TEXAS TECH UNIVERSITY
Department *of* Chemical Engineering™

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

Message from the Chair


Simon

It is an exciting time to be associated with chemical engineering at Texas Tech. We are one of the top departments in the university with extremely productive faculty and great students, and we continue to strive to reach 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. Both our students and our faculty continue to receive recognition for their excellence through receipt of a variety of awards, and the department as a whole improved its U.S. News and World Report ranking to 60th out of all chemical engineering programs in the country.

At the undergraduate level, we currently have 383 students in the major, with a record 57 students graduating last May. The Texas Tech AIChE student chapter, led by Assistant Professor Micah Green, successfully hosted the March 2013 Regional AIChE Meeting in Lubbock. Texas Tech students won both the research paper competition and the jeopardy competitions at the regional competition and will compete at national competition later this fall. The quality of our undergraduates continues to improve, despite the increase in our enrollments, and this is in part tied to scholarships — the department was able to provide more than $66,500 in scholarships to undergraduates this year. The graduate program, currently at 62 graduate students, is strongly tied to research funding and expenditures. Restricted expenditures in 2012 topped $2.2 M, and total research expenditures are more than $3.5 M — and we are on track to exceed that amount by 20% in 2013. Kudos to the faculty for working hard to make us the leaders at Texas Tech in research dollars per faculty member!

Exciting news this fall includes the arrival of National Academy of Engineering member, Dr. Chau-Chyun Chen, who comes to us from AspenTech. Chen holds the Jack Maddox Distinguished Engineering Chair in Sustainable Energy, is a professor of chemical engineering, and brings expertise in molecular thermodynamics and phase equilibrium to the department. We are also delighted to welcome Assistant Professor Wei Li, who performs bioengineering and microfluidics research, and Professor of Practice Chijuan Hu, who will take responsibility for teaching and renovating our undergraduate laboratories. Both Professors Li and Hu will formally join the department in January 2014. Other changes in the faculty include the retirement of Dr. Uzi Mann after 35 years of service and the departure of Dr. Raghu Rengasamy — we thank them both for their service and wish them well.

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 scholarships and resources for updating facilities. Thanks to a generous gift from Phillips 66, we recently purchased a bioreactor for our undergraduate laboratory which should be up and running for our spring laboratory courses. The Whitacre College of Engineering is also in the midst of a fund-raising campaign for renovation of teaching laboratories, including those in our department. In the coming year, we hope not only to 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. 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.

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

Dr. Chau-Chyun Chen Joins Chemical Engineering as Jack Maddox Chair


Chen

The Department of Chemical Engineering is pleased to welcome Dr. Chau-Chyun Chen as the new holder of the Jack Maddox Distinguished Engineering Chair in Sustainable Energy. Chen comes to Texas Tech from AspenTech, where he served as Vice President of Technology. One of the founders of AspenTech in 1981, Chen was instrumental in developing the innovative first-principles modeling approach that AspenTech brought to the chemicals industry. He also pioneered process modeling techniques for difficult chemical systems such as those involving electrolytes, polymers, and pharmaceuticals. He is especially well known in academic circles for developing the electrolyte NRTL activity coefficient model for modeling electrolyte solutions and was elected to the National Academy of Engineering (NAE) in 2005 for his contributions to molecular thermodynamics and process modeling.

Chen received his bachelor's degree in chemistry from the National Taiwan University in 1973, and his master's and doctoral degrees in chemical engineering from the Massachusetts Institute of Technology in 1977 and 1980, respectively. He has published more than 100 scientific articles, book chapters and patents. In addition to his election to NAE, Chen received the 2001 Computing Practice Award, Computing and Systems Technology (CAST) Division of the American Institute of Chemical Engineers (AIChE), and the 1984 Ted Peterson Student Paper Award also from CAST Division of AIChE.

He is looking forward to teaching thermodynamics, performing research and working with the graduate students, and collaborating with other faculty members both in the department and in the college.

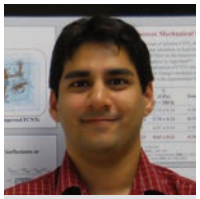
Best Wishes to Uzi Mann in His Retirement


Mann

Dr. Uzi Mann retired at the end of August from the university. He served the Department of Chemical Engineering for 35 years, teaching every undergraduate core course except Thermodynamics II. Mann is particularly known for developing a novel methodology to design chemical reactors, which is described in a textbook "Principles of Chemical Reactor Analysis and Design," (Wiley, 2009). The methodology provides a unified approach for designing reactors with single and multiple chemical reactions. The methodology enables the designer to determine the optimal geometry of the reactor and the optimal flow condition to provide optimal heat transfer. Recently, he received a U.S. patent for developing an efficient process to produce biodiesel. He is working with Texas Tech to commercialize the technology. He and his wife, Helen, plan to move to Memphis, Tenn., to be near two of their four grandchildren. The department heartily thanks him for his service and wishes him all the best in his retirement!

Student News

Chemical Engineering Graduate Student News


Khare

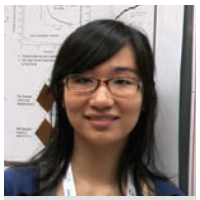
Ketan S. Khare, a chemical engineering graduate student working in Associate Professor Rajesh Khare's research group, was awarded the first place in the poster competition at the Polymer Composites and High Performance Materials Workshop organized by the Division of Polymer Chemistry, American Chemical Society (ACS) in Santa Rosa, California in July 2013. His poster, which was titled "Effect of the Chemical Functionalization of Carbon Nanotubes on the Thermo-mechanical Properties of Cross-linked Epoxy-Carbon Nanotube Nanocomposites," presented results that elucidate the key role played by matrix-filler interfacial interactions in load transfer between the polymer matrix and the carbon nanotubes in nanocomposites.


Maddala

Jeevan Maddala, an August 2013 Ph.D. graduate, was awarded an NSF STTR grant in May 2013 to commercialize his doctoral work, which was performed under the supervision of Professor Raghunathan Rengasamy. The project, "Development of a Computational Tool for Modeling, Simulation, and Design of Next Generation Discrete Droplet Microfluidic Systems," is a collaboration with Rengasamy. The aim is to develop novel design concepts for microfluidic lab-on-a-chip devices that allow precise control of chemical composition and concentration. Such devices are anticipated to facilitate discovery of materials for various pharmaceutical and biomedical applications, including protein crystallization, stem cell growth, and drug screening.


20-Million -Year-Old Dominican Fossil Amber

Graduate student Jing Zhao's work on 20-million-year-old amber published in Nature Communications, was highlighted by National Geographic, the Tikalon blog, and Texas Tech. Zhao made calorimetric and viscoelastic measurements on 20-million-year-old amber under the guidance of Professors Sindee L. Simon and Gregory B. McKenna. The purpose of the work was to test the idea of glass formation through an "ideal" glass transition. The findings challenge this view and alter the current paradigms for the physics of glasses.


Gao

Siyang Gao, a graduate student in Professor Sindee L. Simon's research group won third place at the International Polyolefins Conference for her poster, titled "The Calorimetric Glass Transition of Single Polystyrene Ultrathin Films." The conference, which was held in Houston in February 2013, attracted more than 600 participants and more than forty poster presentations.


Solomon

Deepak Solomon, a graduate student working under the supervision of Assistant Professor Siva A. Vanapalli, was awarded fourth place in the graduate student poster competition at the 84th Annual Meeting of The Society of Rheology in Pasadena, California in February 2013. The poster was titled, "Measurement of Hydrodynamic Resistance due to Purely Elastic Instabilities in Curvilinear Microchannels."

Texas Tech AIChE Student Chapter News


(Back row L-R): Nik Barrows, Ariana Poindexter, Nina Seyadali, and Marco Sandoval (First row): Alex Shoopman

The Texas Tech AIChE Student Chapter successfully hosted the 2013 Southwest AIChE Regional Conference in Lubbock last March. Our congratulations and thanks to the 2012-13 officers, Donny Torres, Kim Davis, Erika Yamasaki, and Jimmy Woods, for doing such a professional job running the meeting. Participants included students from Lamar University, Louisiana State University, Rice University, Tecnológico de Monterrey, Texas A&M University, Texas A&M University–Kingsville, the University of Houston, and the University of Texas at Austin.

Our own students also represented us well at the regional competition. Naureen Suteria, a current senior performing research under the supervision of Assistant Professor Siva A. Vanapalli won first place in the Regional Student Paper Competition. The Texas Tech ChemE Jeopardy Team (Braden Pate, Seth Spear, Amber Helm, and Michael Sees) also took first place. The students will compete at the national competition in San Francisco this fall. Also representing Texas Tech at the national conference will be the AIChE officers for 2013-14: Nik Barrows (President), Alex Shoopman (Vice President), Ariana Poindexter (Treasurer), Nina Seyadali (Secretary), and Marco Sandoval (SORC Representative). For the upcoming semester, AIChE has planned tailgates, intramurals, socials, and community service. Intramurals include flag football, volleyball, and soccer. The next community service event is at the end of September with the Salvation Army. The AIChE student chapter also organizes information sessions with various companies; three such meetings are planned in October.

Chemical Engineering Graduate Student Association

The Chemical Engineering Graduate Student Association (ChEGSA) was founded in 2007 with a mission to promote scholarly activities and social interaction among departmental graduate students. The current executive committee, Parviz Dorsa (President), Zhiyuan Qian (Vice-President), Evelyn Lopez (Treasurer) and Madhusudhan Pallaka (Secretary), serve the 50 current members.

Last spring, several movie nights and group outings were organized. The fall events started off with a welcome picnic for the new graduate students. ChEGSA has also organized poster and t-shirt design competitions. The aim of the poster competition, co-organized with the SPE Student Chapter, is to reward excellent scholarship, promote interdepartmental interactions, and encourage undergraduate students to pursue graduate studies. ChEGSA is advised by Dr. Ted Wiesner.

Departmental News

Texas Tech SPE Student Chapter News

Rong Xu (Vice President), Ran Tao (President), and Evelyn Lopez (Secretary)

The Society of Plastics Engineers (SPE) is an international organization founded in 1942 and dedicated to the advancement of knowledge for all plastics industry professionals. The SPE serves more than 20,000 plastics professionals in the United States and more than 70 countries around the world.

The Texas Tech Student Chapter, with approximately 35 undergraduate and graduate student members, is part of the South Texas SPE section. The main purpose of the chapter is to provide educational resources to help students achieve their career goals relating to polymers and plastics. Through the organization, students make contacts with industry, attend the annual Polyolefins Conference in Houston, and broaden their knowledge of plastics by attending seminars.

The chapter also holds social events, such as hiking trips and the annual poster competition, which is jointly organized with the Chemical Engineering Graduate Student Association (ChEGSA). In addition, in 2012, eleven Texas Tech students were awarded scholarships through SPE.

Chemical Engineering Faculty and Staff Awards

Several chemical engineering faculty and staff members were recognized by the Whitacre College of Engineering last May for their service.

Abernathy

Dr. Rajesh Khare received the George T. and Gladys Abell-Hanger Faculty Award for outstanding graduate teaching, Dr. Micah Green received the Lockheed Martin Excellence in Teaching Award, Dr. Ron Hedden received the Whitacre Research Award for excellence in research, and Dr. Micah Green received the Whitacre Research Award for growth in research.

The department's unit coordinator, Mary Beth Abernathy, received the Orval Leroy Lewis Award.

Green

At the university level, Dr. Micah Green also received the Texas Tech Alumni Association New Faculty Award.

Chemical Engineering Faculty Research Grants and News

Hedden

Drs. Ron Hedden and Rajesh Khare are the recipients of a three-year, $639,929 grant from the National Science Foundation titled "DMREF: Combinatorial Methods to Enable Rapid Prototyping of Pervaporation Membranes for Bio-alcohol Recovery."

Khare

The proposed work will enable rapid tuning of polymers used in pervaporation membranes, which are critical to the energy-efficient purification of biofuels such as ethanol and n-butanol. In particular, Hedden and Khare will identify molecular factors that affect solute transport in polymeric membranes through a synergistic program consisting of combinatorial synthesis experiments, thermodynamic modeling and molecular simulations.

McKenna

Dr. Gregory B. McKenna received a new two-year $100,000 grant from the American Chemical Society Petroleum Research Fund to investigate "Fingerprinting non-linear response of star-branched and dendritic polymers: LAOS, Lissajous and Harmonics."

Weeks

Dr. Brandon Weeks, with co-PI Dr. Louisa Hope-Weeks (Chemistry), has been awarded funding through a five-year grant, "Awareness and Localization of of Explosives and Related Threats (ALERT)." The grant funds a multi-institution Department of Homeland Security Center of Excellence for the study of explosives performance and detection.

In addition, Dr. Weeks was awarded a three-year contract from the Air Force Office of Scientific Research for the study of microwave interactions with energetic materials. The latter is a collaborative proposal with Dr. Michelle Pantoya (PI-ME) and Dr. Mohammad Saed (ECE).

Several faculty members are also taking leadership roles in professional societies. Dr. McKenna has been elected president of the Society of Rheology; his term will start October 17, 2013.

Dr. Khare has been selected as the chair of AIChE's Area 1a (Thermodynamics and Transport Properties) Programming Committee; his term will begin at the 2014 annual meeting.

Dr. Simon is the conference chair for the 2014 annual meeting of the North American Thermal Analysis Meeting, to be held in Santa Fe, N.M., next September.

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External Advisory Board News

The mission of the Department of Chemical Engineering's External Advisory Board (EAB) is to provide feedback and support for departmental education and research goals. The EAB serves a key role in our undergraduate degree accreditation process, vetting program assessment and changes related to continuous improvement and serving as a resource for industry needs with respect to program graduates. The EAB also provides input on the graduate program and research, bringing perspectives from other academic departments and government laboratories.

Under the leadership of Chair David Crouch and Vice-Chair Mark Darby, the EAB is also organizing subcommittees composed of EAB members and other alumni to better serve the department and professional community. Three committees are being organized:

- **Alumni Engagement**, whose primary goal is to offer social opportunities to establish a greater sense of community with ChE graduates and to offer opportunities to interact with faculty and staff;
- **Chemical Engineering Outreach**, whose primary goal is to develop resources for talking to high school students about chemical engineering careers and making presentations at high schools around the state;
- **Department Development**, whose primary goal is to understand department needs and priorities and help with fundraising, as well as to encourage other means of support, including providing opportunities for plant visits and professional interactions.

If you would like to be involved, do not hesitate to contact Dr. Simon!

Safety News

Success in Process Safety


Weeks

The inaugural Process Safety course was taught by Professor Brandon Weeks as an elective in Spring 2013. The course, which will be required for students graduating in 2014, was developed in conjunction with Red Raider leaders from industry. Alumni and external advisory board members, Jack McCavit, Ryan Pederson, Julie Jackson, and David Crouch provided useful information on course content. Special thanks also go out to Chris Coon who not only helped in the development of the course, but also hosted the entire process safety class at the Borger Phillips 66 plant. This was a great experience for the students because they were able to tour the refinery, Chevron Phillips Chemical facilities, and the control room in a single day. Best of all, most of the plant tour presentations were made by Texas Tech alumni so current and past students from the department were able to interact — and it was great for our current students to see how well our alumni are doing.

Weeks will teach the process safety course again in spring 2014, and Phillips 66 will again host the field trip. In addition, guest speakers will be added to the class schedule in order to give the students a broader industrial perspective, including speakers from Swagelock and Phillips. We are always looking for more speakers and more input on course development. If you would like to volunteer to share your experiences on safety or would like to provide an opportunity for the students to visit your site, please contact Dr. Brandon Weeks.

Departmental Safety Initiatives

Creating a culture of safety is the right thing to do. It is not only a professional and ethical obligation for engineers, but as educators, it is also paramount to preparing students for successful careers in industry and academia. The Department of Chemical Engineering has added a required Process Safety course in the undergraduate curriculum; more information on the course developed by Dr. Brandon Weeks can be found on in the article above. At the graduate level, we strive to ensure that our students and postdoctoral researchers not only understand safe laboratory practices but are also committed to safety. In addition to annual online safety training and safety seminars, routine weekly visits to various laboratories are performed by the departmental safety committee which is led by Dr. Sanjoy Bhattacharia, the departmental safety officer. Other committee members include Dr. Ronald Hedden, a graduate student representative, Yunzhe Ma, and the department chair. The safety officer writes an inspection report every week and informs the corresponding principal investigator of the lab.

The aim of these friendly laboratory inspections is to improve students' knowledge of best safe practices and to monitor current practices, including chemical storage, waste disposal, carcinogen use, and operating practices and protocols. Over the past year, we have observed that regular monitoring of laboratory safety has resulted in a significant decrease in safety violations and a decrease in the severity of violations. Moreover, the faculty members are more aware and committed to safe laboratory practices. The Department of Chemical Engineering is ahead of many other departments at Texas Tech in ensuring a safe workplace, and our goal is to be a role model in this and all areas.

Keeping in Touch

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**