

# CEE NEWS

CIVIL AND  
ENVIRONMENTAL  
ENGINEERING

SUMMER 2012

Carnegie  
Mellon  
University



## ENVIRONMENTAL IMPLICATIONS OF SHALE GAS EXTRACTION

SEE STORY ON PAGE 3



## CEE Department Head

JIM GARRETT

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Dear Friends,

I sincerely hope that all is well with you and your families.

I write to you in the midst of an amazing number of exciting developments and change at Carnegie Mellon. We have a new building for Bioengineering, Nanotechnology and Energy about to be built on campus between Hammerschlag and Wean Halls. Some CEE faculty will have labs and offices in that new building. In addition, a new Energy Institute is being launched and will be housed in the new building. There are many links between the research going on in CEE and the mission of the new Energy Institute, a number of which are highlighted in our feature story about the environmental implications of shale gas extraction. Others include our work related to energy use in buildings, pipeline monitoring, and carbon sequestration.

In another exciting opportunity, especially for CEE, Carnegie Mellon is in the process of partnering with New York University, University of Toronto, IBM, Cisco and other partners, in the creation of the Center for Urban Science and Progress (CUSP). CUSP is being established in Brooklyn in response to Mayor Bloomberg's initiative to establish some new strong engineering research activity in New York City. As there are enormous strengths at Carnegie Mellon in the area of urban systems, we are also in the process of establishing an institute, at Carnegie Mellon to coordinate and bring visibility to all of the diverse and well-established activity. For example, the research in the Pennsylvania Smarter Infrastructure Incubator, the IBM Smarter Infrastructure Lab (featured in the last newsletter), and the newly established University Transportation Center are all major activities and resources related to the new initiative. Researchers from the new institute will collaborate with each other, with CUSP and with other partners to establish interdisciplinary projects aimed at improving the performance of our urban systems.

As I reported in my last letter, the search continues for our new president and we are all sent periodic updates about the search committee's progress on this important task. More recently, CIT Dean Pradeep Khosla announced that he would become the next chancellor of the University of California at San Diego. Professor Kumar Bhagavatula has been named the interim dean and a search is underway for our next dean of CIT. While these leadership changes will bring some challenges for all of us, leadership change also provides exciting opportunities for growth at CMU. The individual departments, including CEE, are very strong and healthy which is a hallmark of Carnegie Mellon. Dean Khosla did an excellent job of providing resources to and empowering the individual departments to define their mission and succeed at it. He also did an excellent job of helping all departments to increase our populations of MS and PhD students, allowing us to be academically healthy and financially solid. I believe this issue of our newsletter certainly makes it clear that our CEE department is thriving.

I end this letter as I always do by thanking all of our loyal and generous alumni who support the CEE department in so many important and much appreciated ways. I am truly grateful for your support.



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# ENVIRONMENTAL IMPLICATIONS OF SHALE GAS EXTRACTION



**P**ennsylvania has a rich history in energy resources, from the first oil well to centuries of coal mining. Recently, Pennsylvania has been central to a national discussion of the potential and the challenges associated with domestic natural gas from shale reserves in the Marcellus and Utica formations. Carnegie Mellon University’s Civil and Environmental Engineering faculty and students are actively engaged in research to understand this new resource and the environmental implications for the region.

## UNDERSTANDING THE ECONOMICS

In 2006 the price of gas was \$8.00 per thousand cubic feet, high enough to spur the development of new technologies to unlock natural gas in shale reserves. Deep shale reserves hold a vast volume of gas, but reaching and releasing the gas requires the new techniques of directional drilling and hydraulic fracturing, adding to the cost for extraction. With the current lower gas prices, development has slowed. New technologies again may enable economical extraction of these resources.

Dr. **Kelvin Gregory** (professor, CEE) explains, “We’re trying to evolve new technology that enables the economically and environmentally sustainable production of natural gas. Can we do this cheaper? Can we do this more efficiently?”

*Continued on page 4 >*

## ENVIRONMENTAL IMPLICATIONS OF SHALE GAS EXTRACTION *continued*

### WATER

Many of the environmental concerns surrounding the development of Marcellus Shale gas have to do with potential impacts on water resources. Dr. **Jeanne VanBriesen** (CEE professor and director of Water Quest) is investigating the affects of shale gas associated wastewaters on the surface waters we rely on as our drinking water sources. She summarizes, “We have been working to determine the baseline quality of water in the region so we can understand how development of this gas resource might affect our water.”

Produced water from oil and gas development, along with water pumped out of coal mines and water from abandoned mines are all possible problems for our watershed. These fossil fuel associated waters are very salty and if too much of this type of wastewater enters the rivers, our drinking water can begin to taste bad (salty). Pittsburgh gets a lot of rain, but in the dryer summertime, contaminant levels can increase due to concentration.

In addition to issues of salty taste, Dr. VanBriesen is concerned about the bromide content in produced water from shale gas extraction. Bromide concentrations in our rivers are very low, even with input of many different types of wastewater. But, even very low bromide levels interact with the disinfection processes in drinking water plants and lead to formation of carcinogenic compounds called disinfection by-products (DBPs). DBPs containing bromide are particularly problematic. In the summer of 2010, a spike in bromide concentration in the Monongahela river was observed by Dr. VanBriesen’s team. Higher DBPs in drinking water were also reported.

### PRODUCED WATER VOLUME LEVELS BY STATE



In response to Dr. VanBriesen’s work (and the work of others at the Pittsburgh Water and Sewer Authority, PWSA), the state Department of Environmental Protection (DEP) made a major policy change: they requested that the Marcellus shale drillers stop taking wastewater to plants that discharge directly into rivers. Dr. VanBriesen continues to evaluate the water quality in the region to understand the role of other bromide sources, and how the water quality responds to other changes like climate. Her research also focuses on the engineering side of the bromide issue.

If we can’t get the bromide levels down in the river, what can we do in the drinking water plant? Are there ways we can form fewer carcinogens even though we have the same amount of bromide? Can we engineer new disinfectant systems that won’t form these chemicals?

Professors **Thanasis Karamalidis**, **David Dzombak**, and PhD student **Clint Noack** (pictured below) are examining the feasibility of exploiting rare earth elements (REE) associated with produced waters from shale gas development for two purposes: (1) potential recovery as a valuable byproduct and (2) utilization of unique REE signatures as a risk assessment tool. REE include the lanthanide series of elements – excluding short-lived, radioactive promethium – and yttrium. These elements are critical to a wide variety of high-tech, energy efficient applications such as phosphors, magnets, and batteries. Escalating costs of REE resulting from divergent supply and demand patterns motivates the first goal. The second goal relates to the search for a reliable, naturally occurring tracer to improve understanding of fluid migration and water-rock interactions during hydraulic fracturing and natural gas recovery. Currently, research is focused on understanding the occurrence of REE in global waters under a wide range of physical and chemical conditions. The next step will be to characterize REE content of shale gas produced waters from a number of different locations and geologic environments. To prepare for this effort, another component of current work is analytical method research and development to overcome the inherent challenges of analyzing hypersaline shale brines for these trace elements.





PhD candidate, **Arvind Murali Mohan**, works with Professor Gregory to characterize microbial diversity in flowback and produced water using molecular ecology techniques to better understand microbial processes in these complex environments. With the increase in number of wells being fractured in the Marcellus, management of flowback and produced water is a fast emerging concern. Microbial activity in these waters can alter the fate of organic carbon and metals, and gives rise to odor causing compounds that complicate water and waste management, and increase production costs. However, very little is known about the geochemistry and microbial ecology of wastewater from gas production in the Marcellus. Results from Murali Mohan and Gregory's research will enable gas producers to improve the economic and environmental sustainability of their activities.

### THE ROLE OF MICROORGANISMS IN WATER MANAGEMENT FOR HYDRAULIC FRACTURING

“We’re trying to put sound science behind emergent technologies for the management of produced water from oil and natural gas extraction.” Dr. Gregory’s work examines the role of microorganisms in biogeochemistry of impoundments for produced water from hydraulic fracturing. This wastewater is commonly stored in open pits where the activity of natural communities of microorganisms change the water’s chemical composition. Bacteria are playing a central role in both the production of malodorous and toxic compounds but also in their degradation.

Dr. Gregory’s work studies, in part, the ecology of these microorganisms; that is, which organisms are there, how many of them are present, and what are they doing. The research reveals that distinct populations of bacteria arise in the impoundments depending on how the water was managed prior to and during impoundment. Produced water that is untreated during impoundment becomes enriched with bacteria that produce malodorous fermentation products and sulfide. However, when the impoundment is aerated during storage, it becomes enriched with microorganisms that degrade organic compounds rather than producing fermentation products and sulfide. His research also reveals that the bacterial communities are affecting the fate of metals and radionuclides in the impoundments. The bacteria alter the redox state of the metals and thereby the solubility of the metals. For example, uranium, which may be present in low concentrations in produced water is precipitated as a solid when the impoundment is not aerated and allowed to become anaerobic. If the impoundment is aerated, the uranium remains soluble. These findings will help the natural gas industry and regulators identify the best management practices for wastewater from hydraulic fracturing.

Through a better understanding of the ecology of the microorganisms in produced water, we can design hydraulic fracturing fluids and engineer processes for natural gas extraction that improve the economics of energy production while minimizing the environmental impacts. “Put science to the task and allow it to trump,” says Dr. Gregory of his research, “Ultimately the answers and solutions will come from science and engineering. It will cut through the hyperbole and get accurate information into the hands of citizens, regulators, and industry.”

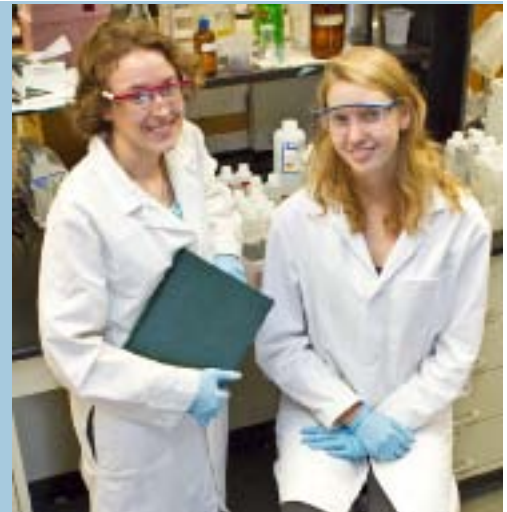


PhD students, **Yuxin Wang** (right) and **Mohan Jiang** (left) are working to evaluate the impacts of Marcellus Shale wastewater in the region and have created a database of information about produced water. The database includes chemicals and their concentrations, such as chloride, bromide, sulfate, dissolved metals and volatile organic compounds, as well as information about chemical impacts in the environment. Wang’s research focuses on how different fossil fuel related wastewaters have different characteristics. Jiang studies methods to understand the treatment technologies and costs associated with the produced waters in order to incorporate this information into a life cycle assessment of shale gas development.

## ENVIRONMENTAL IMPLICATIONS OF SHALE GAS EXTRACTION *continued*

CEE undergraduates **Christina Miller** (class of 2013) and **Stacie Lackler** (class of 2014) joined the Monongahala River sampling team after expressing an interest in hands-on field and laboratory research. They take weekly samples at drinking water plants and monthly samples at tributary locations and analyze them in the laboratory for total dissolved solids (TDS), chloride, sulfate, and bromide. They also measure disinfection by-products in the finished water from the plants. Their work is providing important insights into how water quality changes in the rivers and streams affect the drinking water that is supplied to consumers in Southwestern Pennsylvania. Christina and Stacie are pursuing the minor in Environmental Engineering and Sustainability.

**Christina Miller** (left) and  
**Stacie Lackler** (right)



## CMU PARTNERS FORM CENTER FOR URBAN SCIENCE AND PROGRESS (CUSP)

CMU is partnering with a consortium of research institutions, including New York University, the Polytechnic Institute of New York (NYU-Poly), the University of Toronto, City University of New York, the University of Warwick, the Indian Institute of Technology Bombay, IBM and CISCO, among many others, to create the Center for Urban Science and Progress (CUSP). This new program will be housed in Brooklyn, adjacent to NYU-Poly and led by NYU physicist Steven Koonin.

Thomas Lord Professor and CEE Department Head, **Jim Garrett** and a group of CMU faculty will focus on research and developing new technologies to combat challenges cities are facing with existing infrastructure, energy use, public health and safety and transportation. By using existing cities as research laboratories, CUSP hopes to utilize real-world problems and apply their findings as part of real-world solutions.

Jim Garrett states, “We are very pleased to have been invited to be a partner in CUSP, which we anticipate will provide many new opportunities for research in the urban systems area as well as new sources of support for CMU graduate students. We are also in the process of proposing the creation of a new institute here at CMU related to urban systems that will bring visibility to all of the great urban systems research activity we have going on at CMU and provide a substantial connection point with CUSP.”

For Carnegie Mellon, CUSP is predominantly a research collaboration that will provide a test bed for CMU faculty to develop research for deployment of smart cities technology. Carnegie Mellon brings research strength in smart infrastructure, intelligent transportation systems and public safety to CUSP, among other areas, which involves faculty from many colleges and schools on campus.



Renderings of proposed CUSP building in Brooklyn

# COMMENCEMENT

## CEE COMMENCEMENT AWARDS 2012

**ASCE Outstanding Civil  
Engineering Student Award:**

Timothy Pianka



**H.A. Thomas Sr.  
Scholarship Award:**

Karen Khalaf



**H.A. Thomas Sr.  
Distinguished Service  
Award:**

Jennifer Martinez



**James P. Romualdi  
Civil & Environmental  
Engineering Award:**

Patrick Garrett



**Paul P. Christiano  
Student Distinguished  
Service Award:**

Saurabh Taneja



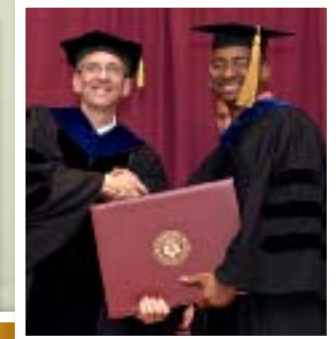
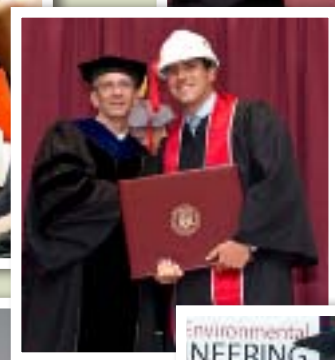
**Outstanding Teaching  
Assistant Award:**

Stacey Louie



**Mao Yisheng Outstanding  
Dissertation Award:**

Yan Xu



## KAUSHIK DAYAL GARNERED THREE 2012 YOUNG INVESTIGATOR AWARDS



**Kaushik Dayal** was awarded the NSF CAREER Award From the National Science Foundation for his project entitled *A Multiscale Strategy for Nano- and Bio- Structures: Deformation, Defects, and Electromechanics* that will "...investigate the use of fundamental structural symmetries for multiscale calculations of structural defects in systems of importance to nanotechnology and life sciences". This award is granted to support junior faculty who exemplify the role of teacher-scholars through outstanding research, excellent education and the integration of education and research.

His second prize was the 2012 AFOSR Young Investigator Prize. His project is entitled *A Multiscale Approach for Complex Functional Materials and Nanostructure*. The Air Force's Young Investigator Research Program supports scientists and engineers at research institutions across the United States who received Ph.D. or equivalent degrees in the last five years and show exceptional ability and promise for conducting basic research.

Dayal was also awarded the Army Research Office Young Investigator Award for his proposal entitled *A Multiscale Atomistic Method for Long-Range Electrical Interactions with Application to Multiphysics Calculations in Functional Materials*. ARO's Young Investigator Program seeks to identify and support academic scientists early in their careers and who show exceptional promise for doing creative research.

## CHRIS HENDRICKSON NAMED UNIVERSITY PROFESSOR



Professor **Chris Hendrickson** has been named University Professor at Carnegie Mellon, the highest academic position university faculty members can achieve. The title is awarded on the basis of national or international recognition for research and other scholarly activities.

Chris joined the CEE faculty in 1978. His research, teaching and consulting are in the general area of engineering planning and management, including design for the environment, system performance, construction project management, finance and computer applications.

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Chris Hendrickson is the Duquesne Light Company University Professor, Co-Director of the Green Design Institute at Carnegie Mellon University, member of the National Academy of Engineering, and Editor-in-Chief of the ASCE Journal of Transportation Engineering. He has co-authored five books and has published numerous articles.

His education includes a Bachelor and Master of Science degrees from Stanford University, a Master of Philosophy degree in economics from Oxford University, and a Ph.D. from the Massachusetts Institute of Technology.

## CHRIS HENDRICKSON APPOINTED TO SERVE ON NATIONAL TRANSPORTATION RESEARCH BOARD

**Chris Hendrickson** has been appointed to the executive committee of the Transportation Research Board (TRB), which provides expert advice on national transportation policy and leadership in transportation innovation.

"This is an opportunity for me to serve as the nation continues to face serious challenges to its aging infrastructure," said Hendrickson. "Improved roads and bridges help boost economic viability and the TRB plays a big part in helping implement new research, technology and innovative policies to encourage needed change."



## TRANSPORTATION RESEARCH CENTER LAUNCHED



CMU and the University of Pennsylvania recently were awarded a USDOT University Transportation Center (UTC) – a joint research center on developing technologies for safe and efficient transportation (TSET). **Allen Biehler**,

CEE adjunct professor, Distinguished Professor at the Heinz College and former Pennsylvania Secretary of Transportation will be the Executive Director of the center with faculty co-directors Raj Rajkumar (ECE) and Dan Lee (Penn).



The UTC is a multi-disciplinary research initiative whose goal is to design, test, deploy and evaluate information and communications technology based solutions to address the problems facing the transportation system of the Pittsburgh region. The Pittsburgh region will serve as a “learning lab,” deploying solutions that can be applied around the nation and the globe.



## GREG LOWRY LECTURES AT KAVLI FRONTIERS OF SCIENCE SYMPOSIA



Recently, Professor **Greg Lowry** was invited to give a lecture as part of the Kavli Frontiers of Science lecture series that is held by the National Academy of Science. His talk, *Forecasting Risk of Exposures to Engineered Nanomaterials*, was one of three lectures given in the series on nanotoxicology.

This prestigious, invitation only, lecture series was also attended by Professor **Jeanne VanBriesen**. The symposia brings together outstanding young faculty across a broad range of disciplines to encourage collaboration and communication among the world’s best and brightest young scientists.

U.S. symposium participants are selected from among recipients of prestigious fellowships, awards, and other honors, as well as from nominations by NAS members and other participants. In addition to learning about research at the frontiers of fields other than their own, the program is intended to create a network of connections that can be maintained as participants advance in their careers.



## JUAN SOBRINO AWARDED EUGENE C. FIGG, JR. MEDAL



CEE Adjunct Professor **Juan Sobrino** was recently awarded the Eugene C. Figg, Jr. Medal for Signature Bridges at the International Bridge Conference (Pittsburgh, June 2012) for his work on *The Triplets*, three extradosed bridges built in La Paz, Bolivia.

This award is given for a single, recent outstanding achievement in bridge engineering that, through vision and innovation, provides an icon to the community for which it was designed.

As part of the Design and Build Joint Venture, a team of engineers at PEDELTA led by Sobrino, developed the conceptual design and final design of the three bridges which are extradosed, i.e., partially cabled supported, with three-span decks and a single central plane of stays to offer a more transparent view. This introduces a new, modern structural type to Latin America.

The bridge construction began in November 2007 and was completed in mid-2010 to coincide with the commemoration of the Bicentennial of Independence. The location of the bridges meant that the Triplets have become part of daily life for more than two million citizens.

## MARIO BERGES COLLABORATES WITH SAMSUNG ELECTRONICS



Samsung Electronics has recently joined the Pennsylvania Smart Infrastructure Incubator (PSII) as a new industry partner. As a part of this partnership, Samsung has funded and is collaborating with Assistant Professor **Mario Berges** to advance its Smart Home efforts. Specifically, this research will be in the area of residential electricity monitoring.

This research endeavor aligns with Samsung’s intention to advance the research in key areas of the Smart Home, which involves becoming smarter about one’s energy consumption, and to increase the creation of commercially viable products.



## CEE FACULTY CO-AUTHOR NEW MAJOR MONOGRAPH

A new monograph, *Embedded Commissioning of Buildings*, on digitally-based evaluation of buildings was recently published by CEE/ICES Professor **Omer Akin** and coauthors **Burcu Akinci** (CEE), **Mario Berges** (CEE), Steven Bushby (NIST), **James Garrett** (CEE),

Daniel Huber (HCI), Sang Hoon Lee (Penn State), and Tanyel Türkaslan-Bülbül (VPI&SU). The book offers in-depth coverage of the most important topics in the field including product models and process models; building information modeling; building codes; sensor networks; just-in-time technologies; and wearable computers.



## PRESIDENT JARED COHON ELECTED TO NAE



Carnegie Mellon President **Jared L. Cohon** was elected to the National Academy of Engineering (NAE), one of the highest professional distinctions granted to an engineer. Cohon was elected for his contributions to environmental systems analysis and national policy and leadership in higher education.

Cohon joins 40 CMU faculty members in the NAE including three active CEE faculty members: Chris Hendrickson, David Dzombak and Jacobo Bielak.

## CEE WELCOMES NEW FACULTY



Tenure track faculty member, **Matteo Pozzi**, is joining CEE for the 2012-2013 academic year. Pozzi received his doctorate in 2007 in structural mechanics from the University of Trento. After spending some time working at Bristol University, he joined UC Berkeley as a post-doctoral researcher working in structural reliability. Pozzi has been a principal investigator for a project relating to bridge network reliability and a technical manager for a research unit for a wireless sensor network for a seismic monitoring project. Both projects were funded by the European Commission.

Pozzi will be joining the CEE Advanced Infrastructure Systems research group where he will continue his smarter infrastructure and urban systems modeling research and collaborate with CEE faculty and students.



**Hae Young Noh** will be joining CEE in January 2013 as an Assistant Professor. Noh received her Ph.D. and M.S. degrees in Civil and Environmental Engineering and the second M.S. degree in Electrical Engineering from Stanford. She studied Mechanical and Aerospace Engineering at Cornell as an undergraduate. Her research interests include knowledge discovery from data using statistical signal processing and massive data mining techniques for smart structures and systems.

Currently, Noh is developing statistical methods that involve analyzing large databases for energy system monitoring, such as diagnosis and forecasting for renewable energy and analysis of power consumption dynamics for energy-efficient and cost-effective design and planning. She is also working on uncertainty propagation and its treatment in seismic risk analysis and introduced new methods for developing seismic vulnerability functions that will be part of the Global Earthquake Model project.



**Semiha Ergan** joined CEE as Assistant Research Professor of Civil and Environmental Engineering. Professor Ergan's research areas include infrastructure information modeling and visualization, virtual construction, IT for construction/engineering and facilities management, BIM, and energy performance visualization for energy efficient retrofits.

Ergan finished her Ph.D. studies at Carnegie Mellon University, Department of Civil and Environmental Engineering in 2008 and received her M.S. and B.S. in Civil Engineering Department from Middle East Technical University (METU) in Turkey.



**Jim Thompson** joined Carnegie Mellon University's Civil & Environmental Engineering Department as a Visiting Associate Teaching Professor in January. Prior to joining CEE, Thompson worked as a structural engineer at GAI Consultants in Pittsburgh where he worked on numerous projects including hazardous site remediation and electrical transmission lines.

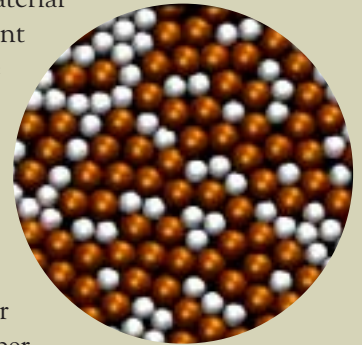
Thompson earned his Ph.D. at Lehigh University and his M.S. at Johns Hopkins University. After receiving his B.S. in Mechanical Engineering at Villanova University, he spent four years in the U. S. Navy's Civil Engineer Corps, serving as the Public Works Officer for the Naval Facility in Adak, Alaska and the Officer-in-Charge of CBU-420 in Mayport, Florida.

## SOFT PARTICLE SUSPENSIONS | *Professor Craig Maloney*



While engineers often take a top-down approach to understanding materials, starting from the large-scale macroscopic material properties, there are others, like, **Craig Maloney**, assistant professor of Civil and Environmental Engineering, who start from the bottom up, trying to predict macroscopic material response from the microscopic makeup of the material.

One class of materials that Professor Maloney studies is soft particle suspensions. The soft particles can either be droplets of one fluid suspended in another – as in an emulsion – or solid particles suspended in fluid – as in an industrial paste or slurry. Soft particle suspensions are used every day in industries ranging from agriculture to construction, yet there is surprisingly little fundamental understanding of their behavior. This lack of fundamental understanding makes designing products with tailored properties – such as the viscosity or yield strength of the suspension – very challenging.



Maloney is studying these suspensions using computer simulations that operate at the level of individual particles. These simulations require specialized computing hardware and can involve several millions of particles at a time. The patterns that emerge in the motion of the particles impact the macroscopic properties – similar in some respects to the complex patterns that arise in turbulence.

One of the most important microscopic parameters governing the macroscopic behavior is the density of particles. At low densities, these suspensions act like simple fluids and flow through a pipe even at very tiny driving pressures. At higher density, the particles start to crowd each other, the viscosity becomes larger and larger, and, finally, the suspension develops all the typical properties of a solid: the flow will stop, and the suspension becomes elastically rigid.

“Imagine that you pack a crate tightly with grapefruits. If you shake the crate, the grapefruits aren’t going to budge. Now, suppose they suddenly turn into oranges. If you keep shaking the box, the oranges are going to fly all over the place” Maloney explains. “By being able to understand and

control this remarkable rigidity transition, similar to melting, we can predict and manipulate the behavior of these industrially important suspensions.”

Professor Maloney was recently awarded a National Science Foundation Career Award that will provide additional funding for his work with these soft particle suspensions. In addition to continuing his research, Maloney will also support additional educational activities by developing undergraduate and graduate level coursework to look at these theoretical models. Lecture modules will relate modern viewpoints to traditional engineering theories creating a “virtual laboratory” using interactive software in lieu of a physical laboratory.

Maloney will also work with the Pittsburgh Supercomputing Center (PSC) to provide outreach for local secondary school instructors. Graphically-based modeling tools will train the teachers to not only use the simulation modules as classroom learning tools but to teach them enough about these simple modeling tools to modify existing simulations and even design their own from scratch. A new program at PSC is currently being developed which will focus on Pittsburgh high schools.

## CEE WINS TWO CIT STAFF AWARDS

- **Ron Ripper** (right) received the CIT Staff Recognition Award, given annually to one staff member in CIT to honor outstanding staff members. Ripper was recognized for his part of the mission of CIT which includes the creation and dissemination of engineering knowledge in a friendly and supportive atmosphere for the benefit and welfare of all people and his role in advancing CIT toward these goals.
- **Jules Krishnamurti** (left) received the CIT Rookie Award, given annually to an outstanding CIT staff member who has been employed by CIT between 6 months and two years. The basis for selection is excellence in the areas of Job Performance, Dedication, Positive Attitude and contributions as a Team Player.



## DR. ELIO D'APPOLONIA GRADUATE FELLOWSHIP FUND ANNOUNCED

CEE is pleased to announce the initiation of the **Dr. Elio D'Appolonia Graduate Fellowship Fund**, started with the generosity of the Devendra (Dev) & Kshama Shukla Foundation. Dr. D'Appolonia has been a treasured friend and mentor to Dev Shukla for many years. Dr. D'Appolonia was celebrated by over 60 colleagues, friends and family members, including several CEE alumni, at a dinner announcing the fellowship in June.

Dr. Elio D'Appolonia, a faculty member in civil engineering from 1948 to 1956, truly helped to define and develop the multidisciplinary, creative problem-solving nature of civil engineering at Carnegie Mellon that remains a hallmark of the program. A structural engineer with classical mechanics training, he found the emerging field of geotechnical engineering an intellectually rich area in need of a combination of mechanics knowledge and creative engineering problem solving.

In 1956, Dr. D'Appolonia left the university to start a consulting practice—first E. D'Appolonia Associates and then E. D'Appolonia Consulting Engineers (EDCE)—and became an internationally renowned consultant in geotechnical engineering. He is widely recognized as one of the leaders who moved the field ahead significantly from the 1950s through the 1970s.



Dev Shukla, Pat Olson, Ann Morris and Dave Troxell (CE 1965, 1967, 1970)



Pictured left to right: Jim Garrett, Tony DiGoia, Elio D'Appolonia, Dave Dzombak

## CEE LOVES THEIR DONORS

The Carnegie Mellon Chi Epsilon chapter sponsored a CEE Love a Donor event in conjunction with the university's Love a Donor Week. Over 40 CEE undergraduate and graduate students gathered to write personalized thank you notes to donors to the CEE department. More than 80 notes were written during the event.





Dr. D'Appolonia was elected to the National Academy of Engineering in 1977 and many of his contributions to this field are still in use today. Employees under his mentorship went on to establish (or take over leadership positions in) many other successful companies in geotechnical and environmental engineering, such as GAI, GEOCON, Soletanche, Environmental Solutions, Inc., TRC, Paul C. Rizzo and Associates, IT/Shaw Environmental & Infrastructure, Inc., D'Appolonia (US and Italy), Montgomery Watson Harza (MWH), and Innovative Technical Solutions, Inc. (ITSI) among others.

In honor of Dr. D'Appolonia's leadership and accomplishments, Carnegie Mellon afforded him its highest honor and conferred upon him an honorary doctorate in 1983.

The fellowship endowment level will currently yield an annual fellowship of \$2,500. Our goal is to increase this endowment to the point where \$40,000 of annual fellowship funds can be awarded. We ask all alumni who want to help recognize Dr. D'Appolonia and help CEE to donate to this endowed fellowship fund. For information how to give to the Dr. Elio D'Appolonia Graduate Fellowship Fund, please contact Trish Bloemker Sowers, Senior Associate Director of CIT Advancement, at (412) 268-3421 or [tsowers@cmu.edu](mailto:tsowers@cmu.edu).

## CEE SERVICE EVENT CELEBRATES NATIONAL ENGINEERS WEEK

CEE graduate and undergraduate students celebrated the start of National Engineers Week at the Carnegie Science Center this spring by participating in a special event to help inspire young people to explore engineering. Student volunteers, organized by the CEE ASCE chapter, staffed a table where kids designed bridges using a piece of paper that they could manipulate in any way and use up to 5 paperclips to reinforce it. Once the bridge was completed, the children would drop pennies to test the strength of their design.

CEE was one of over 50 participating organizations in the Carnegie Science Center program, Engineer the Future, a

## FAREWELL TO TWO LONG TIME CEE STAFF MEMBERS

CEE recently bid farewell to two long time dedicated staff members, **Patty Langer** and **Karen Musati**



**Karen Musati**

Karen Musati retired on June 15 after 23 years of service to the department. Karen plans to spend more time traveling, enjoying spending time at home, and volunteering at her church and local nursing home.



**Patty Langer**

Patty Langer left CMU on August 2 after 17 years of service. Patty is planning to spend more time caring for her newborn grandson, Dylan Christopher, who was born in May of this year.

The department wishes to thank both of them for their years of service to the CEE community. They will be missed and we wish them the best in their future endeavors.



▲ **Undergraduate Aileen Craig and graduate student Peter Simon stand ready to get kids excited about civil engineering.**



▲ **Craig helps a budding civil engineer test her bridge.**

celebration of the science of engineering and the region's achievements and advances in architecture, building, and construction. The event was geared toward students in grades 3–12 and hosted more than 1,110 students from the Pittsburgh region.

## FOUR CEE STUDENTS AWARDED FELLOWSHIPS

Four CEE PhD students have recently been awarded prestigious and competitive fellowships:

**Lun Yang** was selected to receive a Liang Ji-Dian Fellowship of \$10,000 in tuition endowed by alumnus Liang Ji-Dian to recognize doctoral students of Chinese heritage. Lun was advised by Kaushik Dayal.

**Mohan Jiang, Brian Reinsch** and **Saurabh Taneja** have been selected to receive a Bertucci Graduate Fellowship of \$10,000 in tuition, which was created through the generosity of John and Claire Bertucci to provide merit scholarships to doctoral students in Engineering. Mohan is co-advised by Chris Hendrickson and Jeanne VanBriesen, Brian Reinsch is advised by Greg Lowry, and Saurabh is co-advised by Burcu Akinci and Jim Garrett.



Lun Yang



Mohan Jiang



Brian Reinsch



Saurabh Taneja

### CEE STUDENT AWARDED 2012 CARNEGIE MELLON WOMEN'S ASSOCIATION SCHOLARSHIP



CEE senior **Jennifer Martinez** was a recipient of a 2012 Carnegie Mellon Women's Association (CMWA) Scholarship. As the president of Chi Epsilon, the Civil Engineering honor society, Jennifer has devoted

herself to revitalizing the Carnegie Mellon chapter by creating a new system for transitioning between sets of officers. She has participated in a service trip to Panama associated with Students in Free Enterprise (SIFE) for all four of her undergraduate years, and was a group leader this year. Jennifer will be continuing her studies in the CEE graduate program this fall.



Grad Appreciation Fun Fest

### UNDERGRADUATE AWARDED RUNNER-UP PRIZE AT 2012 MEETING OF THE MINDS COMPETITION



**Sophie Grodsinsky** (CEE/EPP '13) placed runner up in the Undergraduate Environmental Research Award category at the 2012 Meeting of the Minds competition at CMU. The competition is

an annual undergraduate research symposium celebrating university-wide research across all disciplines.



2012 CEE Night with the Pirates



## JACQUELINE GUEVEL EARNS ALL-AMERICAN DISTINCTION



CEE sophomore **Jacqueline Guevel** earned All-American distinction with a fourth-place finish in the 60-meter hurdles at the 2012 NCAA Division III Indoor Track and Field Championships in March at Grinnell College in Waverly, Iowa.

Guevel crossed the finish line in a school-record time of 8.76 seconds. Guevel, earned All-American honors in the indoor 55-meter hurdles and the outdoor 100- and 400-meter hurdles last season.



## RACHEL HOESLY'S ARTICLE IN ES&T ALSO HIGHLIGHTED IN CHEMICAL & ENGINEERING NEWS



CEE graduate student, **Rachel Hoesly**, recently published her research findings in Environmental Science & Technology (ES&T) Journal and has been featured in Chemical & Engineering News. Hoesly, along with researchers in the Green

Design group, used Allegheny County as a case study to look at how changes in population and heavy industry have affected the CO<sub>2</sub> emissions in the country.



2012 Undergraduate Senior Dinner

## CHI EPSILON INDUCTS 17 NEW MEMBERS

The Chi Epsilon Carnegie Mellon Chapter inducted 17 new members this spring: CEE undergraduate students **Nicola Carey, Valerie Chang, John Duhring, Elissa Goldner, Siyun Luo, Alexander McHugh, Jolita Mo, Steven Nguyen, Jessica Rinn, Madeleine Stearns, Sarah Zakrajsek, Amy Zhang**; CEE graduate students **Mahbuboor Choudhury** and **Tess Doeffinger**; CEE December 2011 graduates **Heather Buck** and **Xiao Ma**; and CEE faculty member Dr. **James Thompson**.

Chi Epsilon is the National Civil Engineering honor society in the United States. The organization honors engineering students who have exemplified the principles of "Scholarship, Character, Practicality, and Sociability" in the civil engineering profession.



## CEE UNDERGRADUATES PARTICIPATE IN ASCE STEEL BRIDGE COMPETITION

CEE Undergraduate students competed for the second consecutive year in the ASCE Ohio Valley Student Conference which was held at the University of Pittsburgh. The team was one of four groups to pass all load tests. Of the 11 competing universities, the CMU team placed fourth in stiffness and fourth in efficiency. In addition to the Steel Bridge event, the students also competed in the Technical Writing, Balsa Wood Bridge and Concrete Horse-shoe competitions. The CEE ASCE team was sponsored by DiGioia Gray & Associates, LLC.



community  
EVENTS

## UNDERGRADUATE SERVICE TRIP - SAN PEDRO, PHILIPPINES

In May 2012, Civil & Environmental Engineering students traveled with Mechanical Engineering students to San Pedro, Philippines to help in a developing country and to gain experience seeing, first hand, the practical application of civil engineering. The students, led by Mechanical Engineering Professor **Robert Reid** (CE '00), helped repair flood damaged squatter homes and prepare them for the upcoming rainy season. A new drainage system for sewage around a local church was also designed and built.

When the group was not working on projects, they executed outreach programs for the children who lived in the squatter settlement. The CMU students explained what it means to be an engineer and spoke of the future of engineering.

The children then constructed and tested bridges made of spaghetti and glue to demonstrate the basic principles of engineering.



Pictured left to right: **Gianfranco Colombi** (MechE '15), **Crismely Pena** (CEE '14), **Christopher Ejiolor** (CEE '14), **Esther Urena** (CEE '14)

### RECENT PHD THESIS

- **Asli Akcamete** - 'A Formal Approach for Managing Facility Change Information and Capturing Change History as part of Building Information Models (BIMs)'  
ADVISORS: Akinci and Garrett
- **Amit Das** - 'Modeling of Meso-scale Plastic Response of Thin Films, Inclusion Size Effects and Dislocation Wall Dynamics'  
ADVISOR: Ancharya
- **Craig Griffith** - 'Physical Characteristics of Caprock Formations used for Geological Storage of Carbon Dioxide and the Impact of Uncertainty in Fracture Properties on Carbon Dioxide Transport through Fractures Caprocks'  
ADVISORS: Dzombak, Lowry and Small
- **Zhiqiang Li** - 'Mechanistic Insight into the Effect of Polymer and NOM Coatings on Adhesion and Interactions between Nonoparticles and Bacteria'  
ADVISORS: Gregory and Lowry
- **Rachael Nealer** - 'Sustainable Transportation and Decision-Making: Case Studies of Transportation Decisions to reduce Environmental Impacts'  
ADVISORS: Hendrickson and Matthews
- **Sharad Oberoi** - 'Towards a Framework to Support Engineering Design Student Projects'  
ADVISOR: Finger
- **Juan Peng** - 'Geochemical Conditions and Design Considerations Affecting Electrode-induced Removal of U (VI) and Tc (VII) from Acidic Groundwater'  
ADVISOR: Gregory
- **Brian Reinsch** - 'Chemical Transformations of Zero-valent Iron and Silver Nanomaterials in Natural and Model Environmental Media'.  
ADVISOR: Lowry
- **Yan Xu** - 'Microbial-catalyzed Reductive Dechlorination of Polychlorinated Biphenyl (PCBs) in Hudson and Grasse River Sediment-Shifts of Microorganism, PCB Tracker Pairs and Geochemical Properties'  
ADVISOR: VanBriesen
- **Lun Yang** - 'Real Space Phase Field Simulations of Ferroelectric Materials'  
ADVISOR: Dayal
- **Mudasar Zahoor** - 'Non-Local Damage Modeling of Rocks Under the Conditions of High Pressure and High Temperature (HPHT)'  
ADVISOR: Acharya



# PIRATES AND THE CAROB BEANS

Students in the Fall 2011 course 12-401 Civil & Environmental Engineering Design channeled their inner buccaneers to complete the course's final project, Pirates and the Carob Beans. They became the ship engineers for the Black Pearl, tasked with making a plank so that Captain Barbossa (TA **Nick Azzolina**) could send Jack Sparrow (Professor **Larry Cartwright**), Elizabeth Swann (TA **Amy Nagengast**) and Will Turner (TA **Te Gao**) to their watery graves for stealing the Captain's treasure chest of carob beans.

Working in teams, students had to use only materials that would be found in the ship's stores, such as small pieces of wood, dowel rods and rope, and only hand tools were allowed. The reaction end of the plank was required to be 3' long, up to 2' wide, and up to 2' high. In addition, the top and bottom surfaces had to be planar. Loose spacers were permitted. Points were given for the distance that Jack, or Will and Elizabeth together, could reach on the plank and have it successfully support their weight.



## ALUMNUS RECOGNIZED BY WHITE HOUSE AS A CHAMPION OF CHANGE



Alumnus **Wayne Balta** (CE '82) was recently honored by the White House as a Champion of Change for his efforts to advance corporate environmental sustainability. Balta was one of eight individuals who demonstrate corporate environmental leadership makes sense, both for businesses and American communities.

The Champions of Change program was created as a part of President Obama's Winning the Future initiative. Each week, a different sector is highlighted and groups of Champions, ranging from educators to entrepreneurs to community leaders, are recognized for the work they are doing to serve and strengthen their communities.

Wayne Balta is the Vice President of Corporate Environmental Affairs and Product Safety at IBM Corporation where he has global responsibility for environmental affairs, energy efficiency, chemical management and toxicology, as well as product safety and related hardware compliance functions.



## ALUMNUS AWARDED ASCE NATIONAL'S COLUMBIA MEDAL



CEE Alumnus and Robotics Institute University Professor **William "Red" Whittaker** (CE '75, CE '79) was recently awarded the ASCE Columbia Medal at the ASCE Earth and Space Conference in Pasadena California. Whittaker was recognized for his sustained outstanding contributions to the advancement of aerospace engineering. While having developed over 60 field use robots since the mid-1980s, his current focus is Astrobotic Technology, a CMU spinoff firm that is developing space robotics technology to support planetary missions and organizing a commercial venture to land a robot on the moon in 2015.



## CEE ALUMNUS AND FACULTY TO RECEIVE 2012 ALUMNI ACHIEVEMENT AWARDS



We are pleased to announce that CEE alumnus **Paul C. Rizzo** (CE '63, '64, '66) and faculty member, **Scott Matthews** (EE '92, TPR '96, '99) will each receive a 2012 CMU Alumni Achievement Award during Ceilidh Weekend this fall.

The Alumni Association presents the Alumni Achievement Award (formerly the Alumni Merit Award) for accomplishment in the nominee's profession and are intended to recognize both accomplishment and leadership in the field which brings honor to Carnegie Mellon University.



## CEE ALUMNUS MAJ. GEN. TALLEY TO LEAD U.S. ARMY RESERVE COMMAND AT FORT BRAGG

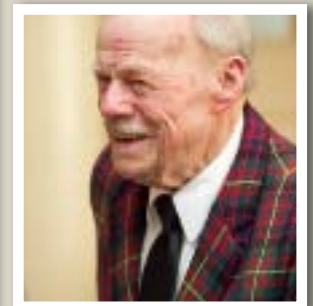


CEE Alumni, Major General **Jeffrey W. Talley** (CEE – PhD '00), was nominated by President Obama and confirmed by the Senate to be commanding general of the U.S. Army Reserve Command at Fort Bragg. The nomination includes promotion to three-star general and a dual assignment as chief of the Army Reserve in Washington, D.C.

Maj. Gen. Talley completed his Ph.D. with Professor Richard Luthy in 2000. In his civilian career, Talley is president of Environmental Technology Solutions (ETS Partners) in Phoenix and an adjunct professor at Johns Hopkins University.

# 1940S & 1950S Decades Dinner

Civil Engineering alumni from the classes of the 1940s and 1950s reminisced about their Carnegie Tech days at a reunion dinner held during Spring Carnival. An alumni reunion committee, chaired by **Tony DiGioia** (CE 1956, 1957, 1960), planned the memorable evening. Committee members included **Florian Bechtold** (CE 1958, 1962), **Dick Gray** (CE 1956), **Fred Graham** (CE 1958) and **Bob Pease** (CE 1949).



## CEE ALUMNI, JOE PAJER, NAMED CEO OF THINKLOGICAL



**Joe Pajer** (CE/EPP '83) was recently named CEO of Thinklogical, a leading provider of fiber optic video switching and KVM systems. He has an M.S. degree in management and a B.S. degree in civil engineering/

engineering and public policy from Carnegie Mellon University. Mr. Pajer brings over 20 years experience of senior executive experience from leadership positions with Marconi, FORE Systems, Compaq Computer Corporation, AT&T and Vocollect.

“I am excited to be named CEO of Thinklogical,” said Mr. Pajer. “Thinklogical is an innovative company that develops new products that excite our customers. The company’s engineering talent, combined with its incredible customer support, assures its continued success in creating significant value for our customers.”

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## Retiring Employee Roy Beebe

The CEE Department planted a Chinese dogwood tree to thank retiring CMU employee Roy Beebe for his 34 years of service as a gardener with Facilities Management Services. The university honored him with an inscribed brick along the pathway outside of Baker Hall.



**Pictured from L to R: Dan Coffelt, Jim Garrett, Donna Marano, Dave Dzombak, Roy Beebe and Keith DeVaughn**



**Roy Beebe and University President Jared Cohon**

## CEE Alumni Awards Brunch:

**Sunday, October 7, 10am - 1pm,  
Pittsburgh Athletic Association.**

Contact **Andrea Francioni Rooney**  
(francioni@cmu.edu) for details.

## CEE Newsletter

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