

# THE CHEMICAL ENGINEERING NEWS

*Internal Newsletter of the Department of Chemical Engineering*

*Carnegie Mellon University*

January 2015

## *Message from the Department Head*

Happy New Year and all the best for 2015! Winter has settled in and I hope you all had a restful break before returning to the Spring semester. The fall semester has been an exciting time in the department and proved to be very busy for all of us. This newsletter reflects the dynamic research and educational activities of our faculty, staff, researchers, visitors and students over the past few months. It is a special privilege for me to recognize all of their hard work.

I am especially glad to gratefully acknowledge our departmental staff, who execute the many complex tasks that make the department a success. It's a pleasure to welcome *Heather DePasquale*, our new Manager of Administration and Accounting, who brings 14 years of financial experience from Computing Services to our department. Moreover, congratulations go to *Larry Hayhurst*, our Machine Shop Foreman, on receiving the CIT Staff Award for Inspirational Leadership.

Notable among faculty recognitions are an Innovators Under 35 Award from MIT Technology Review for *Katie Whitehead*; Thomson Reuters Highly Cited Researcher Selections for *Neil Donahue*, *Ignacio Grossmann* and *Spyros Pandis*, and *Nick Sahinidis*' election as an INFORMS Fellow. Also, our featured article is by Prof. *Aditya Khair*, who was recently recognized as an Early Career Fellow in the College of Engineering. Over the past four years, Aditya and his team of six graduate students and two undergraduates have developed a strong research program through the application of applied mathematics to problems in fluid mechanics, colloid science, electrochemistry, and electrokinetics .

Moreover, this fall our department was strongly represented at the Annual AIChE Meeting in Atlanta, with over 80 technical and research presentations. Particular meeting highlights were two invited technical sessions, and a celebratory dinner for *Ignacio Grossmann*'s 65<sup>th</sup> birthday, organized by two of our loyal alumni, Profs. Chris Floudas and Stratos Pistikopoulos. It was also a great pleasure to reconnect with alumni and friends at the CMU reception.

Finally, I am pleased to welcome 12 new visiting researchers to our department. As described below, new research projects are starting for 38 MS and 13 PhD students, who entered last fall. In addition, five students defended their PhD theses, 9 passed their PhD proposals, and 23 passed their PhD qualifying exams and our masters program graduated 50 students last month. And we especially look forward to congratulating a large senior class in May. Much more information on our activities is described below.

Have a great semester!

*Larry*

## Department News

**Prof. Meagan Mauter** is transitioning from our department to CEE on July 1, 2015. She plans to maintain a courtesy appointment in ChemE as well as strong research and teaching ties with us. During and after the transition Meagan will continue to advise students and share facilities in our department, as needed for her research program. We look forward to further interactions with Meagan in her new position.

ChemE Faculty Selected as Thomson Reuters Highly Cited Researchers:



**Neil M. Donahue, Ignacio E. Grossmann, and Spyros N. Pandis** have been selected as the Thomson Reuters Highly Cited Researchers. As stated in the notification to Professor Grossmann: “Highly Cited Researchers 2014 represents some of the world’s leading scientific minds. Over three thousand researchers earned this distinction by writing the greatest numbers of reports – officially designated by Essential Science Indicators (ESI) as Highly Cited Papers – ranking among the top 1% most cited in the Web of Science for their subject field and year of publication, earning them the mark of exceptional impact. The data used in the analysis is based on the ESI indicators between 2002-2012 (11 years), which included 113,092 Highly Cited Papers. Less than 20 Faculty Members from the top 40 US Chemical Engineering Departments were selected.”

## Staff News

Please welcome **Heather DePasquale**, our new Administration and Accounting Manager, whose office is in DH1101. Heather has been at CMU for fourteen years--the past seven as a Senior Financial Administrator in Computing Services. She lives in the North Hills with her husband Eugene, daughter Gabby (a 2013 CMU graduate) and 3-year old son, Santino.

Congratulations to **Larry Hayhurst**, our machine shop foreman, who won the CIT Staff Award for Inspirational Leadership due to his outstanding work in our department.

At the same ceremony, **Shirley Pavlischak** was nominated for continuing excellence in her work.

Also recognized for years of service were: **Janet Latini** and **Alice Yochum** (15 years) and **Allyson Danley** and **Dave DeLo** (5 years).

### ***Faculty News***

**-Shelly Anna.** Prof. Anna has been elected as a Fellow of the American Physical Society, an honor limited to one-half of one percent of its members. She was recognized for her contributions in extensional rheology and droplet microfluidics, and in particular for elucidating and manipulating the effect of surfactant in microfluidic tip streaming.

**-Larry Biegler.** Prof. Biegler has recently presented seminars at the University of British Columbia, University of Minnesota and Technical University in Dortmund, Germany. For the next three years Larry will have a visiting appointment as the Qiushi Chair Professor at Zhejiang University, China.

**-Andy Gellman.** In September, 2014, Prof. Gellman gave a plenary lecture on “High Throughput Methods in Catalytic Surface Science” at the 17<sup>th</sup> International Conference on Solid Films and Surfaces held Rio de Janeiro, Brazil. He spent September and October, 2014 as a visitor at the Fritz-Haber Institute in Berlin. He is currently serving as the vice-chair of the Gordon Research Conference on Chemical Reaction at Surfaces held in Ventura, CA in February, as well as the co-chair of the 24<sup>th</sup> North American Meeting of the Catalysis Society, being held in Pittsburgh in June of this year.

**-Chrysanthos Gounaris.** At the AIChE meeting held in Atlanta in November, 2014, Prof. Gounaris co-chaired the session on “Supply Chain Optimization.”

**-Ignacio Grossmann.** Prof. Grossmann was honored for his 65th birthday with two sessions at the AIChE meeting in Atlanta that were organized by Chris Floudas and Stratos Pistikopoulos on November 17, 2014. See links at:

<https://aiche.confex.com/aiche/2014/webprogram/Session27583.html>

<https://aiche.confex.com/aiche/2014/webprogram/Session28475.html>

In addition, Ignacio was presented with an on-line academic tree

<http://titan.princeton.edu/tree/> that involves a total of 495 names. This is one of the largest academic trees in process systems engineering.

A special issue of the journal of Computers & Chemical Engineering was also published in his honor. <http://www.sciencedirect.com/science/journal/00981354/72>

**-Aditya Khair.** Prof. Khair recently received a Dean’s Early Career Fellowship, awarded by the CIT Review Committee. He will receive discretionary funds for a three-year period beginning July 1, 2015.

**-Dennis Prieve.** Prof. Prieve was invited to speak at a session honoring Howard Brenner at the

AIChE Meeting in Atlanta. Prof. Brenner (MIT), who passed away last February, was on the faculty at CMU from 1966 to 1977 and served as Dennis' mentor after he started as an Assistant Prof. in 1975. Other speakers at the session included Andy Acrivos (CCNY), Bill Schowalter (Princeton), Joe Goddard (UCSD), Gary Leal (UCSB) and John Brady (Cal Tech) -- the senior members of the fluids mechanics community within AIChE.

**-Nick Sahinidis.** Prof. Sahinidis was selected as a 2014 INFORMS Fellow, one of only 12 chosen from 11,000 members. He recently gave a seminar at the University of Michigan.

**-James Schneider.** Prof. Schneider delivered an invited plenary presentation at the AIChE meeting in Atlanta. He has also been invited to give a lecture at the ACS National Meeting in Denver this March. The talk is in the Molecular Engineering of Peptide Assembly symposium. In addition, Jim is one of the co-chairs of the 89th annual technical meeting of the ACS Division of Colloid and Surface Chemistry which will take place on campus June 15 – 17, 2015.

**-Robert Tilton.** Prof. Tilton is one of the co-chairs of the 89th annual technical meeting of the ACS Division of Colloid and Surface Chemistry which will take place on campus June 15 – 17, 2015. Also, the Tilton lab has received funding as part of the CMU Center for Polymer-Based Protein Engineering.

**-Lynn Walker.** Prof. Walker has taken over as Chair of Fluid Mechanics programming at the AIChE. Also, she recently gave a seminar as part of the Centennial Seminar Series at the University of Delaware.

**-Katie Whitehead.** Prof. Whitehead has been named as a Pioneer on the MIT Technology Review's Innovators Under 35 list. Last fall she gave an invited talk on immune cell siRNA delivery at the 2014 NanoDDS Symposium. In addition, Katie was featured on the McGowan Institute's Regenerative Medicine Today podcast for a discussion on the lab's work with nanoparticles. The Whitehead lab has received funding as part of the CMU Center for Polymer-Based Protein Engineering.

### **Welcome Visiting Scholars**

Dr. Weifeng Chen from Zhejiang University, China; Dr. Mark Daichendt, recently retired from Air Products, Inc.; Christian Hoffmann from the Berlin Institute of Technology, Germany; and Dr. Ivan Zapata Gonzalez, of Centro de Investigacion on Quimica Aplicada, Mexico, are working with Prof. Larry Biegler's group.

Dr. Felipe Diaz Alvarado, of Universidad de Chile and Michele Corbetta, from Politecnico de Milano, Italy, are working with Prof. Ignacio Grossmann's group.

Dr. Yanwei Li, from Nanjing University, China, are working with Prof. Spyros Pandis' research group.

Kai Zhou, from Zhejiang University, China and Nikolaos Ploskas of the University of Macedonia, Greece, are working with Prof. Nick Sahinidis' group.

Dr. Zhara Egdesadi of Queens University, Canada; Dr. Tor Aksel Heirung, of the Dept. of Cybernetics of the Norwegian University of Science & Technology; and Dr. Lijia Luo, from Zhejiang University, China, are working with Prof. Erik Ydstie's research group.

### *Undergraduate News*

Congratulations to the following students who were on the CIT Dean's List for Fall 2014:

#### *Seniors*

Samuel Cheang  
Eamon Cullinane  
George Degen  
Erica Green  
Jordan Green  
Sara Kelly  
Sam Klein  
Jae Won Lee  
Joshua Lucheon  
Mariah Ondeck  
James Petka

Palak Pujara  
William Records  
Alexis Steger  
Caitlin Streamer  
John Taormina  
Samuel Winslow  
Darwin Yang  
Ariana Zito-Wolf  
Allison Lim  
Ju-Eun Yoon

#### *Juniors*

Joetsaroop Bagga  
Luise Bering  
Jonathan Berman  
Maggie Chen  
Onyenma Enwereji  
Edna Fongod  
William French  
Teng Yew Hoo  
Yoyinsola Ibikunle  
Khadijah Binti Ahmad Jais  
Julie Jung  
Do Hyung Kim

Sean Kim  
Eleanor Kwik  
Muyuan Li  
Sophie Lohmann  
Alexandra Newby  
Wooram Seok  
Michael Shimko  
Adam Simpson  
Brian So  
Vishal Vala  
Sunn-Young Wang  
Yongyan Zhu

#### *Sophomores*

Vishal Ahuja  
Tamara Amin  
Anna Bandecca  
Zachary Blonder  
Minrui Feng  
Samantha Ho

Anna Hoar  
Maya Holay  
Hyo Cheol Jeong  
Dianna Li  
Rinko Maeshima  
Brandon Ortiz

Gordon Pace  
Alexander Peterson  
Jakob Przybycien  
Lauren Relyea  
Mariah Richardson  
Johnathan Roppo

Casey Salandra  
Adam Somers  
Maximilien Vachon  
Jamei Wang  
Julia Wang  
Yuxuan Yang

**Congratulations to:**

--**Do Hyung Kim** and **Anthonia Raphael-Chieke**, both ChemE juniors, who were awarded Ford Blue Oval Scholarships in the amount of \$2,000 each in November, 2014.

--**Vishal Ahuja** and **Anna Zhang**, both ChemE sophomores, who were accepted into the competitive SRO-URO program for 2015-16 for their research in the Whitehead lab.

***Exchange Students***

Welcome to Teng Yew Hoo, Khadijah Jais and Youngyan Zhu, our new exchange students from Imperial College and to Luise Bering, Andreas Bremen and Sophie Lohmann from RWTH Aachen.

Best wishes to our students Corrine Bacigal, Brigit McGovern and Carrie Qiu who are studying at Imperial College and Santosh Prabha who is studying at RWTH Aachen.

***Graduate News***

Good luck to our first-year graduate students who have joined the following professors in their research efforts:

**PhD Students:**

Braulio Brunaud  
Lisa D'Costa  
Pablo Garcia  
Qin Gu  
Khalid Hajj  
Christopher Hanselman  
Yun-Ru Huang  
Steven Iasella  
Burcu Karagoz  
Sasimas Katanyutanon  
Nicholas Lamson  
Christiana Lara  
Zixi Zhao

Prof. I. Grossmann  
Prof. S. Anna and L. Walker  
Prof. S. Pandis  
Prof. T. Przybycien  
Prof. K. Whitehead  
Prof. C. Gounaris  
Prof. R. Tilton  
Prof. T. Przybycien and R. Tilton  
Prof. A. Gellman  
Prof. A. Gellman  
Prof. K. Whitehead  
Prof. I. Grossmann  
Prof. E. Ydstie

**MS Students:**

Sumedh Bknalkar  
Athary Bhosekar

Prof. A. Khair  
Prof. N. Sahindis

Moiz Bohra	Prof. M. Mauter
Zhaofeng Chen	Prof. J. Kitchin
Zihao Chen	Prof. M. Jhon
Zhiyuan Cheng	Prof. E. Ydstie
Ananya Chowdhury	Prof. N. Sahinidis
Yulong Deng	Prof. E. Ydstie
Siddharth Deshpande	Prof. J. Kitchin
Kanishka Ghosh	Prof. C. Gounaris
Yunli Han	Prof. N. Sahinidis
Arpita Iddya	Prof. M. Mauter
Anushree Kamat	Prof. C. Gounaris
Keshav Kasturi Rangan	Prof. E. Ydstie
Bhagyashree Lele	Prof. R. Tilton
Xinqian Li	Prof. N. Sahinidis
Xiangying Liao	Prof. A. Gellman
Siyu Liu	Prof. N. Sahinidis
Wenyang Lu	Prof. S. Pandis
Vatsal Modi	Prof. C. Gounaris
Venkatesh Naik	Prof. J. Kitchin
Tapas Peshin	Prof. N. Sahinidis
Nandini Ramachandran	Prof. E. Ydstie
Samji Samira	Prof. A. Gellman
Sreejith Sasidharan	Prof. S. Pandis
Aditya Sinha	Prof. N. Donahue
Wonyup Song	Prof. M. Jhon
Kanika Suri	Prof. K. Whitehead
Kashish Tayal	Prof. C. Gounaris
Hari Thirumalai	Prof. J. Kitchin
Kinshuk Verma	Prof. N. Sahinidis
Haichao Wu	Prof. S. Garoff, T. Przybycien and R. Tilton
Kang Wu	Prof. N. Sahinidis
Zonglin Yang	Prof. T. Przybycien
Yuyu Yao	Prof. E. Ydstie
Zuo Zeng	Prof. A. Gellman
Mingkai Zhang	Prof. R. Tilton
Yupeng Zhao	Prof. M. Mauter

**Congratulations and good luck to our students who graduated in Fall 2014:**

**Satyajith Amaran – PhD** Advisor: N. Sahinidis. Title: *“Interactions of Uncertainty and Optimization: Theory, Algorithms, and Applications to Chemical Site Operations”*

**Melissa Day – PhD** Advisor: S. Pandis. Title: *“Atmospheric Organic Aerosol and Climate Change”*

**German Oliveros Patiño – PhD** Advisors: B.E. Ydstie, S. Seetharaman. Title: *“Modeling and Stability of the Horizontal Ribbon Growth Process”*

**Ellis Robinson – Phd** Advisor: N. Donahue. Title: *“Mixing and Phase of Organic Particles”*

**Linlin Yang – PhD** Advisor: I. Grossmann. Title: *“Optimization Models for Water Management in Chemical Processes and Shale Gas Production”*

## **MS**

**Cheshta Balwani – MS** Advisor: L. Biegler. Title: *“Equation - Oriented Flowsheet Optimization”*

**Burcu Beykal – MS** Advisor: M. Mauter. Title: *“Fouling Studies on Capacitive Deionization Electrodes: Experimental Analysis of Protein Adsorption to Charged Surfaces”*

**Cheng Cheng – MS** Advisor: A. Gellman, N. Shukla. Title: *“The Study on the Ultra Stable Gold Nanoparticles”*

**Weijia Cui – MS** Advisor: N. Sahinidis. Title: *“Optimization of Lithium-ion Battery with Derivative-free Optimization Algorithms”*

**Tarun Dalwani – MS** Advisor: A. Gellman, J. Miller. Title: *“Kinetics of Ethylene Hydrogenation Over Copper-Palladium Alloys”*

**Owaiz Ebrahim – MS** Advisor: R. Tilton. Title: *“Competitive Adsorption of Polymers with Complex Architectures”*

**Yuan Fang – MS** Advisor: D. Prieve. Title: *“Dye Solubilization and Conductivity of Surfactants in Nonpolar Solvent”*

**Nitish Govindarajan - MS** Advisor: J. Kitchin. Title: *“Identifying Potential  $\text{LaBO}_3/\text{SrBO}_3$  Perovskite Candidates for Thermochemical  $\text{CO}_2/\text{H}_2\text{O}$  Conversion”*

**Nishtha Gupta – MS** Advisor: J. Miller. Title: *“Activity of Supported Palladium Catalysts for Low Temperature Methane Oxidation”*

**Charles Janini – MS** Advisor: A. Gellman. Title: *“Kinetic Modeling of Autocatalytic Surface Explosions Involving D-Tartaric Acid on  $\text{Cu}(643)^{\text{R}\&\text{S}}$  and L-Aspartic Acid on  $\text{Cu}(110)$ ”*

**Yash Khandor – MS** Advisor: C. Gounaris. Title: *“Network Design using Mixed Integer Linear Optimization”*

**Boyu Li – MS** Advisor: A. Gellman. Title: *“Ultra-High Vacuum Apparatus Upgrading and Recommissioning”*

**Chenkai Li – MS** Advisor: M. Mauter. Title: *“Nanocellulose Aerogel Membranes for Water Desalination via Membrane Distillation”*

**Zekun Li – MS** Advisor: J. Schneider. Title: *“Length-based Separation of DNA in Gel Free Solution”*



**Chang Liu – MS** Advisor: K. Whitehead. Title: *“Mixed Tailed Lipid Nanoparticles for Drug Delivery Applications”*

**Nai-Yuan Liu – MS** Advisor: P. Sides. Title: *“Generation and Measurement of Streaming Potential by Means of a Hydraulic Jump”*

**Xin Liu – MS** Advisor: B.E. Ydstie. Title: *“Design of an Adaptive Controller Using MIT Rule”*

**Yu Liu – MS** Advisor: M. Jhon, L. Biegler. Title: *“A Mesoscale Model for Thermal Management in Heat Assisted Magnetic Recording”*

**Irene Lotero Herranz – MS** Advisor: I. Grossmann, D. Papageorgiou. Title: *“Incorporating Alternative Formulations in an MILP-MINLP Decomposition Method for the Global Optimization of the Multiperiod Blending Problem”*

**Meiheng Lu – MS** Advisor: J. Kitchin. Title: *“An Electronic Log for the CSAF Project”*

**Jiaqi Luo – MS** Advisor: N. Sahinidis. Title: *“Analysis and Testing on Nonlinear Programming with Filter”*

**Jiesi Ma – MS** Advisor: N. Donahue. Title: *“Volatility Analysis of Organic Carbon Using Thermal Optical Measurements”*

**Raj Maniar – MS** Advisor: T. Przybycien. Title: *“Conventional vs. Precipitation based Process for the Production of Monoclonal Antibodies”*

**Xinyu Nie – MS** Advisor: N. Sahinidis. Title: *“ALAMO-based Models for the Thermodynamic Properties of Water and Steam”*

**Hsin Pang – MS** Advisor: B.E. Ydstie. Title: *“Modeling and Control of Tubular Reactor”*

**Arjun Ramesh – MS** Advisor: A. Gellman. Title: *“Preparation and Characterization of Surface Structure Spread Single Crystals”*

**Niyatee Ravipati – MS**

Advisor: T. Przybycien. Title: *“Platform Process for Recombinant Protein Purification”*

**Boya Shi – MS**

Advisor: B.E. Ydstie. Title: *“Control and Simulation of Distillation System Guided by Systematic Control Theory. A Case Study of Purge Distillation Column”*

**Jiawei Sun – MS**

Advisor: M. Jhon. Title: *“Modeling and Optimization of Fuel Cell Systems”*

**Jay Thakkar – MS**

Advisor: D. Kauffman, A. Gellman. Title: *“Atomically Precise Au<sub>25</sub> Clusters for Electro-Catalytic CO<sub>2</sub> Conversion”*

**Lin Wang – MS** Advisor: C. Gounaris. Title: *“Development of Software for the Automatic Mapping of Reactions via Integer Linear Optimization”*

**Ruxin Wei – MS** Advisor: B.E. Ydstie. Title: *“Control of Reactive Systems Using Invariants”*

**Wenqin You – MS** Advisor: J. Kitchin. Title: *“Modeling a Pressure Swing Adsorption CO2 Capture Process”*

**Nan Zhang – MS** Advisor: M. Mauter. Title: *“Predicting the Salt Adsorption Capacity of Capacitive Deionization Electrodes as a Function of Electrode Structure and Cell Geometry”*

**Tong Zhang – MS** Advisor: N. Sahinidis. Title: *“Medium-term Turnaround Planning for Integrated Chemical Sites”*

**Hua Zheng – MS** Advisor: N. Sahinidis. Title: *“Model and Search: a Derivative-Free Algorithm and the Computational Experience”*

**Xingshi Zhou – MS** Advisor: M. Mauter, J. Sirola. Title: *“Process Modeling of Forward Osmosis Systems Utilizing Power Plant Waste”*

#### MS-CPS

**Prashansa Desai** Advisor: L. Walker, S. Anna. Title: *“A Microfluidic Study of Crystallization and Phase Transitions of Concentrating Droplets”*

**Ran Li** Advisor: R. Tilton. Title: *“Colloidal Particle Adhesion in Solutions of Polymer/Surfactant Complexes”*

**Jialiu Zhang** Advisor: S. Anna. Title: *“Combined Use of Microfluidic Device and Spectroscopic Detection”*

**Zechen Zhang** Advisor: R. Tilton, T. Przybycien, S. Garoff. Title: *“Detection of Marangoni Flow Driven Drug Delivery”*

#### MS - Chemical Engineering and CPS

**Sixue Cheng** Advisor: D. Prieve. Title: *“Conductivity Enhancing Surfactants in Nonpolar Media”*

**Xiaoyu Liang** Advisor: J. Schneider. Title: *“Novel Surfactants in Nonpolar Media: Micelle Size and Structure”*

**Yunyao Zhang** Advisor: A. Gellman. Title: *“Preparation and Characterization of Surface Structure Spread Single Crystals: Cu and Ni”*

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**Congratulations to the following students who recently presented their research proposals:**

**Nicholas Austin**

Advisor: N. Sahinidis. Title: *"DFO-Based Mixture Design and Group Optimization"*

**Jacob Boes**

Advisor: J. Kitchin. Title: *"Developing Simple Computational Models for Rapid Analysis of Transition Metal Alloy Systems"*

**Nicholas Chisholm**

Advisor: A. Khair. Title: *"Quantification of Locomotion Across Reynolds Numbers"*

**Stephanie Kirby**

Advisors: L. Walker and S. Anna. Title: *"Characterizing Interfacial Properties and Adsorption Mechanisms Underlying Bacterial Adsorption at Liquid/Liquid Interfaces"*

**Steven Klara**

Advisor: M. Mauter. Title: *"Characterizing the Fundamental Mechanisms of Fouling Resistance through the Study of Novel Amphiphilic Polymeric Surfaces"*

**Christopher Knapp**

Advisor: K. Whitehead. Title: *"A Targeted Lipid Nanoparticle siRNA Delivery System for Treatment of Mantle Cell Lymphoma"*

**Robert Stout**

Advisor: A. Khair. Title: *"Charge Dynamics in Concentrated Electrolytes at Large Voltages"*

**Wei Wan**

Advisor: L. Biegler. Title: *"Algorithm Improvements for Interior Point Optimizer"*

**Ningxin Wang**

Advisors: S. Pandis and N. Donahue. Title: *"Multi-generation Chemical Aging of Secondary Organic Aerosol Components Under High/Low NO<sub>x</sub> Conditions"*

**Mingzhao Yu**

Advisor: L. Biegler. Title: *"Model Reduction for Dynamic Simulation and Optimization of a Carbon Capture System"*

**Qi Zhang**

Advisor: I. Grossmann. Title: *"Enterprise-wide Optimization for Industrial Demand Side Management under Uncertainty"*

**Congratulations to our second year Ph.D. students who passed their qualifier exams:**

Travis Armiger  
Rebecca Ball

Toni Bechtel  
Alex Bertuccio

Blake Bleier  
Mehak Chawla  
Markus Drouven  
John Eason  
Randall Gamble  
Devin Griffith  
Lisa Kasiewicz  
Jiaying Ke  
Nikos Lappas  
Jianfeng Liu

John Michael  
Juan Morinelly  
Brittany Nordmark  
Irem Sen  
Nicholas Skarzynski  
Anirudh Subramanyam  
Justin Weinberg  
Zachary Wilson  
Xiaoxiao Yu

### **Congratulations to:**

--PhD candidates **Jacob Boes, Matthew Payne, Irem Sen** and **Xue Yang** who received Bertucci Graduate Fellowships in the amount of \$20,000 to be applied toward tuition. This fellowship was established to provide merit fellowships to graduate students pursuing doctoral degrees in Engineering in CIT and reflects outstanding work in Chemical Engineering.

--PhD candidate **Christopher Knapp** who was awarded a Dowd-ICES fellowship for his work on developing a delivery system to treat B-cell lymphoma in the Whitehead lab.

--PhD candidates **Yash Puranik** and **Francisco Trespalacios**, both of whom won CAST graduate student travel awards to the AIChE meeting in November, 2014.

--PhD candidate **Nicholas Lamson** has been awarded the Thomas and Adrienne Klopach Graduate Fellowship.

### **ChEMSA 2015 officers**

President	Sumedh Beknalkar
Vice President	Nimmy Mathew
Social Chairs	Kanika Suri, Haichao Wu
Finance Chair	Samji Samira
Academic Chair	Siddharth Deshpande
Communication Chair	Tapas Peshin
Technical Chair	Vatsal Modi

### **CHEGSA 2015 officers**

President:	Alex Bertuccio
Vice President:	Toni Bechtel
Symposium Chairs:	Jake Boes, Stephanie Kirby, Justin Weinberg
Social Chairs:	Khalid Hajj, Chris Hanselman, Christiana Lara, Venkatesh Naik, Nick Lamson, Keshav Kasturi
Webmaster:	Rob Apap

GSA reps: John Riley, Bethany Nicholson (Ben Yezer - Alternate)  
Fundraising Chair: Mehak Chawla  
Outreach Coordinator: John Michael

### Alumni News

**JitKang Lim**, PhD/ChemE/2009, a former student of Prof. Bob Tilton and Prof. Sara Majetich (CMU Physics), won the National Young Scientist Award of the Malaysian Ministry of Science, Technology and Innovation in November, 2014.



The National Young Scientist Award is the highest honor which can be given to a scientist at the age of 35 or below by the Malaysian government. Dr. Lim is a senior lecturer in the School of Chemical Engineering at the Universiti Sains Malaysia, where his research group specializes in hybrid magnetic nanomaterials and their applications. He has also received the 2014 Universiti Sains Malaysia Outstanding Service Award, the 2013 Takeda Young Entrepreneurship Award and is the founding chair of the American Chemical Society Local Chapter of Malaysia.

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**Susara (Sarette) Van Den Heever**, PhD/ChemE/2001 a former student of Prof. Ignacio Grossmann, is now the IBM Decision Optimization Product Manager. She is currently directing the IBM DOcloud offering (Decision Optimization on Cloud) shown below:

[https://www.ibm.com/developerworks/community/blogs/jfp/entry/trying\\_decision\\_optimization\\_on\\_cloud\\_beta?lang=en](https://www.ibm.com/developerworks/community/blogs/jfp/entry/trying_decision_optimization_on_cloud_beta?lang=en)

She has also done interesting work on water management in Ireland using analytics:  
<http://www.research.ibm.com/articles/ireland-water-management.shtml>

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**Henry Pennline**, BS/ChemE/1971, has just published a book entitled *Mercury Control for Coal-Derived Gas Streams* by Wiley-VCH. See link below for details.

<http://www.wiley.com/WileyCDA/WileyTitle/productCd-3527329498.html>

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### *Spring 2015 Chemical Engineering Seminar Series*

February 3, 2015

Prof. LaShanda T. Korley

*Exploiting the Structural Diversity in Nature as a Path Toward Mechanical Enhancement*

Case Western Reserve University

Department of Macromolecular Science and Engineering

February 10, 2015

Prof. Anna Balazs

*Designing Biomimetic Capsules and Gels that Undergo Directed Movement*

Distinguished Professor of Chemical Engineering; and,

The Robert v. d. Luft Professor, Department of Chemical & Petroleum Engineering

University of Pittsburgh

March 3, 2015

Prof. Joe Qin

Mork Family Department of Chemical Engineering and Materials Science

University of Southern California

March 17, 2015

Prof. Jeff Morris

Professor & Chair, Chemical Engineering Levich Institute; and

Department of Chemical Engineering, City College of New York

March 31, 2015

**TOOR LECTURE**

Dr. Scott Whalen

Procter & Gamble

*Chemical Engineering in the 21st Century Global Economy -- Some Practical Lessons*

April 7, 2015

Prof. Daeyeon Lee

*Janus Particles as Solid Surfactants*

Associate Professor of Chemical and Biomolecular Engineering, University of Pennsylvania

April 14, 2015

Prof. Giorgio Carta

*Transport Phenomena and Protein Stability in Downstream Processing of Biopharmaceuticals*

Lawrence R. Quarles Professor  
Dept. of Chemical Engineering, University of Virginia

April 21, 2015

**BAYER LECTURE**

Prof. George Stephanopoulos

***Save the Date—Upcoming Events***

The 89th annual technical meeting of the ACS Division of Colloid and Surface Chemistry will take place on campus June 15 – 17 and will highlight the latest scientific advances in colloid and surface science, its intersections with other scientific domains such as biophysics and environmental science, and its diverse biomedical and industrial applications. In addition to 13 technical symposia and a poster session, the Symposium features two distinguished plenary lectures, the Unilever Award lecture honoring an outstanding young faculty member, the Victor K. LaMer Award lecture honoring the best Ph.D. thesis in colloid and surface chemistry from a North American University, and an instrument exhibition. The Symposium is co-chaired by Steve Garoff, Jim Schneider and Bob Tilton and numerous other Carnegie Mellon faculty are organizing technical sessions. Abstract submission is open until April 5, 2015 at [www.colloids2015.org](http://www.colloids2015.org).

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The 37th Annual ChEGSA Symposium will be held on Thursday and Friday, October 22nd & 23rd, 2015. Similarly to last year's symposium, this year's dates align with the week of the fall mid-semester break.

This year's keynote address will be given by Prof. Norman J. Wagner, the Robert L. Pigford Chair of Chemical Engineering at the University of Delaware. Professor Wagner is a distinguished researcher in the fields of rheology, complex fluids, and polymers. He was recently awarded the Bingham Medal of the Society of Rheology, and was awarded the Siple Award in 2002 by the US Army for his development of shear thickening fluids for novel energy absorbing materials. Professor Wagner also earned his Bachelor's degree in chemical engineering from CMU and we look forward to welcoming him back to the department!

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The CAPD Annual Review Meeting will take place on Monday and Tuesday, March 9-10, 2015 here at CMU. This will be preceded by a meeting of the special interest group on Energy Systems Engineering on Sunday, March 8 and followed by the meeting of the special group on Enterprise-wide Optimization on Wednesday, March 11, 2015.

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The CAPD short course, Conceptual Design, Optimization Modeling and Integrated Process Operations is scheduled to take place on May 6-13, 2015 here at CMU. The short course will be organized in 7 modules that can be taken in any combination (e.g., 1, 2 & 3, or all 7).

<http://capd.cheme.cmu.edu/shortcourse/index.html>

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The American Chemical Society National Meeting and Exposition will be held in Denver, Colorado March 22-26, 2015. Early registration closes on January 30.  
<http://www.acs.org/content/acs/en/meetings/spring-2015/registration.html>

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The CAST division of AIChE is organizing a Big Data topical at the Spring Meeting of the AIChE in Austin, Texas on April 26-30, 2015. <http://www.aiche.org/conferences/aiche-spring-meeting-and-global-congress-on-process-safety/2015>.

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## ***Faculty Profile***

### **Aditya Khair**

I joined the Chemical Engineering department in August 2010 as an Assistant Professor. Actually, rather than “joined” I should say “re-joined,” since I was at CMU in 1999-2000 as an exchange student from Imperial College London. In the fall of 2010, I wrote a piece for the ChemE Newsletter to (re)-introduce myself to our department. To recap my background: I was born in India; raised in England; completed a MEng degree in ChemE from Imperial College; followed that with a year of Math at Cambridge (Part III of the Math Tripos); a PhD. in ChemE at Caltech; and a postdoc at UC Santa Barbara.



The last four-and-a-bit years at CMU have flown by. My wife, Vanessa, and I have settled into Pittsburgh and live in Indiana Township, near Hartwood Acres. Vanessa was born and raised in Los Angeles, so the first winter in Pittsburgh was an experience for her, although I am happy to report that we have both become very fond of Pittsburgh (although perhaps not the weather). In August 2012 we had a baby girl, Isabel, who is now 2 and a half years old --- I must have watched “Frozen” a dozen times already...

My return to CMU has been a blast. For that, I have to thank my fellow ChemE faculty members who have been an unwavering source of support and encouragement. I also thank our great departmental staff, especially my assistant Alice Yochum, who for many months stayed silent as I barged into her office to borrow a hole-punch. As further evidence of my longevity here, Alice ordered me a hole-punch of my own last week! Most of all, I thank the students in my research group, which currently comprises 6 PhD. students: Sarah Feicht, Toni Bechtel, Rob Stout, Javier Lanauze (co-advised with Lynn Walker), Nick Chisholm, and Ben Yezer (co-advised with



Dennis Prieve and Paul Sides); 1 MS student: Sumedh Bektalkar; and 4 undergraduates: Sam Winslow (co-advised with Bob Tilton), Alex Frankel, Chris Seok and Vishal Vala. Before writing this article, I re-read the research statement for my application to CMU; I have done essentially nothing of what I had proposed! That, however, is a good thing, which is due to the intellectual ability and drive of my students to tackle problems that I could not.

Basically, I am a theorist: I use the tools of modern applied mathematics and engineering sciences to investigate problems in fluid mechanics, colloid science, electrochemistry, and electrokinetics. However, I have enjoyed strong collaborations with experimental colleagues in our department, in particular Lynn Walker, Dennis Prieve, and Paul Sides. The range of problems that my group tackles is broad: from charge transport in organic semiconductors (think OLEDs) to the fluid dynamics of swimming organisms. Sarah Feicht, who has developed new current-voltage relations for OLEDs and quantified charge transport in mixed ionic-electronic conducting materials, leads the former effort. The latter work is the project of Nick Chisholm, who has developed mathematical models to connect the swimming of very small organisms (e.g. bacteria) to that of much larger species (e.g. fish); the relevance of this work is to bio-mixing in the ocean. Rob Stout works on electrically driven transport in concentrated electrolytes and ionic liquids: we recently published a paper that explains the anomalous electrophoretic migration of colloidal particles in concentrated electrolytes, where it observed that negatively charged particles drift to negative electrodes, in apparent violation of Coulomb's law. Toni Bechtel works on the mechanical behavior, or rheology, of colloidal dispersions, and we are currently investigating the response of such materials to large-amplitude oscillatory shear (i.e. brushing your teeth!). Javier Lanauze computes and measures the deformation and burst of oil droplets subject to electric fields, which is relevant to electro-emulsification, for example. Finally, Ben Yezer does theory and experiments to discover the origin of charge carriers in organic liquids, which you need to know to disperse particles in such media.

The group has been productive: we have published 16 papers in leading international journals, and my students have talked at national meetings, often during the first or second years of their graduate studies. Two of our papers include undergraduate students as authors (Alex Frankel and George Degen), which speaks to how amazing our ChemE undergrads are.

In summary, a big thanks to everyone who has made my return to CMU so enjoyable--I look forward to many more happy years in Pittsburgh!