

Infrastructure

Department of Civil and Environmental Engineering

SPRING 2008



CEE Led Doctoral Training Program Addresses Areas of Critical National Need

CEE graduate student Julia Reis (Charlottesville, VA) is headed to Ethiopia this summer. She plans to continue her graduate research, which will focus on malaria reduction around a large multi-purpose reservoir there. Reis states that most of the 1.1 million people who die from malaria each year are in Sub-Saharan Africa. While there, she hopes to emulate the success of the Tennessee Valley Authority's management practices, which eradicated malaria in the southern United States.

Reis is one of five graduate students in the Department of Civil and Environmental Engineering who have been participating as fellows in a program called Graduate Assistance in Areas of National Need (GAANN). Begun in 2003, UVA's GAANN program in water resources and contaminant hydrogeology was developed and proposed by the faculty in the Program for Research in

Contaminant Hydrogeology (PIRCH), which has been facilitating interaction between the School of Engineering and Applied Science and the Department of Environmental Science. This GAANN graduate traineeship is directed by CEE associate professor Teresa Culver. The program is supported financially by the U.S. Department of Education and the University of Virginia.

The generous stipend support, as well as funds that fellows can use at their discretion toward their research and professional development, facilitate excellent research opportunities. As described by Professor Culver, "The fellows have had greater freedom to define important projects that really excite them, and the program's flexibility has allowed us to recruit exceptional students. Some students have used fellowship funds to travel to field sites and collaborate with researchers all over the world, including Ethiopia, Germany, Guatemala and Indonesia. Others have purchased equipment and supplies to study sensitive ecosystems, such as coastal wetlands and streams. One can see that the knowledge base that they are helping to build is moving us toward a more sustainable society."

Justin Henriques, a graduate student in the Department of Systems and Information Engineering, conducted a case study in Cimahi, Indonesia, where he worked with community leaders and government officials to assist in the assessment and planning of drinking water supply and grey water reuse for several communities within Cimahi. His research is focused on contributing to the development of Capacity Factor Analysis (CFA), a decision support system for selection of appropriate technologies for municipal sanitation services in developing communities. Once completed the model will allow developing communities to select drinking water supply and grey water

reuse systems that are safe, affordable, able to be built and managed by the community using local resources, and are amenable to expansion as the community's management capacity increases. Justin has been accepted to receive the Graduate Research Fellowship (GRF) from the National Science Foundation (NSF). "This is fantastic news as it will enable me to continue research in basic needs infrastructure in developing communities."



Justin Henriques (bottom, third from left), UVA GAANN Fellow, with members of community water supply group in Leuwigajab, Cimahi, Indonesia



Young boy in Leuwigajab, Cimahi, Indonesia helps mix cement for community water supply building

The intent of the GAANN program is to increase the number of students prepared to seek academic positions in contaminant hydrogeology and water resources and to train a new generation of interdisciplinary scientists and engineers. One of the previous fellows is already applying these skills as an assistant professor. Current fellows include 12 graduate students between 3 departments in the university: five in CEE, one in Systems and Information Engineering, and six in Environmental Sciences. By focusing on increasingly threatened water resources, the GAANN fellows will be prepared for careers that will make a difference for the nation and the world.

Letter from the Chair

Greetings CE Alumni and Friends! It has been an eventful year for the CEE department, beginning with the name change last summer. Our three new assistant professors in the environmental and water resources area have immediately impacted our program by infusing new areas into the teaching and research agenda. Their research activities include carbon-neutral manufacturing processes, carbon sequestration technologies and algal-based biofuel research with Andres Clarens; environmental biotechnology with Lisa Colosi; and fluvial geomorphology operation in a watershed associated with dam operation and removal, land use within a watershed, and river restoration with Joanna Curran. The new faculty also makes it possible for the department to offer two common graduate courses that all incoming students are required to take. Forefronts of Civil Engineering (with Teresa Culver, Brian Smith, and Tom Baber) introduces the major challenges facing civil engineers in the planning, design, construction, operation, and maintenance of the natural and physical infrastructure, with varying topics that include sustainability, sensor technology, as well as infrastructure security and design for natural disasters. The second semester course, Computational Methods in Civil Engineering (with Winston Lung), introduces students to fundamental numerical methods common to different areas of civil engineering in a computationally-oriented environment, based on MATLAB. In addition to providing our students with common quantitative skills and a sound academic philosophy for engaging contemporary problems facing CEs, this course provides an opportunity for our graduate students from different sub-disciplines to get to know each other and will, consequently, promote more research collaboration and creativity.

Our undergraduate enrollment continues to grow and our students are increasingly involved in a more diverse range of activities. Just to name a few of their pursuits: traveling to assist underdeveloped countries; participating in the EcoMOD project between the engineering and architecture schools; organizing a networking night for interviewing with companies seeking our graduates; participating in the ASCE Virginia's Conference (see the related article); and performing other outreach and service activities. The 2004-08 CE major declarations statistics are as follows: 53 ('04), 41 ('05), 49 ('06), 58 ('07) and 60 ('08) which are expected to rise for this new Class of 2011. The 41 declarations in 2005 finished with 52 graduates in the Class of 2008 with a BSCE.

The Center for Transportation Studies recently hosted the first Mid-Atlantic Universities Transportation Center (MAUTC)/DOT meeting. The exchange between the MAUTC Universities and the state departments of transportation (DOTs) was invaluable in helping the five programs (at PSU, U.Va., MD, WVU and VaTech) and states (VA, PA, MD, and WV) move toward conducting collaborative regional research, education, and technology transfer activities. SEAS Dean Jim Aylor addressed the group and attended part of the meeting, as did Gary Allen, the VDOT Chief of Technology, Research and Innovation. The Center's distinguished lecture series hosted Professor Michael Meyer from the Georgia Institute of Technology in the fall and Commissioner David Ekern of the Virginia Department of Transportation in the spring. Tim White (BSCE 1991, MSCE 1995) was elected chair of the CEE Advisory Board effective spring 2008, as Heather Wishart

stepped down as chair before the December birth of her twins, Clara and Nicholas. Tim is the Vice President of T3 Design, PC, and resides in Richmond, Virginia. If you are interested in joining the Advisory Board, please contact me.

For its part in the Capital Campaign, the CEE Department has identified the following priorities for funding to support our departments continued success:



Mike Demetsky

- I. Endow and Name the Department
- II. Endow and Name Cutting-Edge Research Labs
 - a) *The Virginia Environmentally Sustainable Technology Laboratory (VEST lab)*
 - b) *The Laboratory for Environmental Enzyme Catalysis*
 - c) *Infrastructure/Materials Laboratory*
- III. Endowment for Excellence in Civil and Environmental Engineering
 - The Furman Barton Endowment (currently over \$200,000)*
- IV. Endowed Graduate Research Fellowships
 - The Faulconer Graduate Fellowship (recently endowed at \$100,000)*
- V. Corporate Sponsors Fund for Professional Excellence
 - a) *Clark Construction Group: Construction Management Course*
 - b) *Virginia Ready Mixed Concrete: Concrete Construction Course*
 - c) *Clark Construction Engineering Business Scholarship for CE*
 - d) *Corporate awards and undergraduate scholarships*
 - e) *Capstone course (Balfour Beatty Construction)*

These corporate designations are examples of the external support that the department now receives but seeks to increase. We ask our alumni and friends to designate donations to the University for the CEE Department or the Furman Barton Fund.

The articles in this newsletter highlight some of the recent contributions and activities of our faculty and students. For more information about the department visit our website <http://www.cee.virginia.edu/>. We encourage all alumni and current students to register at HoosOnline.virginia.edu, that only Hoos can access, for convenient email forwarding. This will assist the department also as we move to adding electronic newsletters.

I hope all of you have a great summer and please visit the department when in Charlottesville.

Mike Demetsky
Chair, Department of Civil and Environmental Engineering
mjd@virginia.edu

Construction Course Prepares Students for Industry

The University of Virginia's web site for the South Lawn Project describes it as "the most ambitious undertaking on the University of Virginia's Central Grounds in a century". The projected \$105 Million dollar complex of buildings and grounds will extend Thomas Jefferson's original Lawn across Jefferson Park Avenue. It is expected to receive LEED (Leadership in Energy and Environmental Design) certification for achieving high standards of energy efficiency, sustainability in site planning, water protection, conservation of materials and resources, and indoor environmental quality.

On April 14, 2008 students in the CE 441 Construction Engineering course were given a tour of the construction site by Faulconer Construction, the company responsible for site development on the project. Faulconer, along with other construction firms, have been key partners with the department in offering the class, providing guest lectures and tour opportunities. CE 441 provides students with an introduction to the challenges associated with large-scale civil construction. During the course, students hear directly from leaders in the construction industry, who provide first-hand examples of professional issues in a series of 7 guest lectures. In addition to Faulconer, the Virginia Department of Transportation (VDOT)



CE 441 students at the Woodrow Wilson Bridge construction site

and Clark Construction also provide lecturers, many of whom are CEE alumni, as well site tour support.

In addition to site tours and guest lectures, students must meet the demands of the classroom. Through reading, project assignments, tests, and lectures, students learn construction management concepts and skills, such as scheduling and estimating. They are also exposed to current construction issues via trade periodicals, such as ENR. According to associate professor Brian Smith, who teaches the class, many

students in civil engineering enter the construction industry. "The department is actively working to prepare students to enter the construction industry, and this class offers a foundation through fostering awareness, skills, and knowledge."

On February 11, 2008, the students got a first-hand account of the details of a major North American engineering project, Alaska Gas Pipeline, from the project's planning manager of BP Exploration, Inc. The proposed pipeline will transport natural gas from northern Alaska to Chicago. The 3,000 mile facility is expected to cost \$35 Billion and will require 10 years to construct. Mr. John L. Horstkoetter spoke to the class, discussing the challenges of this project - ranging from scheduling, sequencing, technology, and policy issues.

The value of CE 441 to students anticipating a career in construction engineering is reflected in their comments: "One of the most useful classes I have taken so far. It is refreshing to have some 'real life' lessons on scheduling and estimating since a lot of us will have to do this upon graduation." And: "I liked how you made the class very real world applicable by bringing in speakers and having us do assignments not directly out of the book. I feel like it really helped me get an understanding of what really goes on in the engineering profession."



CE 441 students tour the South Lawn construction site

CEE Student Awards

Civil engineering students continue to distinguish themselves in scholarship, research, and applied knowledge as they pursue study in a variety of fields that impact our environment and civil infrastructure.

Lauren Doucette

Lauren Doucette (CE '08, Virginia Beach, VA) is one of the finalists selected to present at this year's Undergraduate Research and Design Symposium. Her topic: Energy Analysis of Local Food-shed Infrastructure: Sustainability of the Charlottesville City Market. Lauren's research was recently featured in UVA Today at:

www.virginia.edu/uvatoday/newsRelease.php?id=4402

and news online at:

www.seas.virginia.edu/enews/enews_apr08/farmer.php



Lauren Doucette

Ben Foster

Ben Foster (CE'10, Wilmington, NC) has received an ARCS scholarship. Achievement Rewards for College Scientists (ARCS) Foundation is a national women's organization that provides scholarships to academically outstanding students. Founded in 1958, the ARCS Foundation focuses its efforts on supporting students in the sciences, medicine, and engineering with the goal of "contributing to the worldwide advancement of science and technology."

Ben studies as a Rodman Scholar, the honors engineering



Ben Foster

program in the School of Engineering and Applied Science. He is currently pursuing a degree in civil engineering and a minor in engineering business. Ben is interested in both the technical and business side of the engineering profession. Technically he is seeking to gear his experience and education toward green construction and design.

As for the business side he is especially interested in the intersection of engineering and poverty, specifically how engineering solutions - if owned by the specific community - can bring hope

to many and act as an agent of peace and justice.

Amy Hearon

CEE master's student Amy Hearon (Albuquerque, NM) was recently featured in a Virginia Transportation Research Council (VTRC) news release (see web address below). The release focuses on Hearon's pavements research and her recent appointment to a Transportation Research Board (TRB) committee, which focuses on pavement construction and rehabilitation. The release can be found at:

vtrc.virginia.gov/BriefDetails.aspx?Id=32

Pat Mandeville

Pat Mandeville (CE '09, Lorton, VA) will receive the Clark Construction Business Minor Scholarship award this year. The scholarship was founded in 2006 by Clark Construction Group LLC. Led by SEAS alumni Daniel T. Montgomery (CE '73), president, and William Talbert (CE '70), executive vice president, Clark Construction was instrumental in establishing the 18-credit minor in 2005. It is designed to encourage civil engineering students to participate in the engineering business minor and is offered jointly by the U.Va. Engineering School and the McIntire School of Commerce.



Pat Mandeville is flanked by Benjamin S. Eitan and Mr. William L. Talbert, Mid-Atlantic Region President of The Clark Construction Group, Inc. on a recent visit to the Clark headquarters in Bethesda, MD

Nick Mazzenga

Graduate student Nick Mazzenga (Dumfries, VA) has been accepted for the prestigious Eno Fellowship. He was selected by the Board of Regents of the Eno Transportation Foundation to participate in the 16th annual Eno Leadership Development Conference in Washington, DC, May 19-22, 2008.



Nick Mazzenga

The purpose of the conference is to build professional development and leadership qualities among the most promising graduate students considering careers in transportation. It is a demanding and immersive experience that offers fellows the opportunity to meet top policymakers and transportation leaders, learn how advocates influence policy positions and become familiar with the development and implementation of transportation public policy. Nick's participation will be underwritten by the foundation and some of its sponsors, including the University of Virginia.

Brian Pailles

Brian Pailles (Charlottesville, VA) is the 2007-2008 Graduate Assistant Teaching Award recipient in Civil and Environmental Engineering. Under the auspices of the Teaching Resource Center, winners of approximately thirty GTA awards of \$250 are chosen annually through departments.

Charles A. Shackelford

Charles A. Shackelford (CE '09, Keswick, VA) is the recipient of "The Clark Construction Group, Inc. Scholarship" for 2008-2009. Charles is a 3rd year CEE student, pursuing the engineering business minor.

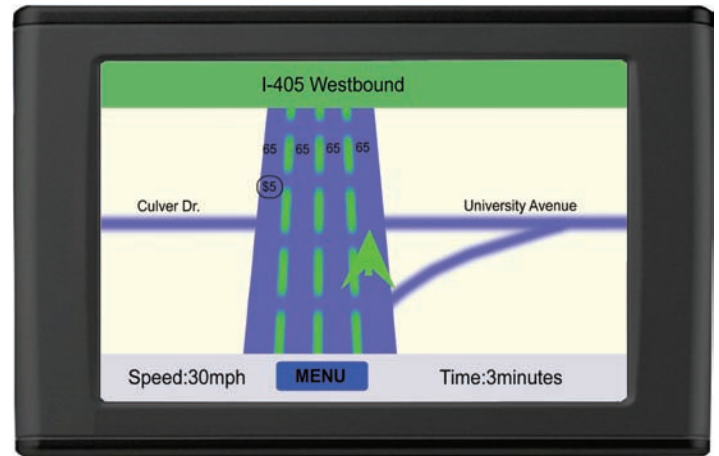
Lab at Forefront of Leveraging Information Technology to Improve Transportation Infrastructure

Imagine the scenario in which your automobile goes into a skid on icy pavement, activating the traction control system. Imagine further that software in your automobile's computer automatically generates a message and sends it wirelessly and simultaneously to both communication infrastructure on the roadside and onboard alarm systems in automobiles upstream, alerting them to the dangerous road conditions. Also the information is rapidly relayed from the roadside unit to regional traffic management operators and to traveler information systems. While such a scenario may seem far-fetched, researchers across the nation are currently striving to make such functionality commonplace.

It has long been hypothesized that many transportation operations objectives can best be achieved through development and application of sophisticated information technology. The vehicle-infrastructure integration (VII) initiative seeks to develop and enable a communications infrastructure that supports vehicle-to-infrastructure, as well as vehicle-to-vehicle communications. While the vehicle component and infrastructure component of the transportation system have traditionally been only loosely coupled (through static signing, vehicle

presence detectors, etc.), VII will allow the components to "work" actively together. Prototypes to test the evolving technology are very expensive to establish and must necessarily be limited in scope. But for this emerging technology to have value to transportation agencies, such as Virginia Department of Transportation (VDOT), they must have knowledge of how it can be deployed to greatest advantage over an entire region or transportation system.

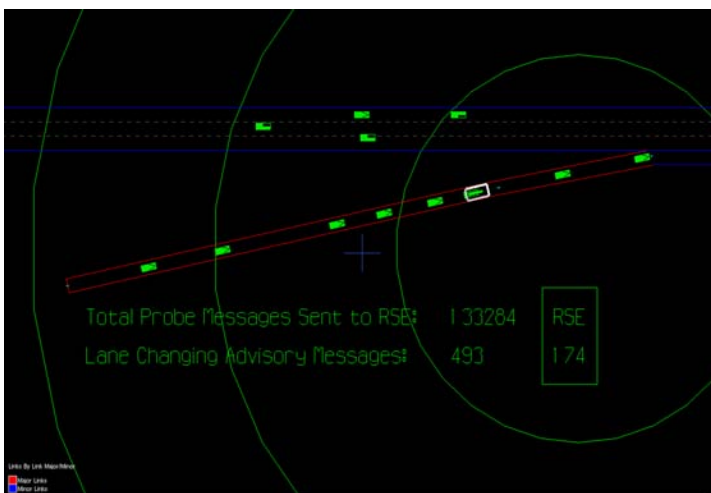
The Smart Travel Laboratory (STL), in the CEE Department's Center for Transportation Studies (CTS), is in the forefront of research to provide answers to how this enhanced wireless technology can be deployed to improve safety, decrease travel time, and manage congestion over an entire transportation system. With funding from the National Science Foundation (NSF) and VDOT, the STL has developed a simulated environment that emulates the deployment of VII operations over an entire region. According to associate professor and STL UVA director, Brian Smith, this is the largest, most comprehensive VII simulation in the country.



Speed and toll information in GPS display

The California Department of Transportation (Caltrans) has asked the STL to use the model to help them understand how VII can be deployed to help them with ramp metering operations to ease congestion. Ramp metering involves the use of traffic signals on expressway access ramps to control merging traffic and reduce "bottlenecks". In addition to determining the best algorithms and roadside placement for signal timing at intersections, the STL VII simulation model can help VDOT decide when and how to deploy the emerging technology for traffic monitoring and management, safety measures, and traveler information. These simulations can also guide the development of the VII technology itself and inform decisions about future prototype development.

The Smart Travel Lab's use of information technology to allow better performance of civil transportation infrastructure exemplifies a robust research agenda that supports the infrastructure research focus of the Department of Civil and Environmental Engineering.



Frame from animation of VII communication functionality

Students Excel at ASCE Virginia's Conference

by Joanna Curran

CEE students enjoyed great success at the 2008 ASCE Virginia's Conference held in Summerville, WV in April. Bailey Fillmore (CE '08, Linden, VA) was the unanimous choice of the judges for the best paper award in the Marr Technical paper competition. James Calabrese (CE '09, Burke, VA) took third place in the Hardy Cross Competition, which is an oral presentation on a topic of the student's choice. U.Va. also took first place in concrete Frisbee, second in Problem solving, third in engineering jeopardy, and first in can-do structure. The can structure was built entirely by 2nd year students - they created a suspension bridge from canned goods!

U.Va. also won the spirit competition, and the Good Old Song was sung a minimum of 6 times throughout the conference. A number of races, presentations, and competitions are included within the Concrete Canoe category. Our canoe, Badmixture, placed second overall missing out on first place by only 0.2 points.

The drama of the competition occurred when the VMI boat t-boned Badmixture, breaking the U.Va. canoe in half. But Virginia Tech, VMI, and West Virginia University helped us repair it, using duct tape and Styrofoam, which allowed us complete the competition, albeit with continuous bailing.

In another note of interest, we had by far the most women at the conference. U.Va. had women in all of the competitions, including our entire Jeopardy team and the majority of our concrete canoe team. This reflects the strong representation of women in the Civil and Environmental Engineering Department.

Assistant professor Joanna Curran is the faculty advisor for the U.Va. ASCE, student chapter.



4th year student Matt Miller wields the concrete Frisbee

Please contact us to find out more about our new initiatives in research and education.

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