TEXAS TECH UNIVERSITY
Department *of* Chemical Engineering™

Winter 2013 Texas Tech University - Edward E. Whitacre Jr. College of Engineering

Message from the Chair


Simon

The advent of a new semester and a new year is a time for both reflection and planning. The past year, 2012, was a good year for the department, with a number of noteworthy achievements:

- The hire of Dr. Carla Lacerda, which brings us to 15 faculty members.
- Dr. Harvinder Gill's receipt of a five-year $2.2 million New Innovator Award from the National Institutes of Health.
- Dr. Micah Green's receipt of a five-year $400,000 CAREER award from the National Science Foundation, which brings us to five current faculty (Drs. Green, Karlene Hoo, Siva Vanapalli, Mark Vaughn, and Brandon Weeks) who have received this prestigious award.
- A success rate of 92% for graduating seniors taking the Fundamentals of Engineering (FE) exam.
- A six-year accreditation from ABET.

The coming year holds promise for continuing our quest for excellence in both teaching and research arenas. At the undergraduate level, Dr. Weeks will teach our first course on chemical process safety, which will become a required part of the curriculum. The student chapter of the American Institute of Chemical Engineering, advised by Dr. Green, will host the 2013 Regional meeting in March. April will bring the Texas Tech Distinguished Engineer Awards Luncheon in Lubbock and the departmental golf outing, as well as the University Research Days undergraduate and graduate poster competitions. The department's annual Senior Design Expo will be held in May.

An important task in the coming year is the development of a plan for realizing our vision — that of becoming the undergraduate chemical engineering department of choice in Texas and one of the top research and graduate chemical engineering departments in the nation. We have a very productive faculty, but we need to ensure our ability to retain this talent with excellent students, state-of-the-art teaching and research facilities, and more endowed professorships. With decreasing state support, gifts from individuals, companies, and foundations are becoming more essential for maintaining and creating centers of excellence such as those found in our department. We rely on such support to provide, for example, scholarships and resources for updating facilities. The Whitacre College of Engineering is in the midst of a fundraising campaign for teaching laboratory renovation, including those in our department. In the coming year, we hope to not only increase gifts to the department, but to also explore innovative partnerships with alumni and industry that will benefit our mission.

Connecting to our alumni is essential for the department's quest for excellence. We have initiated an Alumni News page on our web site where we are highlighting your professional accomplishments, and we have started an Alumni Thoughts column in the newsletter. Please let us know of your accomplishments, and feel free to stop by and chat with me concerning how you can contribute to our efforts when you are in Lubbock.

With the very best of wishes for a happy, healthy, and productive 2013,

Dr. Sindee Simon
P. W. Horn Professor
Whitacre Department Chair in Chemical Engineering

New Faculty Member: Dr. Carla Lacerda


Lacerda

Our newest faculty member, Dr. Carla Lacerda, joins the faculty of the Department of Chemical Engineering at Texas Tech in the spring of 2013 as an assistant professor.

She earned a bachelor of science in food engineering from the Federal University of Viçosa, in Brazil in 2002. She then went to Colorado State University to pursue a doctorate degree in chemical engineering. During her graduate work, she gained experience with proteomics technologies to elucidate mechanisms of metal resistance in microbial communities. After completion of her Ph.D., Lacerda transitioned from environmental to biomedical science. Her postdoctoral work, also at CSU, encompassed the development of methods for tissue engineering, microscopy and laser microdissection of heart valve tissues, as well as proteomic characterization of valve disease.

Her most recent work, which she will continue at Texas Tech, involves the development of cell and organ culture in vitro models of valve disease. Lacerda is interested in understanding the effects of different mechanical stimuli on heart valves; specifically, the mechanical triggers of valve degeneration. Better knowledge of these molecular pathways will facilitate the development of new drugs to slow or reverse disease progression and to improve the design of tissue-engineered valves. In addition to heart valve mechanobiology, Lacerda's research program will also develop new techniques for tissue engineering.

In addition to her research, Lacerda is excited to be in the classroom teaching chemical reaction engineering. She also plans to develop new elective courses in tissue engineering and biomedical applications of chemical engineering concepts.

Departmental News

Texas Tech made a big impression at the first Texas Soft Matter Meeting held at the University of Houston in January 2013. Texas Tech had 24 representatives at the meeting, including 19 students, two post-doctoral researchers, and three faculty members. An invited lecture entitled "The Calorimetric Glass Transition under Nanoconfinement" was given by Dr. Sindee Simon. The students and other faculty were from the Soft Matter Working Group at Texas Tech. The group focuses on research and education in the blossoming field of soft matter and soft materials and is represented by faculty from the Departments of Chemical Engineering, Mechanical Engineering, Industrial Engineering, and Chemistry and Biochemistry.

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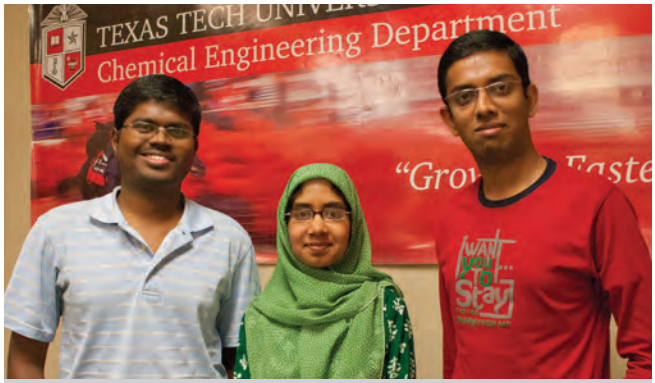
Student News

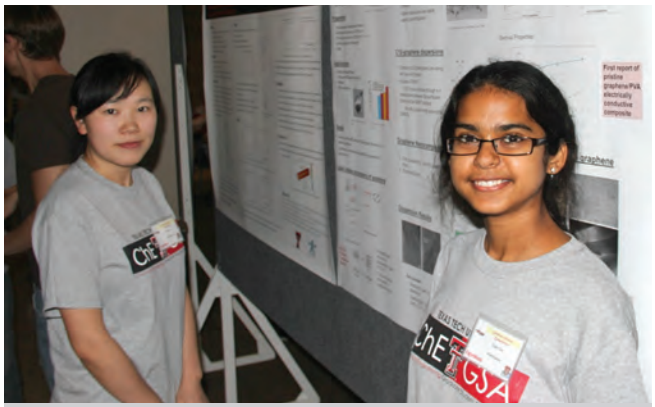
Graduate Student Organizations: ChEGSA and SPE



(L-R) ChEGSA Officers: Srinivasan Raman, vice president, Fahmida Irin, president, and Jeevan Maddala, secretary.

The department is home to two complementary graduate student organizations: the Chemical Engineering Graduate Student Association (ChEGSA) and the Texas Tech Student Chapter of the Society of Plastics Engineers (SPE).

ChEGSA was founded in 2007 and serves as a platform for educational and social networking for all departmental graduate students. The elected executive committee, Fahmida Irin, president; Srinivasan Raman, vice president; Shaswati Atwe, treasurer; and Jeevan Maddala, secretary; serve the 50 current members. In the fall, a welcome picnic for the new graduate students was organized. ChEGSA also organizes the annual poster competition along with SPE. The aim of the poster competition is to reward excellent scholarship, promote interdepartmental interactions, and encourage undergraduate students to pursue graduate studies. ChEGSA is advised by Dr. Rajesh Khare.



ChEGSA members Rong Xu (left) and Sriya Das (right) present posters at the ChEGSA Annual Poster Competition.

SPE boasts 35 undergraduate and graduate student members and provides educational resources aimed specifically at students pursuing a minor or graduate degree in the area of polymers and plastics. Student scholarships are awarded through the chapter to attend the annual Polyolefins conference in Houston, and five students will give posters at the conference in February. The SPE student chapter also organizes educational seminars and social events, including an annual hiking trip. The elected officers of the SPE student chapter are Ziniu Yu, president, Rutvik Godbol, vice president, Astrid Torres, secretary, and Jeff Paden, treasurer. The chapter's faculty advisor is Dr. Ronald Hedden.

Texas Tech University AIChE Student Chapter

(L-R Back Row) Jimmy Woods, Donny Torres, Mark Haddad
(L-R Front Row) Erika Yamasaki, Kimberly Davis

The 2012-2013 school year has been an exciting one for the Texas Tech Chapter of AIChE. In October, chapter members raised more than $ 2000 during the biannual APHASIA fund raiser by volunteering to do yard and house work for donators. Soon after, the chapter took fourteen student members to Pittsburgh for the Annual AIChE National Student Conference. Texas Tech was represented by two student teams competing in the ChemE Jeopardy Competition and the 2012 National Chem-E-Car Competition. All students were also given the opportunity to network with other schools and industry professionals, as well as to attend professional development workshops.

The Texas Tech Chapter of AIChE will host the 2013 Southwest Regional AIChE Conference on March 22-24, 2013, and members are excited to have the opportunity to host students from across the state. The goal is to represent the Whitacre College of Engineering well, have an organized meeting, and showcase the best Texas Tech has to offer. In order to make this possible, the students are looking to partner with industry and Texas Tech alumni. To get involved or have your company represented at the conference, please contact chapter president Donny Torres at donny.torres@ttu.edu.

New Process Safety Course

Dr. Brandon Weeks will teach a new three-credit Chemical Process Safety course in the spring of 2013. The course, which is the first formal safety course in the university and will be required for students graduating with the 2013-14 catalog, marks the department as a leader at Texas Tech in safety. The course is focused specifically on process safety and will utilize modules from CCPS and SACHE. Students will be introduced to Federal regulations and oversight agencies responsible for process safety and management.

The change in the curriculum arises as part of the continuing improvement process that we do for accreditation and is in response to a recent ABET requirement that chemical engineering programs explicitly address hazards associated with processes. Although the previous ChE curriculum included environmental, health, and safety, the safety training in the past was predominately laboratory safety with some HAZOP evaluation. The addition of this new course in the curriculum broadens the students' training to include concepts associated with process safety.

The class is intended to be industrially relevant and will involve site visits and guest speakers from industry. Dr. Weeks welcomes participation from alumni for the development of this course. If any of you would like to be a guest lecturer please contact Dr. Weeks. We will give an update in future newsletter along with the outcomes from this inaugural course.

Faculty News

Gill Receives NIH Director's New Innovator Award


Gill

Dr. Harvinder Gill, an assistant professor of chemical engineering, has received a $2.2 M grant from NIH to fund his work in developing pollen grains as novel microcapsules for oral vaccine delivery. Gill's research will develop pollen grains as a novel system for oral vaccination, which could lead to improved, painless, and edible vaccines in the future.

Gill is one of 51 researchers to receive the NIH Director's New Innovator Award to pursue visionary science that exhibits the potential to transform scientific fields and speed the translation of research into improved health. The New Innovator Award is a prestigious honor that supports exceptionally creative new investigators who propose highly innovative projects that have the potential for unusually high impact.

The oral route can be an attractive alternative to the current needle-based method of vaccine administration. Oral vaccination is painless, has potential to be self-administered, and it can induce both systemic and mucosal immune responses. However, oral vaccination is challenging because vaccines degrade in the stomach and pass poorly through the intestine in the human body. Dr. Gill proposes to address this challenge by harnessing the natural toughness of pollens to help transport vaccines into the human body through the oral route. By first removing the native plant biomolecules, which are the root cause of pollen allergies, a non-allergenic empty shell will be created, which can subsequently be filled with vaccines. This 'Trojan horse'-like system can then safely ferry vaccines through the harsh environment of the stomach into the intestines for improved uptake into the body. If successful, this research could lead to development of oral vaccines against many infectious diseases, transforming the way we administer vaccines.

Gill joined the Texas Tech Department of Chemical Engineering in 2009 after completing doctoral work at the Georgia Institute of Technology and post-doctoral work at Emory University.

Green Wins National Science Foundation CAREER Award


Green

Dr. Micah Green, an assistant professor of chemical engineering, has received a $400,000 Faculty Early Career Development (CAREER) Award from the National Science Foundation for his work on graphene.

The CAREER Award is one of the most prestigious grants from the National Science Foundation, given to qualified professors early in their careers to promote high-quality research and novel educational initiatives. Green is the fifth current faculty member in chemical engineering to receive this award following in the footsteps of Drs. Hoo, Vanapalli, Vaughn, and Weeks.

Green's award focuses on single-atom-thick sheets of graphite, termed graphene. These sheets display extraordinary mechanical strength and electrical conductivity, and have a wide range of applications ranging from solar cells to aerospace composites. In recent years, Green's group has developed a variety of techniques to produce graphene sheets without damaging them.

The work funded by the CAREER Award focuses on scalable production of these sheets and the ability to understand their surface properties as a function of processing techniques.

Education and outreach are also a major component of this award. Green will expand his successful "Science and Science Fiction" flex course at New Deal High School while initiating new efforts to educate undergraduate students about graduate research in engineering.

Green is an alumnus of the Texas Tech Department of Chemical Engineering. He earned a Ph.D. in chemical engineering at the Massachusetts Institute of Technology, after which he served as an Attwell-Welch Postdoctoral Research Fellow at Rice University. He returned to Texas Tech as an assistant professor in 2009.

Department News

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Dr. Harvinder Gill received new funding for two projects from the National Institutes of Health (HIA): $356,148 for "Nanoengineered Virus-Mimics as Templates for Design of a Universal Influenza A Vaccine," and $2.2 million for "Pollen Grains as Trojan Horses for Oral Vaccination" – see the article in this issue for more details.

Dr. Micah Green received new funding for three projects from the National Science Foundation (NSF): $259,300 for "Conformation and Alignment Control in Scalable Graphene Film Processing," $60,122 for "EAGER: The Verge of Percolation in Nanoparticle Networks," and $400,000 for his prestigious NSF CAREER proposal – see the article in this issue for more details.

Qiuying Gu, a doctoral student under the supervision of Dr. Karlene Hoo, recently completed a seven-month internship with Halliburton in Carrollton, TX. Her project involved modeling a cement flow valve and mixing system, designing and testing an appropriate controller strategy, preparing a written report, and orally presenting the results to the Halliburton staff.

Drs. Greg McKenna and Brandon Weeks were recently awarded $383,294 for their proposal to the Office of Naval Research, "DURIP: Purchase of a Nanoidentification System for Nanomechanical and Interfacial Measurements on Nanostructured Materials."

Dr. Sindee Simon was named recipient of the 2013 Lubbock Women of Excellence Award in Science from the Lubbock YWCA. She was also honored to be named a Fall 2012 Assessment Spotlight Champion by the Texas Tech Office of Planning and Assessment. Simon also recently received $ 376,000 for an NSF project, "Nanoconfinement and its Influence on Polymerization," which will be performed in collaboration with Dr. Edward Quitevis in the Department of Chemistry and Biochemistry, as well as $ 100,000 from the American Chemical Society Petroleum Research Fund for "Thermodynamics of Nanoconfined Equilibrium Polymerizations."

Ben Xu sucessfully defended her dissertation and received a Ph.D. in December, 2012. Her dissertation, "Dynamics and Thermodynamics of Small Molecule Glass Formers, Polymers And Organic Crystals", was supervised by Prof. Greg McKenna.

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Thoughts and News from Chemical Engineering Alumni

We would love to hear from you. If you would like to write an article for the newsletter or if you have important news to share, contact Dr. Sindee Simon, and of course, keep your contact information up to date at this link: **www.coe.ttu.edu/info**

A Message from the Chemical Engineering External Advisory Board

All of us who have authored this letter share something in common with you; we are all chemical engineering alumni from Texas Tech. We are reaching out to all of our fellow alums with a request that you join us in something else we share in common, being engaged with the department and the Whitacre College of Engineering. We all worked hard to get our degrees, and we had some intense times with classmates and professors. It is time to not only renew old acquaintances but also to get engaged with the new faculty and students who are journeying down the same paths we have. The intent of this letter is to tell you a bit about the myriad of ways you can get involved with Texas Tech and the Department of Chemical Engineering such as recruiting, talking to AIChE student groups, participating in college nights, and providing financial support. This letter also provides the contact info for each External Advisory Board (EAB) member so that you know how to get started.

First, it might be worthwhile to tell you briefly about the department, the college, and the university. All of this is quite different than what most of us remember. Dr. Sindee Simon, who came to Texas Tech in 1999 from Pitt, was named the chair of the department in September 2012. She brings a lot of enthusiasm and a deep commitment to the graduate and undergraduate students. Here is a link to the department's Strategic Objectives page. The vision statement is "The Department of Chemical Engineering will be the undergraduate chemical engineering department of choice in Texas and will be recognized as one of the top research and graduate chemical engineering departments in the nation."

Did you know that our department is the leading research group, not only in the Whitacre College of Engineering, but also for the entire university on a dollars-per-researcher basis? Here is a link to the types of research that the department is doing, and here is a link to bios for the department faculty. They are young, diverse and energetic and are a major reason the department is in the top 75 nationally and climbing.

When most of us were at Texas Tech, the department prided itself in putting out practical bachelor's level engineers that industry desired. One of the ongoing things that the EAB monitors is that undergraduate instruction does not suffer in the push for national recognition —which has a heavy component of graduate level research.

Dr. Al Sacco has been the dean of the college for two years. He is a ChE and an astronaut (who went up on two shuttle missions). He has told us that he wants the department to compete with the leading universities in the nation. So, we are all proud of the progress our department and college continue to make and we hope you are too. You are probably asking yourself how you can get more involved with your alma mater and your major department. Here are some suggestions:

- ***Recruit Undergraduate and Graduate Students*** – Your company should be hiring Texas Tech ChEs. If not, convince them they should. After that, be the recruiter and come meet the kids!
- ***Volunteer to be on the External Advisory Board*** – You get to meet the faculty and many of the students. You will get involved with vetting the curriculum, maintaining the balance between undergraduate teaching and research, and maintaining the department's accreditation. The group meets twice per year. Contact Dr. Simon.
- ***Participate in College Nights*** – Texas Tech and other universities are present at many "college nights" to persuade local high school students to attend their universities. Sometimes there is someone who can tell the students about what an engineer is, but rarely is there someone who can tell them why they might want to be a chemical engineer. You could volunteer to talk to high school students and their parents about Tech and chemical engineering at the college nights.
- ***Provide Financial Support*** – There are a number of ways you can provide financial support to the university, the college, or directly to the department. Many companies will match employee contributions to universities, some by as much as three times. Individuals' or companies' donations can go to scholarships, lab equipment, endowments, renovations, or new construction. The dean recently started an initiative to renovate undergraduate teaching labs, including the ChemE Unit Ops labs and details can be found here. Most people are surprised when they find out how little monetary support the state provides to the departments. You and your company can help. Scott Self in the Dean's Office would love to talk to you about ways to contribute.

These are just a few of the ways you could re-engage with Texas Tech, the Whitacre College of Engineering, and the Department of Chemical Engineering. If you are interested but do not know who to talk to or how to get started, please call any of us. Links to contact each of us can be found on the department's External Advisory Board web page or on the Dean's Council's web page (an advisory group for the dean consisting of representatives of each of the engineering departments). We would love to hear from you. Guns up!

The Chemical Engineering External Advisory Board

David Crouch, Chair

Ryan Pederson, Former Chair
Roger Bonnecaze
Chris Coon

Mark Darby
Paul Eisman
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Ken Krawczyk

Julie Jackson
Jack McCavit
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Priestley Receives Significant Research Grants, Serving on Faculty at Princeton University


Priestley

Dr. Rodney D. Priestley, a 2003 graduate with a bachelor of science in chemical engineering, is currently an assistant professor in the Department of Chemical and Biological Engineering at Princeton University and an affiliated faculty member at the Princeton Institute for the Science and Technology of Materials.

After completing his degree at Texas Tech, he obtained a Ph.D. in chemical engineering from Northwestern University in 2008 and completed an NSF/Chateaubriand postdoctoral fellowship at ESPCI in Paris.

His broad research interests are in polymer science and engineering. As a young investigator he has received several awards including the ACS New Investigator Grant, 3M Non-Tenured Faculty Grant, NSF CAREER Award, AFOSR YIP Award, Wentz Junior Faculty Award from the School of Engineering and Applied Science at Princeton University and named a 2013 Diverse Emerging Scholar. He is honored to have recently been selected to represent the Division of Polymer Physics of APS in delivering the 2013 UK PPS/DPOLY Exchange Lecturer.