEE student chapter. The group offered him many opportunities to gain leadership skills, but also to meet his classmates in a non-academic setting. “It really helped me to get to know my department and classmates better,” he said. “They’re the same classmates I did projects with over the next three years.”

As a junior, Khanzada was invited to join the CEE chapter of Chi Epsilon, the national civil engineering honor society. He wanted the Chi Epsilon students to have a larger role within the CEE community and worked with faculty to help ensure there was a mentor-mentee program in place, as well as a faculty research seminar series. He also found time to become active with the university’s Habitat for Humanity chapter, serving as trip advisor.

Khanzada’s passion for service began in high school; once he reached Carnegie Mellon, it was just a matter of finding the right opportunities—and those related to CEE seemed like a great fit.

“I really liked civil engineering and knew the department was close-knit,” he recalled. “For that reason, I thought it only made sense to join an organization within my department, and ASCE was the most active organization for undergraduates in civil engineering.”

His experience and lessons in leadership landed him an opportunity to be part of the highly selective Initiating Meaningful Pittsburgh and Qatar Ties (IMPAQT) program, which connects students from the Pittsburgh campus to students attending the CMU Doha campus in Qatar.

“I’ve always had an interest in going abroad and working,” said Khanzada. This experience also laid the groundwork for a summer internship with AECOM working on the Doha Oasis mega-construction project.

In December, Khanzada completed his undergraduate studies in civil engineering with a minor in international relations and politics, a combination he described as “a little bit unconventional.”

Not content to stop there, Khanzada also enrolled in the Integrated Masters/Bachelors (IMB) program in CEE, which streamlines admission to the graduate program and enables participants to take graduate-level classes while they are still undergraduates. He will earn a master’s degree in civil and environmental engineering with a concentration in advanced infrastructure systems this May.

Committed to the Community

Junior James Crnkovich may not be a native of Pittsburgh, but since arriving at Carnegie Mellon he has fully adopted the city as his own: “I’ve kind of fallen in love with Pittsburgh,” he admitted.

He came to CMU from Phoenix, Arizona, where he had not begun to experience all that Phoenix had to offer until his senior year of high school. He resolved that once he arrived on campus, he would engage with the Pittsburgh community.
A resident assistant since December 2015 and treasurer for the ASCE student chapter, Crnkovich is most involved with Partners Allied in Civic Engagement (PACE), an organization established by the university to promote civic engagement as part of the student experience. As part of his work with the organization, he routinely partners with community organizations to support their activities and also helps organize campus events to increase the visibility of service year-round.

“Our student leaders like James understand the importance of working with the greater Pittsburgh community,” said Andrea Francioni Rooney, Director of Undergraduate Programs for CEE. “Student service and outreach results in a welcoming and inclusive learning environment on campus.”

“It’s been a way for me to understand and try to bridge diverse backgrounds and bring diverse communities together,” Crnkovich said. In fact, the idea of bridging issues and communities has emerged as a theme for his time at Carnegie Mellon—“how to reach out and create connections that might be difficult to form naturally,” he explained. The experiences have given him a well of experience to draw from when he enters the workforce and needs to reach out to community members, he said.

Crnkovich also values the sense of community, especially the kindness of the faculty and support for a variety of interests. “There are a lot of really diverse interests within the department,” he explained. “To be part of this is genuinely amazing. I’m incredibly grateful.”

The CEE Community

A recurring theme among students in CEE is the sense of community. Most of the students know each other, and they call professors by their first names. “I know all the professors,” said Cruz, adding that they “really care about you as a person.”

Khanzada echoed her sentiments. “I think Civil and Environmental Engineering is the greatest department at Carnegie Mellon,” he said.

Faculty and staff provide what he called a “holistic investment” in the students, taking an interest not only in academics, but in students’ overall well-being, including non-engineering skills that will help them to build successful careers.

“They’re really the backbone holding all the students together,” he said. Thanks to his university experiences, Khanzada feels confident in taking on new challenges, but leaders, and the active involvement of all of our students in the professional and social activities of the department, have been very important to the vibrancy and collegial culture of CEE.”

Sinclair appreciates that the CEE program has made it easy to bond with classmates. “You get to know the personalities and find out more about each other,” he said. “You can easily talk to peers about different aspects of engineering.”

In addition, the program’s culture of community has made it easier to connect with professors.

In the classroom, they don’t stay behind the podium, but walk around and talk with each of the students; they also make themselves available to speak with students outside the classroom, be it a discussion in their office or a quick hallway conversation. “You can relate to them,” said Sinclair.

“Our student leaders like James understand the importance of working with the greater Pittsburgh community.”

-Andrea Francioni Rooney
Learning at the Creative Intersection of Art and Technology

“I think it’s very important to be able to bring in different perspectives to your field of study,” says Morgan Reed (BS ’19). “Being able to look at projects not only from an engineer’s perspective, but also as an artist, allows me to think of the visual aspects more than I would have.”

Reed is an aspiring structural engineer who plans to make an impact in urban development, and she has a unique and unexpected minor: Animation and Special Effects. No, she doesn’t want to animate Pixar’s next Toy Story movie. She knows that learning creative and artistic animation skills will help her create 3D models for engineering.

Animation & Special Effects is one of Carnegie Mellon’s IDeATe minors (Integrative Design, Arts & Technology), a network of interdisciplinary courses that encourage learning at the creative intersection of art and technology. IDeATe’s minors and courses bring together students and faculty from creative and technical majors to learn subjects in game design, sound design, physical computing, intelligent environments, and more.

In one of the IDeATe courses, Responsive Mobile Environments, often called Mars Habitats, Reed worked with other students in engineering, physics, architecture, and art majors to create a self-sufficient plant biome model that could survive on Mars.

“Being able to work one-on-one with these different groups of people definitely made this class a worthwhile experience that made me all the more excited to be a part of IDeATe,” Reed says.

Susan Finger, a CEE professor and Associate Dean of IDeATe, encourages students from all disciplines to pursue courses or minors in IDeATe, because collaborating with students with other perspectives allows them see their own field differently.

Her Rapid Design class, for example, focuses on learning through experimentation. “Basically you’re thinking about how you learn, how you learn by experimenting, and you make something that engages a child—not book learning, but the kind of experimental learning you get by playing with stuff.”

Even if students don’t want to commit to the five IDeATe courses it takes to earn an IDeATe minor, they can still benefit from one or two of the interdisciplinary courses. They are designed without extensive prerequisites, so students from all areas of the university can pursue interests outside their majors.
Pluckin’ Dragons

CEE Senior Design students were tasked to “pluck the dragon’s egg from its lair without getting caught in order to leave Carmelworts College before expiring of old age.”

The teams designed and built a dragon containment system that allowed the tethered dragon (Professor Jim Thompson) to roam freely within a 20-foot radius while not allowing movement (sliding or toppling over) of the structure itself while also meeting cost and weight allowances.

Young “wizards” entered the “Try, Wizard” tournament where they tested their dragon containment apparatus while working together to also capture the dragon’s egg.

Co-instructor Professor Sarah Christian served as the master of ceremonies and made the official measurement of the tether performance, held at the end of the Fall 2016 semester.

Visit bit.ly/2016-cee-senior-design on YouTube to learn more about this year’s project!
Connecting Power Plants and Drinking Water Safety

When CEE Professor Jeannne VanBriesen began looking for possible sources of bromide in local rivers, she was expecting to find shale gas wastewater management to be a source. But after changes made to treatment and disposal of water produced by shale gas extraction did not drop bromide levels as low as expected, she began exploring other industries.

Coal is known to contain bromide, and when coal-fired power plants use wet flue gas desulfurization to control emission of chemicals that cause acid rain, bromide can end up in the wastewater. Also, these power plants are subject to recently finalized regulations for mercury control that may increase bromide discharges.

While bromide reduces air pollution, bromide in the wastewater can cause problems for downstream water treatment plants, which do not typically remove it from drinking water. Bromide concentrations have never been regulated and are seldom measured.

VanBriesen, with PhD student Kelly Good, used many different sources of bromide information to estimate the amount of bromide entering the Allegheny River basin from coal-fired power plants, as well as oil- and gas-produced water management activities.

They also examined how those bromide loads affect downstream concentrations of bromide. Their research was recently published in Environmental Science & Technology.

THE EFFECTS OF BROMIDE

According to Good, bromide in our rivers was considered naturally occurring and harmless to humans and ecosystems until recently. However, bromide can cause changes in chemical reactions within the drinking water treatment plants that affect our water.

In short, when river water goes through a drinking water treatment plant, any bromide present combines with organic matter and chemical disinfectants (like chlorine), creating disinfection by-products (DBPs). DBPs are associated with reproductive and developmental health effects and cancer, and when bromide is present, the DBPs that form are more toxic and carcinogenic.

“What we know is that if you have bromide in your source water, it increases the rate of reaction, and you have more disinfection by-products, as well as by-products with bromide in them,” said Good, who worked as a planning engineer for a large drinking water utility before beginning her studies at CEE. “We would strongly prefer to not have bromide in our source water,” she added.

Although it is known that bromide causes DBP problems, it is not known how much of that bromide is coming from power plants. “In the absence of widespread monitoring data, we need a method to estimate how these power plants are affecting downstream drinking water plants,” said Good. “That’s the gap that this work is seeking to fill.”

THE RIGHT PLACE—THE RIGHT TIME

The Allegheny River basin was an ideal location for this research due to the
presence of multiple power plants and the availability of data on bromide concentrations. VanBriesen and Good estimated bromide loads on a mass-per-time basis, but Good emphasized that it is the concentration of bromide that is most important to the drinking water utility.

“You could have a high load, but if you also have a high flow, that could dilute the bromide to a lower concentration,” she explained.

Good hopes that their research will help put the issue of bromide use into perspective for power plants, water treatment plants and regulators. She suspects there are concentrations of bromide in the river basin at certain times of the year that may be a problem to the water treatment plants.

“The point is to try to get ahead of it and affect decision-making around bromide use,” she said.

With the data provided by this research, drinking water treatment plants will be better able to understand their watershed. “This will help them know what’s going on in their system,” said VanBriesen. “Power plants can use this information to make more proactive decisions about meeting emissions standards. This should help them understand what the implications of those choices are on their neighbors at the drinking water treatment plant. We all want a cleaner environment, and choices we make to control one type of pollution often cause challenges for another type of pollution. It is important that we think about these issues at the watershed system level.”

Good and VanBriesen will next apply their methodology to the entire state of Pennsylvania, looking at all power plants and large, community-based drinking water treatment plants.
Professor Hae Young Noh and her research team were awarded two out of five awards at the Embedded Networked Sensor Systems (SenSys) conference held at Stanford in November 2016.

The team was awarded Best Poster Award for their work entitled “Multiple Pedestrian Tracking through Ambient Structural Vibration Sensing” based on their footstep-induced floor vibration technology, which is able to track multiple occupants in a space. This research can be applied to efficient energy management planning, healthcare, and security.

Their poster “HAP - Fine-Grained Dynamic Air Pollution Map Reconstruction by Hybrid Adaptive Particle Filter” was awarded Best Poster Runner Up. This work uses sensors mounted on taxis to reconstruct a fine-grained dynamic air pollution map.
Imagine strapping on a harness and dangling yourself over the side of a bridge, 100 feet in the air—the wind whipping past you, the earth far below. It might sound like a scene from a spy movie, or a fun idea for a vacation activity. For a bridge inspector, however, it’s just another day on the job.

But just because it’s routine doesn’t mean it’s safe. When hanging by a tether from a bridge, accidents are always possible. Service cranes can tip over; workers can be crushed. The job of inspecting our bridges for potential dangers is essential to the safety of the thousands of people who cross them every day—but where there are humans, there’s always the potential for error.

That’s why CEE Professor Burcu Akinci wants to leave the dangerous work to the drones.

“Using drones to scan bridges for structural problems could provide data on the conditions of the bridge without putting people in high-risk situations,” says Akinci. “We could then analyze this data using algorithms, to gain an objective assessment of bridge conditions.”

Akinci, along with a team from the Robotics Institute led by Sanjiv Singh and a team at the Department of Civil and Environmental Engineering at Northeastern University led by Jerome Hajjar, have joined forces to develop the Aerial Robotic Infrastructure Analyst (ARIA). This tabletop-sized drone uses photo and video capture techniques, as well as state-of-the-art laser scanners, to create a high-resolution 3D model of the bridge, which can then be safely analyzed by an inspector on the ground. The project is made possible by a grant through the National Science Foundation National Robotics Initiative.

While infrastructure inspection is already being conducted in some cases by micro-air vehicles, ARIA is designed to be more than just a means of data gathering. As the drone flies autonomously around the bridge, it processes the data it gathers, providing feedback and suggestions while allowing the inspector on the ground to make assessments of the bridge in real time. Then, after landing, the drone’s onboard software can take the data it gathered and build a 3D model of the bridge in which inspectors can immerse themselves to visualize the structure without ever having to leave the ground.

Carnegie Mellon and Northeastern are pioneering this technology, and they predict that ARIA will be one of the first in a long line of robotic infrastructure inspection technologies. Already, the researchers are working on applying ARIA’s capabilities to other infrastructure problems, such as the inspection and assessment of power transmission lines.

“The unique aspect of this team is that it combines the robotics perspective, the vision-based data processing perspective, and the civil engineering condition assessment and structural analysis perspectives,” Akinci says. “This allows us to approach the complicated problem of infrastructure inspection from multiple perspectives and create a system that works for everyone involved in the process.”

Thanks to this unique combination of perspectives, our bridges will be safer for civilians above and below.
Tracking Methane Leaks in Pittsburgh

When it comes to climate change, we all know that carbon dioxide emissions are a big problem. It is a dangerous greenhouse gas, emitted by the burning of coal and other fossil fuels.

But CO₂ isn’t the only greenhouse gas emitted by our energy system. And now that approximately one-third of U.S. electricity comes from natural gas, researchers are working to contain another of climate change’s biggest contributors, and the primary ingredient in natural gas: methane.

Unfortunately, thanks to the significant age of Pittsburgh’s pipeline infrastructure, these leaks are not hard to find.

“There are some of these pipes can be more than 100 years old,” says Tari, “and since they’re under the streets, they’re under the loads of the vehicles that are passing overhead.”

Along with their advisors in Carnegie Mellon’s Smart Infrastructure Institute and the Center for Atmospheric Particle Studies, postdoctoral researcher Aja Ellis (MechE) and PhD student Yasamin Tari (CEE) have partnered with People’s Gas Company to help it find leaks in its natural gas pipelines, which run under Pittsburgh’s streets, and also to track the amount of gas being released into the atmosphere. This gas is known as unaccounted-for gas, and not only is it hard on the environment, but it can also lead to higher energy prices.

In addition to being a major contributor to global greenhouse gas emissions, methane leakage in cities can pose other problems. Due to its high combustibility, too much escaped methane, met with a stray spark or flame, can go up like a bonfire.

In order to find and track these methane leaks, the team is taking to the streets for a unique method of data gathering. Using their mobile methane laboratory—a white paneled van filled with equipment for measuring and detecting methane—they drive around the city mapping leaks. From there, the team overlays the data onto maps of People’s Gas pipeline infrastructure.

Using this data, the team hopes to create a predictive model of what conditions are more likely to cause pipelines to leak.

“We’re looking to come up with a better predictive model of the pipeline infrastructure and how pipeline characteristics might correlate to leak frequency and magnitude, so that we can apply that to the greater Pittsburgh area,” Ellis says. “Based on the model, you might find out that your buried steel pipelines have more leaks than plastic, or vice versa. So you want to go drive in the areas where you have more of those pipelines buried, because you can expect to see more leaks in these areas.”

“Some of these pipes can be more than 100 years old, and since they’re under the streets, they’re under the loads of the vehicles that are passing overhead.”

-Yasamin Tari
In Their Words: What They’ve Learned

We asked some of our undergraduate students to reflect about the things they have learned about civil and environmental engineering and leadership in the department.

“I have learned that civil engineering is a much more broad field than I initially thought. When most people think of civil engineering, they think about structural engineering. Learning a little bit about Professors Berges, Noh, and Samaras’ work opened my eyes to other things that are part of civil engineering that I would not have initially categorized as such.”

GAURAV CHATTERJEE - Class of 2018

“I chose civil and environmental engineering because I always wanted to be able to do something that can tangibly change the world. I have learned that civil engineering isn’t all just hard skills and doing math; good oral and written communication skills get you a lot farther. Through my experience in ASCE and Chi Epsilon I have learned the importance of being organized, staying on top of everything, good communication skills, and having infinite patience.”

CAROL QU - Class of 2017

“My favorite class is 12-638: Behavior of Structural Systems, taught by Dr. Sarah Christian. I am currently taking this class, and it is helping to put everything that I learned in structural engineering together. From this class, I understand now how the building’s structure systems work together, and what a structural engineer should consider when designing the lateral forces resisting systems.”

MASKANA ADEDJOUMAN - Class of 2017

“During my time at CMU, as a student and being part of the football team, I learned the importance of everyone buying into a system and to invest my time, not spend it. I also value knowing the people around me have my back.”

JOHNNY MASCARO - Class of 2017

Recent PhD Theses

IRA POSEN - Fuel, Feedstock, or Neither? - Evaluating Tradeoffs in the Use of Biomass for Greenhouse Gas Mitigation - Advisor: Matthews

JOHN STEGEMEIER - Effects of Transformations of Ag and CuO Nanoparticles on their Fate in Freshwater Wetland Sediments and Plants - Advisor: Lowry

PENGYUN WANG - A Statistical Approach for Assessing Seismic Transitions Associated with Fluid Injections - Advisor: Small
SABYASACHI CHATTERJEE
PhD Candidate
Bradford and Diane Smith Fellowship

Sabyasachi Chatterjee’s research focuses on obtaining a coarse response for a system of rapidly oscillatory ordinary differential equations using modern mathematical tools and application of this theory to study the microstructure of crystalline materials at the meso and macro scale from the underlying motion of crystal defects.

With this work, he and his advisor, Professor Amit Acharya, are aiming to achieve this by coupling an exact, non-closed partial differential equation based theory with inputs obtained from time averaged response of fast Discrete Dislocation Dynamics simulations.

MOSTAFA MIRSHEKARI
PhD Candidate
John and Claire Bertucci Fellowship

Mostafa Mirshekari, who is advised by Professor Hae Young Noh, looks at using footstep-induced floor vibration to monitor and characterize occupant behavior and characteristics, such as their identity, location, and activity types.

This information can be used to better serve the occupants and increase operational efficiency in smart structures, marketing, and health care.

SNEHA SHANBHAG
PhD Candidate
Neil and Jo Bushnell Fellowship

Advised by Professors Meagan Mauter and Jay Whitacre (MSE), Sneha Shanbhag’s research is focused on designing electrochemical desalination systems and nanostructured electro-active materials for selective ion removal from saline waters. Her work will shed light on a novel approach to efficiently extract and recover ionic species of value or those that cause detrimental effects on our health or ecosystems.

After completing her graduate studies, Shanbhag plans to pursue research in the area of environmental electrochemistry.

DAVID RAMPTON
PhD Candidate
Jared and Maureen Cohon Fellowship

Advised by Heinz Professor Mitch Small, David Rampton’s research will focus on monitoring activities related to the development of unconventional hydrocarbons, and the production and distribution of natural gas.

Rampton returned to the classroom after developing an impressive international professional career with major oil companies, working across Europe, Scandinavia, and Africa.

DIPAYAN MUKHERJEE
PhD Candidate
Elio D’Appolonia Fellowship

Advised by Professors Kaushik Dayal and Hae Young Noh, Dipayan Mukherjee is researching a data-driven approach to analyze fluid flow through porous materials.

Porous materials like concrete and rocks are used extensively in engineering construction and a data-driven approach promises to give quick and accurate estimate of fluid flow through such materials, subjected to certain fluid pressure gradient.
While Khanzada was leading the chapter, it was awarded both a Distinguished Chapter award and a Community Service award.

**COREY HARPER**  
PhD Candidate  
Elsevier Atlas Award

PhD student Corey Harper was recently awarded the December Elsevier Atlas Award, which recognizes research that could significantly impact people's lives around the world.


**JULIE KIM**  
Senior  
Ody Mackin Achievement Award,  
ASCE Pittsburgh Section

Julie Kim was also honored for her leadership at the ACSE Pittsburgh Section banquet.

Kim has served as president in both the ASCE chapter and Chi Epsilon. Through her leadership efforts she increased student attendance at meetings and helped create events to connect the department.

**AHMAD KHANZADA**  
Senior  
American Bridge Leadership Award,  
ASCE Pittsburgh Section

The top student leadership award for the ASCE Pittsburgh Section went to Ahmad Khanzada. He developed and honed his skills through involvement in ASCE and Chi Epsilon, participating, developing programs, and leading.

Among his accomplishments as president of the chapter was the expansion of an undergraduate mentorship program that quickly acclimates sophomores to the CEE Department by pairing them with upperclass students.

**JULISSA CRUZ**  
Junior  
Achievement Award,  
ASCE Pittsburgh Section

Julissa Cruz was recognized for her leadership within ASCE. Cruz has been an enthusiastic and energetic member of the CEE ASCE student chapter since she was a first-year student.

As a sophomore, Cruz served on the executive board for the student chapter, and was recently selected to be the president for the coming year.

While on the executive board, she has helped organize and plan many successful and engaging events for the student chapter.

**CEE Students Named Andrew Carnegie Society Scholars**

Ahmad Khanzada, from Roslyn Heights, New York, is the current president of national civil engineering honor society Chi Epsilon and past president of the CMU chapter of American Society of Civil Engineers (ASCE).

In the 2016 spring semester, Khanzada participated in the CMU IMPAQ program. Khanzada has also led a student group as part of the Habitat for Humanity organization.

Senior Julie Kim, from Calgary, Canada, has served as both ASCE president and Chi Epsilon president.

This summer, she was selected to work on a research project, A Computational Approach to Physics Based Modeling Darcy Flow Through a Porous Microstructure, as part of the 2016 CEE Summer Research Assistant Program.

Kim is also a member of the student organization Facilitation Opportunities for Refugee Growth and Empowerment (FORGE).

ACS Scholars are selected each year by their deans and department heads to represent their class in service and leadership. These undergraduate seniors embody Carnegie Mellon’s high standards of academic excellence, volunteerism, leadership, and involvement in student organizations.
Distinguished Alumnus

Richard E. (Dick) Gray (BS ’56) is an internationally recognized engineering geology and geotechnical engineering expert who has completed projects ranging from foundation engineering to mine subsidence and stabilization to mine fire control to disposal sites for fly ash. He continues to share his talents with the next generation through DiGioia Gray and Associates, a company he founded with fellow CEE alumnus Tony DiGioia in 2005.

Gray is involved in many technical and professional organizations, including the American Society of Civil Engineers and the Pittsburgh Geological Society, and he has been chairman or president of three major U.S. engineering and geology groups: The Engineering Geology Division of the Geological Society of America, the Association of Engineering Geologists, and the US Committee of the International Association for Engineering, Geology, and the Environment.

“I accept this award in recognition of a great group of young men, the Civil Engineering Class of ’56, and our teachers,” Gray said. “I am thankful for the concept of lifelong learning that was instilled in us as students.”

Lt. Col. Christopher K. Raible Distinguished Public Service

Since 1989, Andrew Jon (AJ) Eggenberger (BS ’61, PhD ’67) has been board member, CEO, chairman, and chairman emeritus of the Defense Nuclear Facility Safety Board (DNFSB). He was responsible for external safety oversight of the Department of Energy’s defense nuclear facilities, a role for which he was appointed by former President George H.W. Bush and confirmed by the U.S. Senate.

Associate Professor Jonathan Malen from the Department of Mechanical Engineering, who worked under Eggenberger at DNFSB, accepted the award on Eggenberger’s behalf.

“It is an honor to CMU that the Raible family has established this award in Christopher’s name,” Eggenberger wrote in a statement delivered by Malen. “Public service has been a most important part of my career. I am sure that I could not have done this without the superb education that I received at [Carnegie Mellon].“
Recent Alumni Achievement

Anna C. Lenhart (BS ‘11) earned a Fulbright grant after graduating from CEE in 2011, which allowed her to pursue projects related to biofuels in Namibia. That experience ignited Lenhart’s passion for young people and the role service can play in their lives. Lenhart worked as a sales force and technology consultant for nonprofits and startup companies before founding her own nonprofit organization. Next Generation of Service works to help young people connect their professional lives and skills with organizations that strive for and are committed to social justice.

Anna is currently pursuing a master of public policy at the University of Michigan.

“When I was notified of this award I had to laugh a little bit because I haven’t worn a hard hat in about three years,” Lenhart said as she accepted the award. “Civil engineers were trained to solve problems for society and that’s what I’m doing in the nonprofit sector as well. I think it has given me a totally different angle of how social change can happen within cities that I wouldn’t have had with a social sciences background.”

Outstanding Alumni Service

Daniel D. Warmack (BS ‘88) is the vice president of Warmack and Co, a real estate business founded by his father in 1950, and the cofounder of Warmack Investments, which focuses on office development and is committed to environmental sustainability with LEED silver- and gold-certified buildings. His commitment to the environment has also led him to a board position on the University of Arizona’s Biosphere 2 project.

Among his various contributions to the department—particularly the undergraduate program—Warmack has supported CEE’s distinguished lecture series in environmental science, technology, and policy. This lecture series has given the Carnegie Mellon community an opportunity to learn from a diverse group of experts from across the nation and the world.

“A Carnegie Mellon education is a robust education and it prepared us for a terrific career,” said Warmack. “I’m very thankful for the education and I’m thankful for the award.”
A Look Back at 2016

Annual ski trip - Hidden Valley Resort

Fall Alumni Advisory Council meeting

Graduate Student Orientation

December Graduate Farewell Dinner

Former Maryland Governor and Senior Fellow at CMU MetroLab Network Martin O’Malley is briefed on CEE research by PhD student Varun Kasireddy

Graduate happy hour and research poster session
Vehicle Automation with the NHTSA

Magna International is among North America’s largest automobile parts manufacturers and suppliers. Audi, of course, is a popular German manufacturer of luxury vehicles. They are multimillion-dollar corporations, and this summer, CEE PhD student Corey Harper advised them both.

Working alongside some of the nation’s top safety researchers at the National Highway Traffic Safety Administration (NHTSA), Harper spent over two months during summer 2016 as a vehicle safety research intern in Washington, DC. There, he had the opportunity to offer guidance on product development and safety standards to these and other well-known organizations.

“The internship allowed me to connect things I learned in the lab and the classroom to a professional setting,” he reflects. “It also assisted me in learning the thinking process and objectives of the USDOT [U.S. Department of Transportation] from a safety perspective.”

Harper spent much of his time as an intern reviewing and providing feedback on Statements of Work (SOWs). Though he’d never reviewed an SOW before, Harper found them similar to research proposals, with which he was more familiar. “Basically, each SOW identifies an issue, lists questions to be answered, and presents a plan on how to address those questions,” he says.

For the most part, his work focused on vehicle automation. Functional safety—related to identifying and mitigating risk around how a vehicle reacts to equipment failures, operator mistakes, and other inputs—was another common topic. For example, Harper reviewed one SOW for a study on vehicles with limited self-driving automation or Level 3 automation.

In these automated vehicles, the control switches between the vehicle and the driver based on traffic or environmental conditions. “At Level 3 vehicle automation, the driver is expected to be available for occasional control,” explains Harper. “With this particular study, the goal was to see how varying levels of vehicle error might impact a driver’s behavior.”

At the NHTSA, Harper also studied the cost and feasibility of equipping personal vehicles with adaptive equipment, like wheelchairs lifts and ramps. Such modifications can range from $10,000 to $20,000 and help individuals with disabilities travel more easily and safely.

For this project, Harper drew on work he’d done in his PhD program for a cost-benefit analysis of partial automation systems like forward collision warning and blind-spot monitoring. “The economic thinking experience, problem-solving skills, and independent work that I’ve done during my PhD were very valuable,” says Harper. “I was able to apply those skills to meet deadlines and consistently do what I was supposed to do with little oversight.”

Now in the last year of his PhD program, Harper will continue his research analyzing the environmental, infrastructure, and safety implications of autonomous and connected vehicles on policies and transportation systems—all the while soaking up as much knowledge as he can from his two advisors: CEE Professors Chris Hendrickson and Costa Samaras.

“You learn a lot from your advisors,” he says. “The discussions I had with my supervisor in the DOT were very similar to the thought processes you go through with your advisors during a research project. Because of my work with them, I was able to go into the internship and learn from the people there, while also relying on existing knowledge for each assignment.”
Deborah Lange (CEE MS ’82, PhD ’01) was selected as the recipient of the Engineers’ Society of Western Pennsylvania (ESWP) 2017 William Metcalf Award. The award recognizes engineers who make outstanding contributions to the region, and is one of the highest honors given by the ESWP.

Throughout her career, Lange has demonstrated a tireless commitment to furthering environmental education and research initiatives. In 2004, she was named executive director of the Steinbrenner Institute for Environmental Education and Research at CMU, a position she held until 2012, and now serves as its Director of Strategic Initiatives.

In both roles, she has been responsible for the advancement of environmental initiatives on CMU’s campus. From 2010 to 2011, she served as the President of the ESWP, where she worked to increase ESWP’s student outreach, and to encourage future generations of engineers.

In her role as executive director of the Western Pennsylvania Brownfields Center, a joint effort between CMU and the University of Pittsburgh to provide access to information and research on brownfield development efforts in the region, Lange created and led workshops to bring together national experts and local stakeholders to strategize comprehensive development initiatives for Western Pennsylvania municipalities and small-business owners.

As STEM outreach coordinator for CMU’s College of Engineering, and Alumni Relations for the Department of Civil and Environmental Engineering, Lange is always broadening the Carnegie Mellon and scientific communities, bringing together engineers both present and future to face the environmental challenges of tomorrow.

G. Ronald Ripper
Director of CEE Facilities

Ron Ripper received the Spirit Award at the 2017 College of Engineering Staff Awards Luncheon in recognition of his dedication to the students and the CEE department.

Ripper joined the department in June 2006 as the manager of the CEE Hauck Environmental Engineering Laboratories. He has consistently demonstrated outstanding dedication, enthusiasm, and commitment to community, both within CEE and the broader CMU community.

His cheerful, positive attitude has done much to contribute to the collegial working environment and family atmosphere in our department.

He has brought the same positive influence to his engagements with groups in the College of Engineering and across the university, including with Athletics, Staff Council, Environmental Health & Safety, and the Green Practices Committee.

Marilù Lundeen
Administrative Assistant

Marilù Lundeen joined CEE as an administrative assistant and will be greeting visitors at our reception desk.

Lundeen has worked at Carnegie Mellon for 14 years, most recently at the Information Networking Institute and at the Tepper School of Business. She is fluent in several languages, enjoys working in CMU’s fast-paced environment, and especially enjoys interacting with students.

Once again CEE students, faculty, and staff worked together to bridge the hunger gap and raised $1,930 and over 200 cans for the 23rd annual food drive sponsored by the CMU Staff Council to benefit the Greater Pittsburgh Community Food Bank.
"One of the reasons I gravitated to building is that we see results immediately, and the results are lasting. You can return to a building and say, 'I had a direct hand in that,'” explains CEE alum Daniel Streyle.

In his more than 40 years of experience in the civil engineering field, Streyle has had a direct hand in an impressive number of projects.

Not just any projects either. As a project manager specializing in professional sports facilities, he has guided teams of architects and builders in creating iconic structures that hold hundreds of thousands of sports fans and visitors every year in the cities of Cincinnati and Phoenix.

Yet these buildings aren't the only legacy Streyle has constructed. A frequent alumni donor, Streyle has given numerous times to the College of Engineering and to Carnegie Mellon University, even establishing an Undergraduate Research Fund in memory of his late first wife, Linda Anne Halas (BS, ChemE '75), in 2015 and, most recently, including Carnegie Mellon in his estate planning.

"You get to a point in your life where you realize that it's not all about you. You want other people to have all the opportunities and advantages that you did," says Streyle, who earned his Bachelor of Science in Civil Engineering from Carnegie Mellon in 1975.

Streyle got his first full-time professional opportunity at Procter & Gamble after earning his MS from the University of Illinois. "Early on, I was assigned to a project as the owner’s rep or project manager," he recalls. "I was managing architects and engineers completing the designs and then managing contractors in the field to get the physical work done."

Streyle liked having that leadership role and end-to-end oversight of the project design, schedule, cost, and delivery.

After working for Procter & Gamble for approximately 20 years, Streyle decided to tackle a new challenge. In retail, buildings were a means to an end; the ultimate goal was to sell product.

The world of sports felt different. "In sports," he says, "there's the game on the field, but the facility itself becomes part of the experience."

In 1997, Streyle joined a consulting firm whose niche was professional sports. Within the year, he was working as project manager, overseeing the building of the new Cincinnati Bengals football stadium until its opening day in 2000.

With his first NFL facility—a $455 million project—in the books, Streyle moved on to another big project: the six-year planning and construction of a stadium for the Arizona Cardinals.

When the stadium was complete, with its fully retractable roof and North America’s first retractable natural grass playing surface, Streyle was proud of what he’d accomplished. The Cardinals had also taken note of his skills, asking him to join their organization as director of construction.

Looking back, Streyle credits much of his success to what he learned in college. "At Carnegie Mellon, you are trained to work hard. Over my career, that is not to be minimized in any way," he says.

Beyond hard work, Streyle also fine-tuned his problem-solving skills as an undergraduate. "At CMU, we spent our time on developing models for how to look at problems and to solve them," explains Streyle, who found this immeasurably more valuable than memorizing structural codes. "When a problem was unique or different, I could understand what needed to be done, and how to apply the codes and the theory to reach the right answers. It was a way of thinking that the university taught us well."

Now, through both the training and insight he gives to his junior colleagues and his generous donations to Carnegie Mellon, Streyle has committed himself to ensuring that future engineers will also be ready to solve the challenging problems of tomorrow.

"Part of your legacy, part of why you exist, is to help pave the way for those who come next," says Streyle. "That, to me, is the primary reason to give back: to empower the next generation."
Daniel Streyle (BS ’75) sets his focus on the future. As project manager, he facilitated the build of the University of Phoenix Stadium and worked to create an impressive structure that will stand the test of time.

At Carnegie Mellon, Dan created a lasting legacy through a gift in his estate plan that will benefit undergraduate engineering research, spurring innovation for generations to come. Learn how easy it is to achieve your philanthropic vision through a planned gift.

Contact the Office of Gift Planning at 412-268-5346 or visit giftplanning.cmu.edu to start building your legacy at CMU today.