

blueprint

SPRING 2013

ULTRA-DEEPWATER WELL MONITORING

CEE'S CUMARASWAMY
VIPULANANDAN RECEIVES
\$2.5M GRANT

- CEE WINS GAANN GRANT
- RODRIGUES WINS \$1M GRANT TO DEVELOP WATER MONITORING SYSTEM

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blueprint

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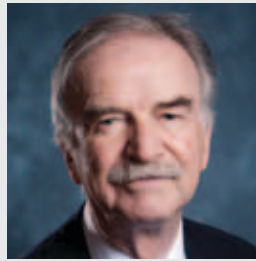
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UNIVERSITY of HOUSTON
CULLEN COLLEGE of ENGINEERING

Chair's Message



Kaspar Willam

Interim Chair, Dept. of Civil and Environmental Engineering

Dear CEE Alumni and Friends,

Welcome to our Spring 2013 blueprint newsletter of the UH Department of Civil and Environmental Engineering. There is much news since the last Blueprint issue appeared in Spring 2012, the main news being the sudden resignation of Professor Abdeldjelil "DJ" Belarbi from chairing our department. Our department experienced significant growth of faculty and students during his tenure. The good news is that our graduate student population has grown from 70 to 89 M.S. and 30 to 80 Ph.D. students from enrollment in fall 2011 to fall 2012, while the undergraduate population slightly decreased from 428 to 383 students in the same period of time due to higher graduation standards of our undergraduate program.

In short, our department has seen unprecedented growth of our graduate program under the leadership of DJ, both of the student body and partly also of the faculty with the addition of three junior faculty members in the infrastructure area: assistant professors Bora Gencturk, Mo Li, and Kalyana Nakshatrala, and two faculty in the geosensing area, assistant professors Craig Glennie and Hyongki Lee. Consequently, the department has seen an upswing of research awards and research expenditures that resulted in a commensurate increase of scholarly output.

What remains to be accomplished is to consolidate the momentum, expand our laboratory infrastructure, and to move forward with a national search for chairman/chairwoman, who will lead our department to new heights of excellence.

On another note, I would like to take the opportunity to thank Osman Ghazzali for his many contributions to the department and his commitment beyond the call of duty. Osman served the department for over 45 years, and according to his wife, he taught, for the last time, Geotechnical Engineering, CIVE 3339, in spring 2012 to 28 students. We wish him well to enjoy his well-deserved retirement as Professor Emeritus of Civil and Environmental Engineering.

Kaspar Willam (NAE)

Interim Chair of Civil and Environmental Engineering

In Spring 2013, Kaspar Willam was elected a fellow of the IA-FraMCoS (International Association of Fracture Mechanics for Concrete and Concrete Structures) in recognition of his outstanding contributions to international fracture mechanics for concrete, concrete structures and to concrete science and technology.

CEE Wins GAANN Grant

The Department of Civil and Environmental Engineering at the University of Houston Cullen College of Engineering has won a grant to provide up to 12 one-year full scholarships for students pursuing Ph.D. degrees.

The grant comes from the U.S. Department of Education's Graduate Assistance in Areas of National Need (GAANN) program, which is designed to enhance teaching and research in fields of major importance to the United States. The grant provides the department with roughly \$400,000 over three years, and is matched by the University of Houston at approximately 30 percent.

The civil and environmental engineering department will use the funds to support Ph.D. students conducting work related to infrastructure and clean water in the Cullen College of Engineering. Both areas were singled out by the National Academy of Engineering as "Grand Challenges" for engineers to tackle in the 21st century.

"In 2009 the American Society of Civil Engineers gave an average grade of 'D' to the nation's infrastructure," said civil and environmental engineering chairman Abdeldjelil "DJ" Belarbi. "The ASCE also

estimated it will take \$2.2 trillion and a new national public-private partnership to make the necessary infrastructure repairs and improvements."

According to Belarbi, the department plans to award one-year GAANN fellowships to four doctoral students over each of the next three years. After this year of funding concludes, each student will be able to join a faculty member's research team, which will help fund the remainder of his or her Ph.D. education. "We'll put them on the grant for the first year then roll them into funded research projects. That way we can reach out to a large number of potential GAANN Fellows," he said.

The department will advertise the fellowships to colleges and universities around the country in the coming months, Belarbi said. Recipients must be U.S. citizens or permanent residents. More information on the fellowship can be found on the civil and environmental engineering department website.

Distinguished Lecture Series Spring 2013

Jeremy B. Fein, Ph.D.

Monday, January 28, 2013
University of Notre Dame - "Using Surface Complexation Modeling to Quantify Metal Adsorption and Bioavailability to Bacteria in Geologic Systems"

Kerry A. Kinney, Ph.D.

Monday, February 4, 2013
The University of Texas at Austin - "Exploring the Microbiome of the Built Environment"

Albert J. Valocchi, Ph.D.

Monday, February 11, 2013
University of Illinois at Urbana-Champaign - "Impact of Mixing-Controlled Reactions on the Transport of Groundwater Contaminants: Modeling and Pore-Scale Experiments"

William P. Ball, Ph.D.

Monday, February 25, 2013
Johns Hopkins University, Baltimore, MD - "Effects of Surface Oxides and Natural Organic Matter on Environmentally Relevant Properties of Carbon Nanotubes"

Lutgarde Raskin, Ph.D.

Monday, March 4, 2013
University of Michigan - "Biological Drinking Water Treatment - Opportunities and Challenges"

Stephanie Fiorenza, Ph.D.

Monday, March 18, 2013
BP North America Inc. - "Case Studies of Bioremediation Solutions: Win-Win Solutions for All Stakeholders"

Mason Tomson, Ph.D.

Monday, March 25, 2013
Rice University - "Environmental Issues Related to Shale Oil and Gas in Western US"

Kenneth W. Hudnut, Ph.D.

Monday, April 8, 2013
Geophysicist, U. S. Geological Survey - "Guiding the Search for Earthquake Surface Rupture"

For more information about these and other lectures visit cee.egr.uh.edu

New Staff



Aliyah Brown joined the department of Civil and Environmental Engineering in December 2012 as the Executive Secretary to the

Chair, Dr. Belarbi. New to the Houston area, the Philadelphia native graduated from Temple University in 2005 with a Bachelor of Arts Degree in Communications. Prior to CEE, she worked as the membership coordinator at WHY (the Philadelphia PBS affiliate), where she was an integral part of the On-Air Fundraising team.

Always up for a challenge, Aliyah looks forward to exploring the endless opportunities Houston has to offer!

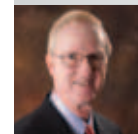
Staff Award



Catherine Santos has received a University of Houston Tier One Staff Award. She received her Ph.D. in chemistry from UH in 2009

and has been a laboratory supervisor in Civil and Environmental Engineering since 2010. She teaches graduate lab classes and maintains the Environmental Lab facilities, and is responsible for lab safety. CEE students, staff, and faculty enjoy working with Catherine because she is friendly and dedicated, and she has a positive attitude in difficult situations. She is proactive in teaching students in the program about lab safety and proper instrument use, and she engages them in thinking critically about their projects. Catherine helps provide the infrastructure for Tier One research.

Profile of Professor Emeritus

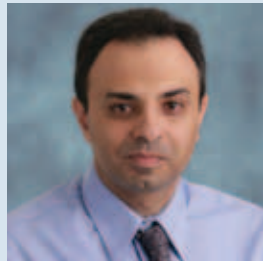


James M. Symons, Sc.D., P.E. (Emeritus), DEE, Cullen Distinguished Professor Emeritus was recently profiled by MIT Technology Review.

The full article is available at <http://www.technologyreview.com/article/508411/james-m-symons-sm-55-scd-57/>

NEUP Grants Given to Two CEE Faculty Members

#1



Ashraf Ayoub

Probabilistic Multi-Hazard Assessment of Dry Cask Structures

Associate professor Ashraf Ayoub leads a team of collaborators that has received an \$865,000 grant from the U.S. Department of Energy Nuclear Energy University Programs, including assistant professor Bora Gencturk, Hugh Roy and Lillie Craz Cullen Distinguished Professor Kaspar Willam, Jamie Padgett of Rice University, and Rizwan Uddin of University of Illinois Urbana-Champaign. This project aims to investigate the performance of dry cask storage systems under multiple hazard systems (earthquake, tornados, combined with aging effects) using a probabilistic multi-hazard framework. This framework will be validated based on experimental research and will provide improved models for safety and reliability of spent nuclear fuels during storage and transportation.

#2



Mo Li

Concrete Materials with Ultra-High damage resistance and Self-Sensing capacity for Extended Nuclear Fuel Storage Systems

Assistant professor Mo Li leads a research team that has received an \$800,000 grant from the U.S. Department of Energy Nuclear Energy University Programs. Her collaborators are Kaspar Willam, Hugh Roy and Lillie Craz Cullen Distinguished Professor, and Kalyana Babu Nakshatrala, assistant professor of civil engineering, and colleagues Yunping Xi of University of Colorado Boulder and Dan Naus of Oak Ridge National Laboratory. The project focuses on understanding the degradation and transport properties of spent nuclear fuel storage materials, especially under elevated temperatures due to neutron and/or gamma radiation, and developing new materials for a safe and extended SNF storage system.

Faculty Member Wins \$1M Grant to Develop Water Monitoring System



Debora Rodrigues

A University of Houston Cullen College of Engineering assistant professor has won a \$1 million grant to develop a water monitoring system that guards against disease- and corrosion-causing bacteria in water systems in real time.

The three-year grant was awarded to Debora Rodrigues, assistant professor of civil and environmental engineering, by the Qatar National Research Fund. She will pilot the technology in water systems in that country, with plans to bring it to other water systems in the future.

Rodrigues is developing the technology in collaboration with Abdelhak Bensaoula, research professor of physics and electrical and computer engineering. The system is designed to be placed in pipelines that carry water to and from water treatment plants. At its heart is a class of molecules known as aptamers, which can be designed to detect specific bacteria. The aptamers Rodrigues is using will be built to bond with disease-causing bacteria and bacteria that cause corrosion in water pipelines.

In addition to bonding with harmful bacteria, these aptamers will have another important characteristic: when they do form a bond, they will emit fluorescence. At that point, an optical sensing tool will record the fluorescence. If the threshold fluorescence is met due to a certain minimum concentration of hazardous bacteria, the system will send an alert to authorities overseeing water systems, allowing them to take action to halt a developing problem in its tracks.

Note that these alerts won't be sent at the first sign of a harmful bacterium. A system that sends out warnings every time a bacterium is detected would produce false alarm after false

alarm, in fact. For bacteria to present a real danger to people or infrastructures, there must be a specific number of these microorganisms present in the water or on the surface of a pipeline. This system will be designed to detect that specific number. In addition to the detection of microorganisms, the system will also detect environmental conditions that can encourage or inhibit the growth of hazardous bacterial populations, such as temperature and pH level.

Rodrigues' collaborators from the University of Quebec at Montreal, led by Mounir Boukadoum, a professor of microelectronics engineering as well as an adjunct professor of electrical and computer engineering at UH, are developing algorithms that link the amount of fluorescence to the amount of bacteria with environmental factors contributing to the presence of these microorganisms in the water system. These algorithms will be integrated into the sensing and alert technology and allow the system to send out warnings as genuine problems are developing but before they become serious.

"You need to have a threshold for what is actually harmful," Rodrigues said. "If you're going to combine environmental monitoring with biological sensing, you need to know what conditions are most likely to produce corrosion or favor pathogens in the water. With these algorithms we can actually predict a problem. The idea is to predict so you can solve a problem before it gets bad."



Researchers Win \$2.5 Million Grant to Develop Offshore Cementing and Drilling Materials

by Toby Weber

Offshore oil production is an exercise in extremes. Widely varying temperatures, very high pressures and extremely corrosive seawater – all are challenges that producers must tackle when drilling and installing wells in ultra-deep water offshore.

Add to this list the basic inaccessibility of the wells themselves. With the top of these wells often sitting thousands of feet under water, monitoring their overall health is another major challenge. To address this issue, Kumaraswamy “Vipu” Vipulanandan, professor of civil engineering and director of the Center for Innovative Grouting Materials and Technology (CIGMAT) with the University of Houston Cullen College of Engineering, is developing a new type of cementing slurry that will enable offshore oil rig operators to easily monitor the health of a well, both during its construction and then

throughout its operational life. He has recently won a more than \$2.5 million, 3-year grant from the non-profit Research Partnership to Secure Energy for America, (RPSEA) and funded by the U.S. Department of Energy (DOE), to conduct this work. Oil Field services firm Baker Hughes is providing additional funding of \$500,000 as a cost share.

This new technology rests on additions to the standard drilling mud and cementing slurry used by operators to construct and form the actual well. Vipulanandan is adding new materials to the slurry, including nano-scale particles of calcium, silica and iron. Other modifiers include polymers, coupling agents, water reducing agents, particle fillers and admixtures. These additions, he said, will turn the drilling mud and cementing slurry into piezomaterials, meaning their electrical properties will change when they encounter mechanical stresses, temperature changes and chemical reactions.

Under this design, during well construction electrical leads will be placed in the outer casing of the well. As the slurry is poured to form the inner wall of the well, the sensors will be used to monitor how quickly the slurry is hardening, how much of the well



Kumaraswamy “Vipu” Vipulanandan

has been completed and if the process is going as intended.

“Sometimes there is a crack in the deep rock formation that allows the slurry to escape. Since the company constructing the well cannot monitor this process, it may take a long time to realize there is a problem,” said Vipulanandan. “With this new technology, the sensors will show quickly that the slurry level is not rising. That way the builder can halt construction and start working on a solution.”

The new cementing mixture will allow operators to monitor operational wells, too, since it will retain its piezoresistive nature after the slurry hardens. When the hardened cement encounters a mechanical stress or strain, the technology’s sensing and monitoring capabilities will make it easy to detect and locate structural problems, such as a crack in the cemented well, allowing the operators to monitor the health of the well throughout its operational life.

Vipulanandan’s collaborators on this grant include Ramanan Krishnamoorti, chair of the UH Department of Chemical and Biomolecular Engineering, as well as Guido Gustavo Narvaez and Qi Qu, both researchers with Baker Hughes.

Rogers Selected for Board Memberships



Jerry Rogers

Jerry Rogers, associate professor of civil engineering, has been selected for the National Board of Directors for Civil Engineering Certification Inc., starting in October 2012. Dr. Rogers served on the founding Board of Directors for the American Academy of Water Resource Engineers from 2004 to 2009, as WRE- Diplomate 009.

Certifications are earned by individuals who have demonstrated a set of knowledge and skills within a certain area. Civil Engineering Certification, Inc. (CEC) was created in 2004 by the ASCE Board of Direction to provide a mechanism for professional post-licensure certification of the various specialties within civil engineering. The CEC is led by a Board of Directors and is a member board of the Council of Engineering & Scientific Specialty Boards (CESB).

CEC has partnered with the Environmental & Water Resources Institute (EWRI), Geo-Institute (G-I), and Coastal Ocean Ports & Rivers Institute (COPRI) to create three professional certification programs and will continue to partner, where appropriate, with other professional organizations to implement specialty certification. CEC created its first academy, the American Academy of Water Resources Engineers (AAWRE) and the Diplomate, Water Resources Engineer (D.WRE) certification program in October 2004. The Academy of Geo-Professionals (AGP) and the Diplomate,

Geotechnical Engineering (D.GE) certification program was established in November 2008. CEC launched its third academy, the Academy of Coastal, Ocean, Port & Navigation Engineers (ACOPNE) in October 2009. There may be other certifications created by other Institutes within ASCE in the future.

Jerry Rogers has been selected to serve on two national historical committees:

The American Society of Civil Engineers: History and Heritage Committee (HHC) Subcommittee on the Panama Canal Centennial History (1914-2014) for the ASCE Annual National Conference in Panama City, Panama in the fall of 2014, and the American Water Resources Association 50th Anniversary Committee to plan the November 2014 AWRA Conference anniversary activities in Washington, DC.

Rogers is a corresponding member of the HHC-ASCE, past Chair, and received the 2011 ASCE National History and Heritage Award and Honorarium.

He was 1989 National President of AWRA during the AWRA 25th Annual Conference in Tampa, Florida.

Interdisciplinary Research Spotlights

#1

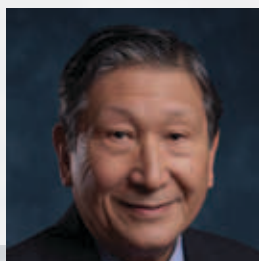
Debora Rodrigues



Debora Rodrigues
photo by TBS Photography

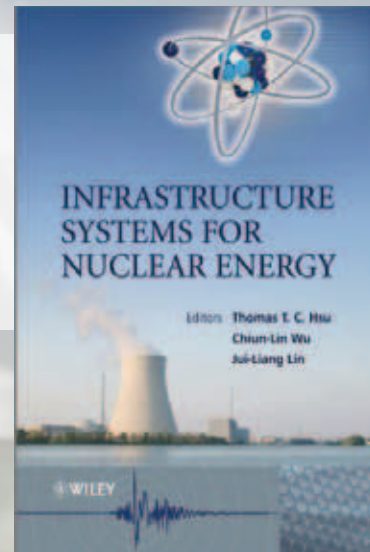
Assistant professor Debora Rodrigues is part of a research team that has been awarded a three-year, \$600,000 environmental monitoring grant from NASA and its inaugural Space Technology Research Opportunities for Early Career Faculty grant program. The team, including Wei-Chuan Shih, assistant professor of electrical and computer engineering, and Jacinta Conrad with the chemical and biomolecular engineering department, as well as Duane Pierson and Mark Ott, microbiologists at NASA's Johnson Space Center, will develop an environmental monitoring system for space missions.

Textbook on Nuclear Energy Infrastructure



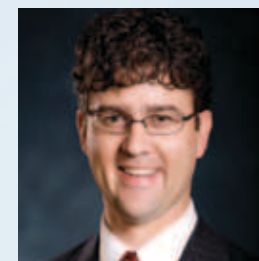
Thomas Hsu

Thomas Hsu, Moores Professor of Civil Engineering, has co-edited a new textbook titled Infrastructure Systems for Nuclear Energy, which will be released next month. Several UH CEE faculty, including Kaspar Willam, Ashraf Ayoub and Yi-Lung Mo have contributed to the book.



#2

Craig Glennie



Craig Glennie

Assistant professor Craig Glennie is collaborating with Wei-Chuan Shih and Zhu Han, assistant professor of electrical and computer engineering, to devise an oil leak detection tool for unmanned offshore rigs. The three-year, \$740,000 grant comes from the Gulf of Mexico Research Initiative (GoMRI), an independent body established in response to British Petroleum's Deepwater Horizon oil spill.

Glennie is also the American Society for Photogrammetry and Remote Sensing Grand Award recipient of the 2013 Talbert Abrams Award for his paper titled "Calibration and Kinematic Analysis of the Velodyne HDL-64E S2 LiDAR sensor," published in Photogrammetric Engineering & Remote Sensing.

Civil and Environmental Engineering Ph.D. Student Presentations

■ Farid Ahmed

Advisor: Dr. Debora F. Rodrigues
Monday, February 18, 2013
"Investigation of Acute Effects of Graphene Oxide on Wastewater Microbial Community: A Case Study"

■ Nancy Linden

Monday, April 1, 2013
Science and Engineering Librarian
"Library Resources for Graduate Students"

■ Fan Jingling

Advisor: Dr. Debora F. Rodrigues
Monday, April 15, 2013
"Heavy Metal Removal by Bacterial Biomass"

■ Tugba Onal Okay

Advisor: Dr. Debora F. Rodrigues
Monday, April 15, 2013
"Microbially Induced Calcium Carbonate Precipitation and Its Applications"

■ Ted Chu

Advisor: Dr. Keh-Han Wang
Monday, April 22, 2013
"Geostatistics-based Rainfield Interpolation Using Radar Rainfall and Gauge Observations: Algorithm Design and Automation"

■ Ali Keyvani

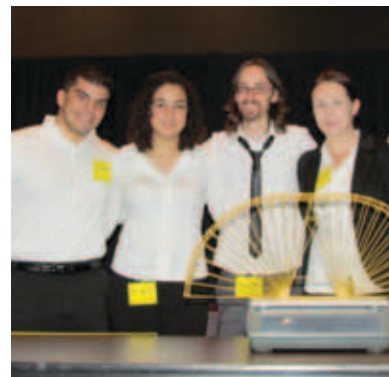
Advisor: Dr. Kyle Strom
Monday, April 22, 2013
"Flocculation of Fine Sediments in Fluvial to Marine Transitions"

UH ASCE Concrete Canoe Team Takes Third Place



The UH ASCE Concrete Canoe Team took third place in the ASCE Texas/Mexico regional competition, held on March 21-23, 2013 in Corpus Christi, TX, competing against 13 teams. The 20-student team was led by Team Captain Scott Wallace and Team Co-Captains John Sanchez and Hayley Redweik. Julio Villalta won second place in the ASCE/TX Mexico regional technical paper competition.

UH ASCE Spaghetti Bridge Team Wins DFI Competition



In October 2012, the UH ASCE Spaghetti Bridge Team won the Student Spaghetti Bridge Competition at the 37th Annual Conference on Deep Foundations. The team reported that there were about 600 engineers and other conference attendees watching as they loaded their bridge. The members of the UH ASCE Spaghetti Bridge Team: Juan "Sebastian" Hernandez, Steven Brock, Sara Karouni, and Milena Malinowska.

PhD Student to Speak at Conference



Maruti Kumar Mudunuru

Maruti Kumar Mudunuru, a Ph.D. student under assistant professor Kalyana Babu Nakshatrala, has received a travel award from the Society of Industrial and Applied Mathematics to attend the 2013 SIAM Conference in Computational Science and Engineering (CSE13). The conference will be held February 25 - March 1, 2013 in Boston. He will be delivering a talk at the conference on "A robust non-negative numerical framework for diffusion-controlled bimolecular-reactive systems."

Mudunuru has also received a scholarship from American Society of Indian Engineers.

Fendley Named Engineer of the Year 2013



William F. "Bill" Fendley, P.E.

William F. "Bill" Fendley, P.E., RPLS (BSCE '71) has been named the Greater Houston Area 2013 Engineer of the Year.

Fendley was chosen by his peers for his professional than forty years. Fendley serves on CobbFendley's Board of Directors. He is co-founder of the firm, and an avid supporter and distinguished alumnus of the University of Houston Cullen College of Engineering. He has served as past President of the Texas Society of Professional Engineers, a Texas Engineering Foundation Trustee, and Chair of the Political Action Committee for Engineers (PACE). He currently serves as Chairman of the National Society of Professional Engineers (NSPE) Legislative and Government Affairs Committee and has also been honored as a fellow of NSPE. He serves the

community on the Waller County Transportation Authority Board and the Prairie View A&M University College of Business Advisory Board. In recognition of his professional achievements, he was inducted into the University of Houston Cullen College of Engineering Academy of Distinguished Civil and Environmental Engineers. He has also received the 2011 Roger Eichhorn Leadership Services Award.

Fendley will be honored during Houston Engineers Week, February 17-23, 2013.

Alumnus Named 2013 Young Civil Engineer of the Year



Brett Pope, P.E.

The Houston branch of the American Society of Civil Engineers (ASCE) has named Brett Pope, PE (MCE '11) the 2013 Young Civil Engineer of the Year - Outstanding Civil Engineer in the Private Sector for his record of leadership and service in engineering societies, his extensive community service, and his geotechnical engineering project management experience.

He has also been awarded the Houston Branch ASCE 2013 Edmund Friedman Award, and nominated for National ASCE Edmund Friedman Award.

Pope joined Terracon Consultants, Inc. in 2008 in the geotechnical department. His four plus years of geotechnical engineering experience includes a wide variety of transportation, public infrastructure, commercial, and residential projects. He has been an active member of ASCE

for four years, currently serving as the Houston Branch V.P. Education and the Texas Section First Year Director at Large. He has previously served the Houston Branch as Secretary, Branch Director, and Younger Member Chair and the Texas Section as Younger Member Chair.

Pope is active in volunteering at the Children's Museum and Houston Food Bank, fundraising for the Snowdrop Foundation (children's cancer research), Elves and More Bike Build, fundraising for the American Foundation for Suicide Prevention, and is a Houston Science Fair Judge for the Engineering, Science, and Technology Council of Houston.

To submit a note for an upcoming edition of *Blueprint*, email blueprint@egr.uh.edu

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Your support matters!

Gifts to UH Department of Civil and Environmental Engineering help fund much-needed scholarships for our students, help us renovate our labs and facilities to be competitive with other Tier-One programs, and help us support the activities of our student organizations.

Thank you for continually helping us meet these needs!