



Message from the Chair

The advent of a new semester and a new year is a time for both reflection and planning. The past year, 2014, was an exciting year for the department, with a number of noteworthy achievements:

- The hires of Drs. Sheima Khatib, Jeremy Marston, and Nurxat Nuraje brings us to sixteen tenured or tenure-track faculty members.
- Seven new grants were funded involving seven different faculty members, with Dr. Vanapalli bringing in nearly \$1M of new funding.
- Research expenditures from competitive sponsored projects topped \$3M, the highest level per faculty member in the university, with \$4.8M in total research expenditures.
- A record-number of graduate degrees were awarded: twelve Ph.D. and five M.S. degrees, with Dr. Gill's Ph.D. student, Yunzhe Ma, winning the 2014 Texas Tech Outstanding Dissertation Award.
- Forty-four bachelor's degrees were awarded, with average starting salary over \$78,000.

The department has considerable momentum towards being the top department in the university and towards obtaining national recognition for our excellent students, productive faculty, and successful alumni. Growth continues at both undergraduate and graduate levels, with 129 freshmen, 20 transfer students, and 22 new graduate students arriving in Fall 2014. We continue to make considerable infrastructure investments with new research laboratories coming online and new equipment purchased for the undergraduate laboratory — including gas absorption column and fluidized bed experiments — made possible by a \$93,000 gift from Phillips 66.

Please feel free to visit the department and learn more about our efforts and how you can contribute. And of course, I wish you all the very best of wishes for a happy, healthy, and productive 2015!

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

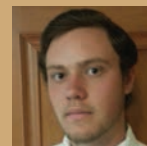


Simon

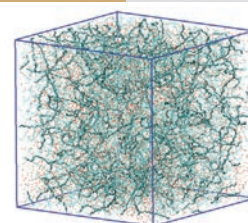
Student News

Undergraduates Earn National Recognition

In November 2014, chemical engineering senior Michael Wurmstein won first place in the Undergraduate Poster Competition of the Computing and Process Control Division at the annual meeting of the AIChE in Atlanta, Georgia. A double major in mathematics, he has been working with Dr. Rajesh Khare since summer 2014, as part of a NSF-sponsored project focused on tuning polymer chemistry to design an energy efficient pervaporation membrane for separation of an alcohol-water biofuel mixture. Wurmstein's part of the project involved preparing atomistically detailed models of the candidate copolymer structures with different chemistries. Although preparation of these molecular models is a challenging task, Wurmstein successfully developed a software tool to construct the copolymer structures. Importantly, the tool can be extended to allow for arbitrary polymer chemistry and topology and will help the team develop design rules to connect polymer chemistry to pervaporation membrane performance. In addition to performing undergraduate research, he tutors underclassmen in chemical engineering.



Wurmstein



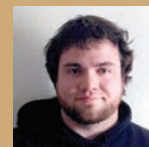
Simulation Box

Junior Matt Kovalski won second place in the Undergraduate Student Poster Competition of the Fracturing Impacts and Technologies Conference hosted in Lubbock in September 2014. Kovalski is supervised by Dr. Chau-Chyun Chen and is working to develop engineering correlations for viscosity of aqueous electrolyte solutions. He is currently working with Dr. Chen on a manuscript for publication, and he also plans to present his most recent work at the Texas Tech Undergraduate Research Conference this spring.

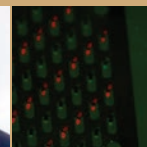


Kovalski

Junior Dallas Drane has been performing undergraduate research with Dr. Harvinder Gill since Fall 2013, working on microneedle arrays composed of microneedles 700 μm -long and separated by just a couple of hundred micrometers on a 1 cm x 1 cm array. Drane is developing a sophisticated coating algorithm that has the precision and identification-capability to locate and coat any individual microneedle on an array. Through this unique 'addressing' capability, any microneedle on the array can be coated with any drug, enabling delivery of multiple drugs through the same device.

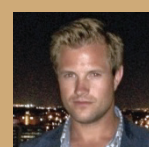


Drane

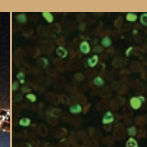


Microneedle array coated with red and green fluorescent molecules

Also working in Dr. Harvinder Gill's laboratory, senior Lance Reynolds' project involves synthesis of polymers inside pollen grains to create a sustained and controlled drug delivery system. The research is part of Gill's pioneering work to use pollen grains for oral drug and vaccine delivery. Pollen grains are 20-30 μm in diameter and have shells that naturally contain micropores a few micrometers in diameter. Reynolds' project involves using these micropores to perform polymer synthesis inside the pollen grains and to characterize the resulting polymer-in-pollen drug delivery system.



Reynolds



Fluorescent polymer synthesized inside pollen grains



Student News

AIChE Student Chapter News

The 2014-2015 academic year has been filled with activities and events for the Texas Tech AIChE Student Chapter. The new officers began the year with a goal to improve the organization, focusing on student involvement and professionalism. In the fall semester, more than ten company events were hosted to improve students' knowledge of potential employers. One of the new events introduced were dinner-and-learns, where student members were able to interact with company employees in a more casual environment without the traditional company presentations. This setting allowed students to gain greater insight into the daily lives of chemical engineers and should help prepare them for life after graduation.



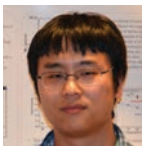
AIChE Officers

Student volunteers from the chapter spent a Saturday in the fall performing house and yard service around Lubbock to raise funds for AIChE's semi-annual community service event, Aphasia, for stroke victims. To date, the chapter has raised over \$18,000 for this cause.

The last major event organized by the chapter in the fall was the National AIChE Student Conference in Atlanta, Georgia. This year, eighteen student members attended the meeting, which was a new record. Attending the conference allowed students to network with other universities and business professionals. Students also attended educational workshops, the ChemE Car competition, and ChemE Jeopardy.

Graduate Student News

Haoyu Zhao won first place in the Student Poster Competition at the North American Thermal Analysis Society meeting, hosted in Santa Fe, New Mexico in September 2014. His poster, titled "Methyl Methacrylate Polymerization in Nanoporous Matrix: Reactivity and Resulting Properties" was coauthored by Fatema Begum, Ziniu Yu, Ronald C. Hedden, and Sindee L. Simon. Zhao graduated with a Ph.D. in December 2014. His dissertation was supervised by Dr. Simon.



Zhao

Nguyen Nguyen, supervised by Dr. Chau-Chyun Chen, won second place in the Graduate Student Poster Competition of the Fracturing Impacts and Technologies Conference hosted in Lubbock in September 2014. Nguyen graduated with a master's degree in December 2014 and is now working for Valero in Ardmore, Oklahoma.



Nguyen

Renewable Energy Global Innovations (REGI) has identified an article by Dr. Rong Xu as a Key Scientific Article. Xu, an August 2014 Ph.D. graduate whose dissertation was supervised by Dr. Ted Wiesner, published "The Conceptual Design of a Two-Step Solar Hydrogen Thermochemical Cycle with Thermal Storage in a Reaction Intermediate" in the International Journal of Hydrogen Energy.



Xu

Undergraduates Earn National Recognition (continued)

In Dr. Siva Vanapalli's laboratory, junior Beatrice Ncho performed undergraduate research in Fall 2014. As part of her project, she investigated the effect of salts on the rheological properties and phase separation of guar gum solutions in order to optimize the performance of fracking fluids.

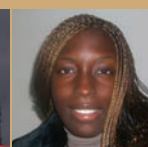


Ncho

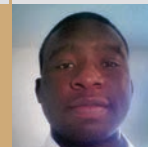
Seniors Eileen Wainaina, Yoh-Kytannie Ouattara, and Pega Kone performed research with Dr. Ted Wiesner in the area of mass transfer, along with high school senior Bluyé Demessie of the Texas Tech Clark Scholars program. Of particular interest is how the transport of a solute changes as the sorbent decreases in size on the nanoscale (100 nm down to 10 nm). In summer 2014, Ouattara and Demessie measured the rates of dissolution of nanoparticulate silica in acidic and basic media, whereas in fall 2014, Wainaina and Kone quantified the reduction of ferricyanate by iodide ion on gold nanospheres. Both sets of experiments employed spectrophotometry and the data that were generated formed the preliminary data for an NSF proposal.



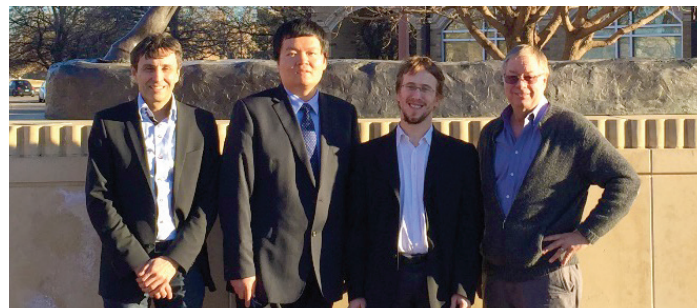
Wainaina



Ouattara



Kone



(L-R) Gilles Régnier, Xiguang Li, Guillaume Miquelard-Garnier, Gregory B. McKenna

Graduate Student Defends Franco-Texan Ph.D.

Chemical engineering graduate student Xiguang Li successfully defended a joint Ph.D. on January 15. The project was sponsored by a French Chateaubriand Fellowship, the National Science Foundation, and the John R. Bradford Endowment at Texas Tech.

The Chateaubriand Fellowship awarded to Li gave him the opportunity to study and conduct research in the laboratories of Arts et Métiers ParisTech in Paris, France, on graphene based nanocomposites made by a novel processing technique called forced assembly by multi-layer co-extrusion. The work in Paris was co-supervised by Dr. Gilles Régnier and Dr. Guillaume Miquelard-Garnier. Upon returning to Texas Tech, Li completed his Ph.D. under the supervision of Dr. Gregory B. McKenna, where he adapted the Texas Tech bubble inflation method to characterize composite nano-sandwich structures as a new means of testing the graphene nanocomposites.

The thesis defense was held in Lubbock before a joint committee that consisted of four French "membres de jury de thèse" and five U.S. members of the Ph.D. committee. Li will be awarded a Ph.D. from both Arts et Métiers ParisTech and from Texas Tech in May 2015.



New Faculty

Dr. Sheima Khatib

Dr. Sheima Khatib joined the faculty of the Department of Chemical Engineering as a tenure-track assistant professor in January 2015. Dr. Khatib obtained her undergraduate and master's degrees in chemical engineering from the Universidad de Malaga in 2001 and 2002, respectively. Her Ph.D. in chemistry is from the Autonomous University of Madrid in 2007, where she focused on the synthesis and evaluation of mixed metal oxides as efficient industrial redox catalysts. She then spent three years as a researcher at the Spanish National Research Council, ranked number one in the Spanish Research Ranking and among the top ten in the European Research Ranking. There, she continued her work in the area of heterogeneous catalysis, expanding her experience into adsorption studies with porous industrial catalysts (zeolites, pillared clays). She then came to the U.S. to work with Dr. Ted Oyama at Virginia Tech, where she directed his laboratory and conducted research in the development of novel ceramic and palladium-based composite membranes for hydrogen separation and catalytic membrane reactors.



Khatib

Dr. Khatib's research at Texas Tech will focus on alternative methods for the sustainable and efficient direct conversion of methane — which is abundant in natural gas — into hydrogen, a clean energy carrier, and other highly value-added aromatic products. These methods, including methane aromatization and methane decomposition, will use mixed metal oxide and mixed metal carbide catalysts supported on micro- and mesoporous materials such as zeolites and pillared clays. She plans to teach undergraduate and graduate courses in mass transfer and reaction kinetics, as well as develop courses in catalysis.

Dr. Nurxat Nuraje

Dr. Nurxat Nuraje joined the faculty of the Department of Chemical Engineering as a tenure-track assistant professor in January 2015. Most recently Dr. Nuraje worked at MIT with Profs. Angela Belcher, Michael Rubner, and Robert Cohen as a postdoctoral researcher. He conducted research on the development of functional thin films for anti-fogging, anti-reflection and anti-bacterial applications, functional nanomaterials for oil field tracking, surfactant delivery systems, and photoactive nanomaterials for solar cells and water splitting applications. Dr. Nuraje obtained his Ph.D. in chemistry at The City University of New York (CUNY) in 2008 and worked as a chemist at Xinjiang Institute of Chemistry of Chinese Academy of Science in the field of enhanced oil recovery. He has won a number of awards, including the Graduate Student Silver Medal at the 2008 meeting of the Materials Research Society for his doctoral work on Room-Temperature Material Synthesis Using Ring-Shaped Peptide Assemblies as Template.



Nuraje

Dr. Nuraje's research at Texas Tech will primarily focus on nanomaterials and biomaterials. In particular, his goal is to explore the physical and chemical properties of new functional materials and develop their "bottom-up" assembly and formation into hierarchical structures. The research could lead to breakthroughs in fundamental science, as well as to revolutionary technologies in solar energy conversion, environmental remediation, and enhanced oil recovery. He plans to teach core courses in thermodynamics and to develop electives in the areas of energy and sustainability, enhanced oil recovery, and synthesis of nanomaterials for these applications.

Alumni News

Rene Hatten Wade, a 1983 B.S.Ch.E. graduate, will be honored in April as a Whitacre College of Engineering Distinguished Engineer (DE). As vice president for product quality at Mary Kay, Inc., Wade oversees global quality for the company, including for multiple manufacturing sites and the distribution network. She is dedicated to excellence and recognized for her selfless professional and community service. She joins many of our distinguished alumni as a DE, including Ken Baker and Jack McCavit, who were honored in 2014 and 2013, respectively.



Wade

Dr. Eric Vasbinder has received the Golden Shield Award from Phillips 66. Vasbinder, a 2004 Ph.D. graduate of the department, is currently the Advanced Controls and Optimization Team Lead for the Borger Refinery. His duties include regulatory control system support and applications, alarm management, and advanced model based control implementation. The award, only seven of which were given in 2015, recognized the significant contributions of the Advanced Process Control group, particularly for leadership, cost savings, developing a strategy for multi-unit integration optimization, and creating a value-adding, disciplined and self-sustaining company program.



Vasbinder

Jeff Morris, a 1974 B.S.Ch.E. graduate, vice chairman of Alon USA, and a Whitacre College of Engineering Distinguished Engineer, was named the 2014 Dream Achiever by Communities In Schools of the Dallas Region (CISDR). The Communities in Schools program has built a successful legacy and has an extensive record of exceptional outcomes. Morris has contributed significantly to this mission, serving on the board of directors for the past twelve years and establishing the CISDR Endowment with a gift from Alon in 2002 as Alon president and CEO.



Morris

The External Advisory Board, led by Mark Darby as chair and Julie Jackson as vice-chair, has a mandate to support and provide feedback to the department chair, to help the department assess industry needs with respect to our graduates, and to help the department with alumni engagement, development, and outreach activities. Working committees established in 2014 to support the department's development and outreach activities are fully functional. One such committee, headed by Andrew Spangler and Julie Jackson, is working to increase gifts for undergraduate scholarships, graduate student fellowships, laboratory and department renovations, and endowed professorships for both junior and senior hires. Another committee headed by Mark Darby is working to develop communication materials to aid in informing high school students about career opportunities in chemical engineering — why chemical engineering is the most versatile degree to pursue and why Texas Tech is the college to attend. The main goal is to attract bright high school students with an interest in STEM (Science, Technology, Engineering and Math) to the Texas Tech Department of Chemical Engineering.



Darby



Jackson



TEXAS TECH UNIVERSITY

Department of Chemical Engineering

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Recent Ph.D. Graduates



Sriya Das - 2014

Dissertation Title

"Dispersion and Rheology of Stabilized Graphene Colloids and Gels"
Dr. Micah J. Green
Process Engineer
Intel Corporation
Portland, OR

Advisor

Current Position

Institution

Location



Xiaojun Di - 2014

Dissertation Title

"Investigation of the Cause of the Glass Transition and Size Dependent Melting Behavior"
Dr. Greg McKenna
Post-Doctoral Fellow
Yale University
New Haven, CT

Advisor

Current Position

Institution

Location



Qiuying Gu - 2014

Dissertation Title

"Model-based Strategy for Control of Hydraulic Fracturing Processes"
Dr. Karlene Hoo
Sr. Technical Professional
Halliburton
Houston, TX

Advisor

Current Position

Institution

Location



Jihye Kim - 2014

Dissertation Title

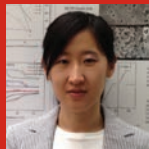
"Drop-based Microfluidics and Crystallization Studies"
Dr. Siva Vanapalli
RDD Engineer III
Baker Hughes
Tomball, TX

Advisor

Current Position

Company

Location



Lan Ma - 2014

Dissertation Title

"Design of a Continuous-Flow, Immobilized-Cell Fermentor System for Production of Bioethanol"
Dr. Ronald Hedden
Biochemical Fermentation Engineer
CP Kelco
San Diego, CA

Advisor

Current Position

Institution

Location



Lakshmi K. Muthu Kumar - 2014

Dissertation Title

"Computational Study of Cello-Oligosaccharide Adsorption/Desorption from the Cellulose Crystal Surface during Enzymatic Hydrolysis"
Dr. Rajesh Khare

Advisor



Deepak E. Solomon - 2014

Dissertation Title

"Microfluidic Tools for Complex Fluid Rheology and Force Characterization of Micro-Organisms"
Dr. Siva Vanapalli
Chief Executive Officer
Neofluidics, Inc.
Amarillo, TX

Advisor

Current Position

Institution

Location

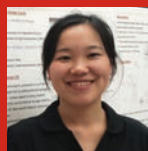


Timothy M. Spinner - 2014

Dissertation Title

"Performance Assessment of Multivariate Control Systems"
Dr. Raghunathan Rengasamy

Advisor



Rong Xu - 2014

Dissertation Title

"Modeling of Solar Energy Conversion into Hydrogen Energy and Electricity"
Dr. Theodore F. Wiesner
Research Associate
Texas Tech University
Lubbock, TX

Advisor

Current Position

Institution

Location



Xin Zhang - 2014

Dissertation Title

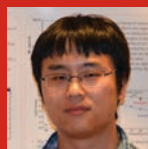
"Fabrication and Characterization of Micro- or Nano-Scale Organic Energetic Materials"
Dr. Brandon L. Weeks
Post-Doctoral Associate
Pacific Northwest National Laboratory
Richland, WA

Advisor

Current Position

Institution

Location



Haoyu Zhao - 2014

Dissertation Title

"Nanoconfined MMA Polymerization and Structural Recovery in Ge-Se Glasses"
Dr. Sindee L. Simon
Post-Doctoral Associate
Texas Tech University
Lubbock, TX

Advisor

Current Position

Institution

Location



Jing Zhao - 2014

Dissertation Title

"Dynamics Below the Glass Transition Temperature and Viscoelastic and Calorimetric Investigation of Different Fossil Resins"
Dr. Greg McKenna
Post-Doctoral Associate
University of Akron/NIST
Gaithersburg, MD

Advisor

Current Position

Institution

Location

Faculty News

Drs. Harvinder Gill and Silke Paust (Texas Children's Hospital and Baylor College of Medicine) were awarded a five-year, \$2.8M NIH grant to evaluate the efficacy of a novel oral pollen vaccine to activate Natural Killer cells and to provide protection against HIV infection.



Gill

A video submitted by Dr. Jeremy Marston and coauthors from King Abdullah University of Science and Technology in Saudi Arabia won first place in the 2014 Gallery of Fluid Motion Award competition sponsored by the Division of Fluid Dynamics of the American Physical Society. The video, which can be viewed on [YouTube](https://www.youtube.com/watch?v=UgWp1tYU8p4), was also highlighted in the BBC report, The Weird World of Everyday Liquids.



Marston

Dr. Siva A. Vanapalli will receive a Rising Star Award from the Cellular and Molecular Bioengineering Special Interest Group of the Biomedical Engineering Society. Rising Star Awards are given to a select group of young faculty who then speak in a special session at the BMES-CMBE meeting. Vanapalli also recently received a \$300,000 NASA grant to fly worms in space.



Vanapalli

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

Incoming faculty member Dr. Nurxat Nuraje has been selected as the winner of the "Joseph Wang Award" by Congizure Publishing Division. The award recognizes outstanding young researchers in the area of nanomaterials and is awarded based on originality of research, impact of research, quality of publications, innovation, and professional standing.