



## Message from the Chair

The 2015/16 academic year is well underway. We look forward to a great year, topping last year's accomplishments, which included being the number one research department in the University with over \$ 3.2 M in external research expenditures, the highest level per faculty member in the University for the second year running. Graduate student enrollment continues to grow with 27 new students matriculating this fall for a total of 70 Ph.D. and 16 M.S. students. Undergraduate enrollment numbers are increasing even faster with 512 students in the major, and 238 enrolled in the first-year Introduction to Chemical Engineering course this fall!



Simon

As expected, the faculty and students continue to be recognized for their outstanding work, including the following noteworthy achievements:

- Ten of our sixteen faculty members brought in new research awards last year.
- Dr. Harvinder Gill was appointed as the Whitacre Endowed Chair in Science and Engineering in recognition of his important contributions to the Department, College, and University.
- Dr. Siva Vanapalli was awarded the Bill Sanderson Faculty Fellowship in recognition of his outstanding performance in research, teaching, and service.
- Dr. Gregory B. McKenna was named recipient of the 2014/15 Bernie E. Rushing Jr. Faculty Distinguished Research Award from the Texas Tech Parents Association.
- Dr. Brandon Weeks was awarded the 2014/15 Spencer A. Wells Award for Creativity in Teaching from the Texas Tech Parents Association.
- Forty-seven B.S. students graduated in May, 2015, with an average starting salary of \$ 74,000.
- Twelve current students were honored by a new Award for Academic Excellence in Chemical Engineering.

Enjoy browsing through the newsletter for more news, and don't forget to share your successes with us. I encourage you all to also stop by and see me the next time you are in Lubbock.

All the best,  
Dr. Sindee Simon  
P. W. Horn Professor  
Whitacre Department Chair in Chemical Engineering

Keeping in Touch - We would love to hear from you. Send news updates to [Sindee.Simon@ttu.edu](mailto:Sindee.Simon@ttu.edu). Keep your contact information up to date at [www.coe.ttu.edu/info](http://www.coe.ttu.edu/info)

## Student Chapter News

The Texas Tech Student Chapter of AIChE has been hard at work to provide resources and professional events to foster students' development. During spring 2015, information sessions were held with Ecolab and CP Chem. Members also attended the AIChE Regional Student Conference in Austin, Texas, where the Texas Tech ChemE Car Team received third place in the ChemE Car Team competition out of a total of nine teams. In the last major event of the past year, AIChE represented the department in the first annual WCOE E-Week, where they took first place in a friendly competition between all the engineering disciplines. With the beginning of the Fall 2015 semester, AIChE is already planning a full schedule for its members. The organization is expecting to host nearly ten information sessions with companies, including ExxonMobil, Kinder Morgan, and Bayer. It will also support an info session with the MBA program and schedule several presentations with student and faculty researchers to give members more information on opportunities for pursuing advanced degrees. Selected AIChE members will also attend the AIChE National Student Conference in Salt Lake City, Utah, where they will represent the department in the AIChE Jeopardy competition and/or by poster presentations on their research. Dr. Lacerda is now advising AIChE, along with Dr. Hedden as co-advisor.



2015/16 AIChE Officers, pictured from left to right: SORC Rep Cameron Riley, Vice President Brian Wang, Secretary Heather Dorrance, Treasurer John Svab, and President Joshua Castilaw.

The Chemical Engineering Graduate Student Association (ChEGSA) led by 2015/16 officers, Michael Sees as President, Farah Jacob as Vice President/Secretary, and Md Moniruddin as Treasurer, hosted a department picnic to kick off the fall semester and welcome new graduate students. The organization hosts coffee hour before Friday seminars and aims to promote interdisciplinary and cultural interaction among the chemical engineering graduate students at Texas Tech. In addition to social activities, the organization has become a platform for students to exchange ideas and learn about different areas of research through a variety of professional events. The organization is advised by Dr. Wiesner.



ChEGSA picnic, September 19, 2015.

The Texas Tech Student Chapter of the Society of Plastics Engineers is an organization of both undergraduates and graduate students who are interested in careers in polymers and plastics. The group is led by 2015/16 President Heedong Yoon, Vice President Pouria Nourian, Treasurer Zhiyuan Qian, and Secretary Nazam Sakib. Their plan for 2015/16 includes inviting guest speakers from industry to talk to members and hosting a poster competition jointly with ChEGSA. Social events include hiking trips, and they are in process of updating their Facebook page and their alumni database. Members also participate in polymer-related outreach activities to K-12 students and will represent Texas Tech at the annual International Polyolefins Conference in February 2016.



## Symposium of Scholars

### *Symposium of Scholars in Honor of Maddox Chair Professors Chen and Reible*



(L-R) Dr. Chau-Chyun Chen, Jim Maddox, Dr. Danny Reible and Dr. Al Sacco Jr.

A symposium of scholars highlighting talks by eight National Academy of Engineers was held September 3 and 4, 2015, at Texas Tech University. The symposium was held in honor of the Jack and Donovan Maddox Chairs, Profs. Chen and Reible, who are both members of the National Academy of Engineers. The event was the first of its kind at a Texas institution and featured talks on the future directions in science and engineering from eminent scholars in the areas of bioengineering and remediation, fluid mechanics, and thermodynamics and energy.

Prof. Chau-Chyun Chen is the Jack Maddox Distinguished Engineering Chair in Sustainable Energy and a member of the faculty in Chemical Engineering. He started his position at Texas Tech in 2013, after a distinguished career at Aspen Technologies. In the last two years, he has mentored fourteen graduate students, two postdoctoral researchers, and two undergraduate researchers on a variety of projects to advance molecular thermodynamic modeling, including for high salinity brines, defense nuclear waste, asphaltene precipitation, energetic materials, and energy storage systems. The work has resulted in three patent applications and external research grants from Savannah River National Laboratory and Apache. Perhaps more importantly, Dr. Chen is

raising the visibility of thermodynamics research at Texas Tech through publications and presentations with seven refereed journal articles published, seven more accepted or in review, and twenty-five presentations in national and international conferences. A whopping sixteen presentations will be given by members of the research team in the upcoming AIChE Annual Meeting in Salt Lake City this November!

Prof. Danny Reible, the Donovan Maddox Distinguished Engineering Chair, is a professor in Civil and Environmental Engineering with a secondary appointment in Chemical Engineering. Dr. Reible's research focuses on the transport and fate of contaminants in the environment and their assessment and remediation, particularly in wetland and subaqueous sediments. Since coming to Texas Tech in 2013, Dr. Reible has attracted more than \$3 M in research funding from government and private sources and attracted two new faculty members to the environmental and water resources program. He is currently working with eleven PhD students and has built a state of the art environmental laboratory. Danny was recently honored with the lifetime achievement award of the Association of Environmental Health Sciences in 2013.

# Undergraduate Research Highlights



Chemical engineering junior, Deborah Albus, is working in Dr. Vanapalli's laboratory to develop a microfluidic approach to measure the static and the dynamic interfacial tension for different liquid pairs. She uses a microfluidic loop to immobilize a droplet of one liquid and then uses the other liquid to squeeze out the

droplet through a constriction. Interfacial tension is obtained by simply monitoring the onset pressure at which the droplet squeezes through. Deborah is testing the approach for water and mineral oil with several different surfactant concentrations, as well as testing dynamic interfacial tension between the liquids as a function of time.



Kosi Anazia, from Lagos, Nigeria, is a junior in chemical engineering. She has been an undergraduate researcher in Dr. Vanapalli's laboratory since Spring 2015. Her research focuses on determining the pressure drop of confined droplets in microchannels.

Although previous studies have been done to quantify the pressure drop of moving droplets in confined channels, the influence of channel cross-section variability on the pressure drop is not clear. A better understanding is expected to help researchers design and implement complex and robust microfluidic systems.



Vi Cao is a senior chemical engineering student working in Dr. Wei Li's laboratory using capillary flow layer-by-layer assembly to prepare drug-loaded nano films for cancer therapy. He is a co-author for a paper that Dr.

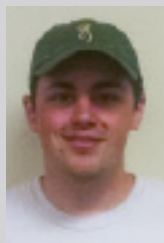
Wei Li is preparing to submit in the fall, and the work will be presented by Dr. Li at the BMES conference and by Ziyi Dong at the AIChE conference.



Sarah Crawford is a junior in the ChE program who is working on a collaborative project with Drs. Hedden and Lacerda involving polymer gels as scaffolds for tissue engineering applications. The goal is to obtain a flexible, mechanically robust scaffold that can withstand the natural flex and stretch cycles

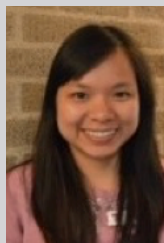
of muscles such as heart valves. Sarah has been working with poly(acrylic acid) gels, as their mechanical properties are good and their carboxylic acid groups are conducive to collagen

binding. Moving forward, the focus will be on molding the gels into a scaffolding for the cells to grow into the proper shape and ultimately form synthetic tissue.



Aric Denton is a senior from Big Spring, Texas, and currently enrolled in the BS/MS program in chemical engineering. Aric has conducted undergraduate research under Dr. McKenna for the past year measuring glass transition reductions in ultrathin polymer films. He is

currently upgrading the Rheometrics RMS-7200 rheometer to a more current technology; this is the only known RMS-7200 that is still operational. Additionally, Aric is researching polymer glass fragility in ultrathin films. In addition to being a member of the Society of Plastics Engineers, Society of Rheology, and AIChE, during his time at Texas Tech, he has been a Red Cross volunteer, Tech's Red Cross Club treasurer, Engineers Without Borders's recruitment chairman, Humane Society of West Texas volunteer, Delta Sigma Phi's vice president, and he traveled to Honduras for a humanitarian mission. He is planning to graduate with his M.S. in the summer of 2017 and pursue a career in polymer research and development.



Mai Dinh, a chemical engineering senior, joined Dr. Lacerda's laboratory in June 2015. Mai's research involves optimization of live cell staining techniques for primary cells in culture. The goal of her project is to monitor cell differentiation and migration while in co-

culture. As part of the work, Mai investigated cell cultures on multiple supports and has become familiar with various cell morphologies and the challenges of fluorescence imaging. Mai has decided to pursue a BS/MS degree after her summer research experience.



Michael Doerfert is a junior in our program who has been working in Dr. Hedden's group on separation processes for biofuels production. Michael is developing polymer networks and gels that can efficiently absorb alcohols out of aqueous mixtures. In spring of 2015, Michael presented his work involving a new

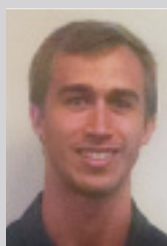
gel absorption process for recovering biobutanol at the TTU Undergraduate Research Conference. In summer of 2015, his work focused on pervaporation membranes, characterizing the swelling and diffusion properties of membrane polymers. The projects have helped Michael understand how different aspects of chemical engineering research must come together to produce a useful biofuels separation process.



Asmaul (Nain) Indah is an international student from Indonesia who is currently a junior in chemical engineering. She has been working in Dr. Hedden's laboratory on a collaborative project to develop novel material systems for road pavement for the state of Texas. In particular, the research aims to address problems associated with deformation caused by extreme temperature swings. To solve this problem, Nain is investigating the feasibility of blending encapsulated phase change materials in asphalt to reduce the variations in the pavement temperature. Nain's summer internship culminated in the preparation of the first pavement samples containing PCMs.



Chemical engineering senior, Matt Hansen, is doing research with Dr. Chen. He is investigating the ability of the Non-Random Two Liquid Segment Activity Coefficient (NRTL-SAC) thermodynamic solubility model, first proposed by Chen and Song, to predict solubility of solvent-solute systems. Accurate predictions are important for the development and optimization of chemical processes that involve, for example, crystallization out of solution. Matthew will present his work at the 2015 AIChE National Meeting.



Matt Kovalski is a senior in chemical engineering from Keller, TX. He is working with Dr. Chen on predicting viscosity, an important transport property for designing chemical processes, especially in terms of heat and mass transfer calculations and process simulation. In particular, Matt is working on accurate engineering viscosity models for aqueous electrolyte solutions for desalination processes, as well as for processes that treat the high salinity water produced from oil and gas production. He plans to present his research at the 2015 AIChE National Meeting.



Jonathan Wilhelm is a junior in the chemical engineering program and is from Amarillo, Texas. Jonathan is working under Dr. Hedden and Dr. Khare on design and simulation of materials for pervaporation membranes. In Dr. Hedden's lab, Jonathan assisted in the production of membranes which were used for pervaporation trials to selectively pass ethanol in order to purify biofuels. In Dr. Khare's group, Jonathan ran molecular dynamics simulations for poly(dimethylsiloxane), a polymer used extensively in pervaporation membranes. Such simulations allow the researchers to see how the polymer chains interact with water and ethanol on a molecular scale, which gives insight into the behavior of the membranes.

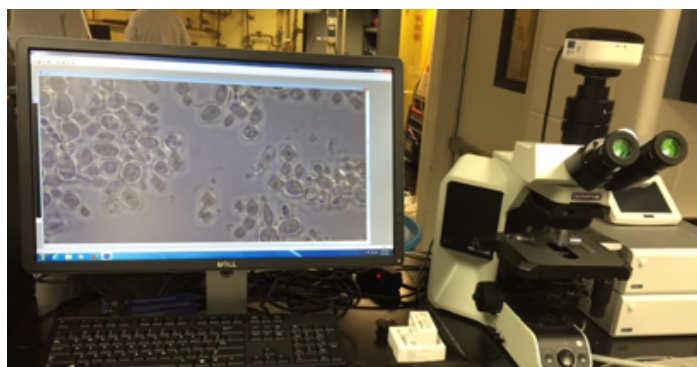
## Undergraduate Teaching Laboratory Upgrades

Several new experiments have been added to the undergraduate teaching laboratory in the past few years with the help of generous donations from Phillips 66, including a bioreactor, microscope with hot stage, gas absorber, and fluidized bed experiments. The bioreactor was purchased in 2014 and is currently used in CHE 4232 Unit Operations Lab to investigate the mass transfer of oxygen in culture media and the growth kinetics of yeast. The microscope is applied in the bioreactor experiment for observing cell morphology and performing cell counts. The microscope will also be used with the hot stage to study polymer crystallization in CHE 5344 Polymers and Materials Laboratory. The gas absorber and fluidized bed experiments were delivered this past summer and experiments are under development.

We plan a major renovation of the teaching laboratory with a move from the basement of the Chemical Engineering Building to a larger and high-bay space in the old Petroleum Engineering Building. In addition to being able to accommodate the growing class sizes, the larger space will also allow us to develop a state-of-the-art unit operation and control room. We are currently in the design stages, working with alumnus Trey Porter (BSChE 2009, now working for Fluor) on a preliminary design. We hope to have the new laboratory up and running in the next academic year.



Graduate teaching assistant, Michael Sees, with seniors Aaron Gonzalez, Michael Wurmstein, and Jonathan Vu in the undergraduate Unit Ops Laboratory.



Microscope used in the bioreactor experiment.

# Faculty News



Dr. Harvinder Gill

Dr. Harvinder Gill has been appointed as the Whitacre Endowed Chair in Science and Engineering in recognition of his important contributions to the Department, College, and University. Dr. Gill started as an Assistant Professor at Texas Tech in 2009 after completing his Ph.D. at Georgia Tech and postdoctoral work at Emory University. He received promotion to Associate Professor with tenure in September 2015. Dr. Gill's research focuses on micro-nano medicine, vaccination, and drug delivery in an effort to address grand challenges in the biomedical and bioengineering field. His work is creative, innovative, and meticulous in approach. His novel projects include the first use of pollen grains for oral vaccinations, funded by over \$ 2.5 M in grants, including the NIH Director's New Innovator Award and the Defense Advanced Research Projects Agency (DARPA) Young Faculty Award. In a second but equally creative project, Dr. Gill is using synthetic nanoparticles to develop an intranasal universal influenza vaccine to offer protection against existing and future strains of influenza. Dr. Gill is a fantastic mentor, using these research projects as vehicles to train students and develop their critical thinking skills. One of his Ph.D. students received the prize for Best Dissertation at Texas Tech in 2014, and he has worked with twenty-six undergraduates and six high school students, several of whom have received multiple honors for their research with Dr. Gill.



Dr. Siva Vanapalli

Dr. Siva Vanapalli has been awarded the Bill Sanderson Faculty Fellowship for his outstanding performance in research, teaching, and service. Dr. Vanapalli joined the Department of Chemical Engineering in the fall of 2008 as a tenure-track Assistant Professor and was promoted to Associate Professor with tenure in September 2014. Dr. Vanapalli's research efforts focus on the science and engineering of microfluidics, and in particular, on driving new technologies for biological analysis and applications. One of the major contributions of his laboratory is the development of droplet-based dilution devices for high throughput drug screening. His group has also recently developed a microfluidic device for measuring the viscosity of individual cells which allows metastatic tumor cells to be distinguished from healthy cells in a

variety of cancers, including brain, prostate, and leukemia. His laboratory has been funded through fifteen successful proposals totaling over \$ 3 M, including new grants obtained in the last year from NIH, NASA, USDOA, and the Cancer Prevention and Research Institute of Texas (CPRIT). A crucial element responsible for Dr. Vanapalli's success is his ability to forge research collaborations. It is well acknowledged by the scientific community that to solve grand challenges in engineering and medicine requires interdisciplinary effort. Dr. Vanapalli's research exemplifies this principle with collaborators in Mechanical Engineering, Chemical Engineering, and several departments at the Texas Tech Health Science Center.



Dr. Gregory B. McKenna



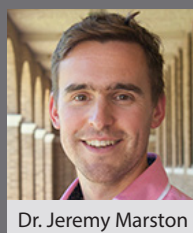
Dr. Brandon Weeks

Dr. Gregory B. McKenna was named recipient of the 2014/15 Bernie E. Rushing Jr. Faculty Distinguished Research Award from the Texas Tech Parents Association, and Dr. Brandon Weeks was awarded the 2014/15 Spencer A. Wells Award for Creativity in Teaching from the Texas Tech Parents Association. Both were honored at the Texas Tech Parents Association breakfast, as well as at the Faculty Honors Convocation, in April 2015.



Dr. Wei Li

Assistant Professor Wei Li received his first grant as principal investigator from CPRIT to study the drug resistance mechanism used by certain cancer cells. The grant, for \$200,000, was one of sixteen grants awarded in Texas under the High-Impact/High-Risk Research category, which is expected to bring new insights and ideas into cancer diagnosis, treatment and prevention. Dr. Jungkyu Kim, an assistant professor in the Mechanical Engineering department, is a co-PI on the project.



Dr. Jeremy Marston

Assistant Professor Jeremy Marston also received his first grant as principal investigator from Bioject Medical Technologies, Inc., for \$2,350. The funds are to perform a preliminary study of needle-free jet injection using high speed imaging with the hope of a larger grant in the future.



TEXAS TECH UNIVERSITY

## Department of Chemical Engineering™

Box 43121 | Lubbock, Texas 79409-3121 | [www.che.ttu.edu](http://www.che.ttu.edu)

### 2015 Awards for Academic Excellence in Chemical Engineering



**Albus**

**Deborah Albus** is a junior in ChE from Whitharral, Texas. She is currently working in Dr. Vanapalli's lab with microfluidic chips and is an officer in the Catholic Student Association, as well as a member of Engineering Ambassadors. After graduation, she hopes to work for an innovative company.



**Obianyor**

**Chiamaka Obianyor** is a ChE senior from Lagos, Nigeria. She currently performs research with Dr. Wiesner on reaction modelling. In the summer of 2015, she was a research intern at MIT with Dr. W. H. Green. She currently serves as the President of Texas Tech's Chapter of the National Society of Black Engineers and plans to pursue a Ph.D. after the completion of her undergraduate degree.



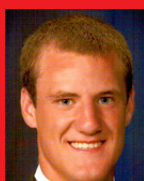
**Dorrance**

**Heather Dorrance** is a senior in ChE from Crosby, Texas. She serves as the secretary for the TTU AIChE Student Chapter and is also involved in several other groups, including the Honors College, Tau Beta Pi, and SWE. She has performed two summer internships with Phillips 66 and has accepted a full-time offer of employment upon graduation.



**Purvis**

**Brittany Purvis** is a junior in ChE from Carlsbad, NM. She has done two co-op rotations with ExxonMobil and has done internships with Mosaic Potash and Kinder Morgan. After she graduates with a B.S. in Chemical Engineering, she plans to work in the petroleum industry.



**Graham**

**Janson Graham** is a junior ChE from Graham, Texas. He has performed an internship with Phillips 66 and plans to intern with them again during summer 2016. Janson is active in the Honors College as a First Year Experience (FYE) mentor and as the community service chairman.



**Rodriguez**

**Samantha M. Rodriguez** is a senior in ChE from Reynosa, Tamaulipas, Mexico. She has performed research at HMRI in the Department of Nanomedicine, and she interned with Kimberly-Clark. Samantha has also been a residential tutor for three years now and is an officer in the engineering honor society, Tau Beta Pi.



**Indah**

**Asmaul Indah** is a junior in ChE from Indonesia. She is performing undergraduate research with Dr. Hedden on two projects, a TxDOT asphalt project and a biofuels project dealing with pervaporation membranes. She enjoys working with polymers and plans to go into the polyolefins industry after graduation.



**Schunk**

**Hattie Schunk** is a junior in ChE from Albuquerque, NM. She has performed undergraduate research with Dr. Casadonte in biofuels and worked as an intern for Sandia National Laboratories where she conducted research on the reprocessing of energetic nano-materials. Hattie is also on the Texas Tech Women's Cross Country and Track team. She plans to pursue her Ph.D. in bioengineering after her undergraduate studies.



**Midiriyanto**

**Fnu Midiriyanto**, a junior ChE, is also from Indonesia. He performed research during the summer of 2015 on metal forming and surface treatment at Indonesian Aerospace. He also previously worked as a summer intern at EF Education First Jakarta. He plans to work in an area of chemical engineering associated with polymer and micro-nano technology.



**Wilhelm**

**Jonathan Wilhelm** is a junior in ChE from Amarillo, Texas. He is currently performing undergraduate research with Dr. Hedden on pervaporation membranes. Aside from his studies, he is a member of the Goin' Band, Catholic Student Association, and American Institute of Chemical Engineers.



**Obi**

**Chude Chike Obi**, a senior in ChE, is from Irving, Texas. He has completed an internship with Western Refining's Optimization group and currently works as a tutor for the TTU athletic department. Chude plans to pursue a doctorate after gaining significant experience in the petroleum industry.



**Wurmstein**

A double major in mathematics, **Michael Wurmstein** has been working with Dr. 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. He plans to pursue a career in Aerospace Engineering.