FALL 2012

CLEMSON
CHEMICAL AND BIOMOLECULAR ENGINEERING

Message from the Chair:

Dear Alumni and Friends of the Department:

Which course(s) did you find to be most valuable during your time at Clemson? When I ask this question of the alumni from the undergraduate program, invariably the answer is the unit operations laboratories plus the senior-level capstone design course because of the open-endedness of the assignments. I started thinking about this issue as I read an article from the US News and World Report (11/23/12) entitled, *STEM Students Must Be Taught to Fail* by Dr. Elizabeth Gerber, a mechanical engineering professor at Northwestern. Dr. Gerber's premise is that far too often our science, technology, engineering, and math (STEM) students are provided well-defined problems that are straightforward and not challenging in their solution. Furthermore, "we deprive [our students] of the experience of dealing with the messiness of authentic, real world problems. As a result, they gain false confidence in their ability to play the game. But none of them will graduate into perfectly packaged problems and painlessly derived solutions."

Please rest assured that our undergraduates are not deprived of inexact problems. They encounter complexities in the unit operations labs and senior design. Additionally, open-ended assignments are integrated into many of our mainline chemical and biomolecular engineering courses, and the fact that the students struggle with uncertainties and illogical solutions makes them more prepared to perform effectively in the workplace. We also note that dealing with complexities is not limited to our undergraduates. Our graduate students face the same issues when they wrestle with the open-endedness and frustrations in their research.

Finally, we take this opportunity to welcome our fourth new faculty member in the last three years. Dr. Mark Blenner received his PhD from Columbia University and completed a post-doctoral appointment at Harvard prior to coming to Clemson. His research interests are in the areas of protein and metabolic engineering, biocatalysis, biosensors, and biorefining. This fall he was a co-instructor for the senior-level unit ops lab and in the spring he will teach mass transfer and separations.

Please enjoy all of the features in this newsletter.

Best regards,
Doug Hirt
Professor and Chair

New Faculty Member

Dr. Mark Blenner

We are pleased to announce that Dr. Mark Blenner has joined the Department of Chemical & Biomolecular Engineering this Fall as an Assistant Professor.

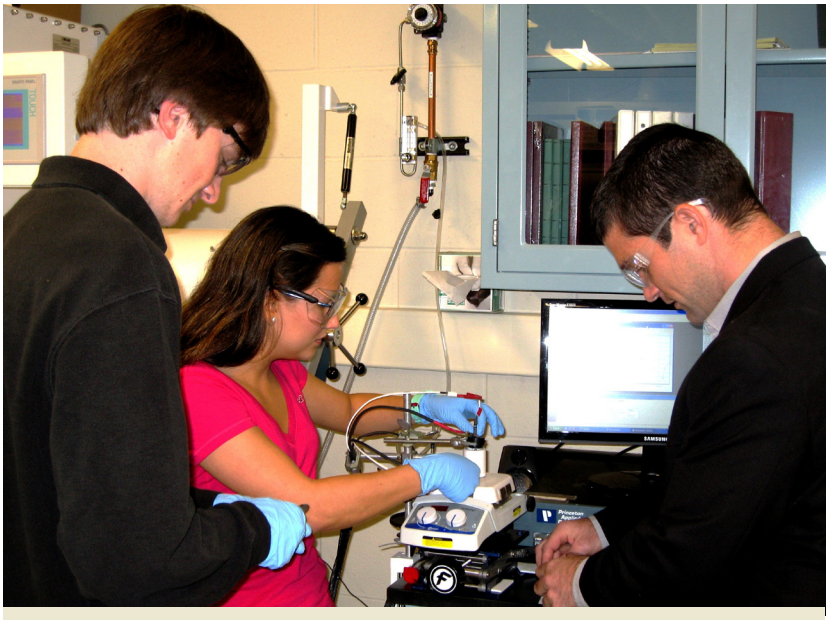
Dr. Blenner received his B.S. degree from Manhattan College, and his M.S. and Ph.D. from Columbia University, all degrees in Chemical Engineering. Prior to joining Clemson University, he was a postdoctoral researcher at Harvard Medical School and the Immune Disease Institute at Boston Children's Hospital.

Dr. Blenner's research focuses on altering molecular-scale microbial properties to enhance the array of chemical reactions they can perform, increase pathway yield, and improve the reliability of industrial scale up. His research group will work on improving biorefining of transportation fuels, bulk and fine chemicals, and pharmaceuticals as a safer, more sustainable route to producing the molecules our society needs.

Making connections is the core of Dr. Blenner's teaching philosophy. By breaking chemical engineering problems into their underlying fundamental phenomena, students can more easily make connections to solve new problems both in chemical engineering and in emerging multidisciplinary fields. His teaching interests are biochemical and bioprocess engineering, mass transfer and separations, and chemical reaction engineering and kinetics. Currently, Dr. Blenner is teaching the Senior Unit Operations Lab.

Please welcome Dr. Blenner to Clemson University! His research interests and expertise will be a valuable asset to our department and to the College of Engineering and Science.

Defect-Engineered Nanocarbons for Electrochemical Energy Storage



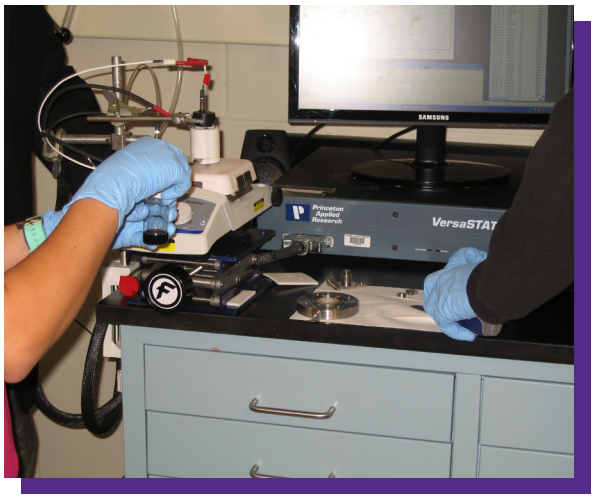
Prof. Roberts, a Co-PI on the research grant, working with Bobby Emmett, an undergraduate in ChBE, and Margie Arcila-Velez, a graduate student in ChBE, to prepare polymer-modified carbon composite electrodes for a series of battery tests.

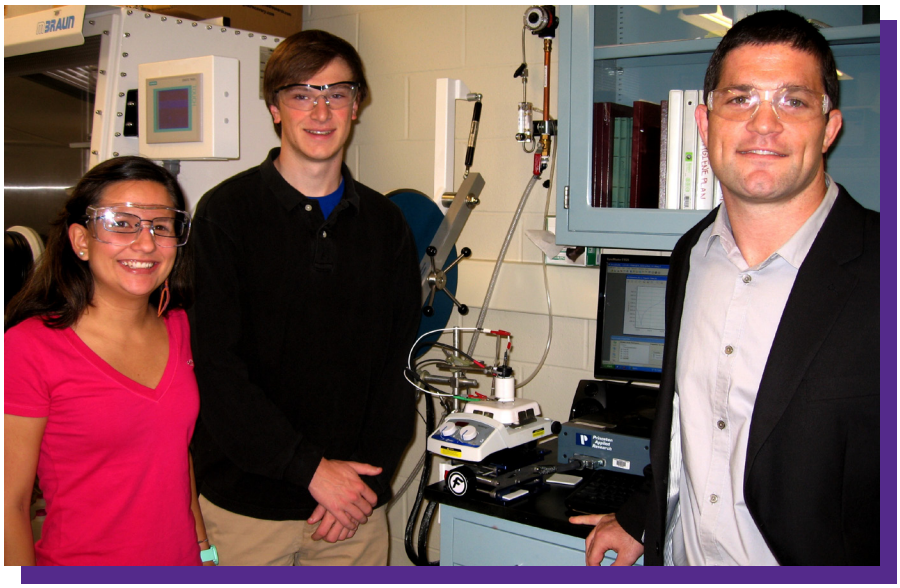
Prof. Mark Roberts, along with Prof. Apparao M. Rao (Physics, Clemson) and Prof. Prabhakar Bandaru (Mechanical Engineering, UCSD), recently received $1.2 Million from the National Science Foundation to study "Defect-engineered Nanocarbons for Electrochemical Energy Storage".

The primary objective of their research grant is to develop high-energy-density carbon materials with nanometer dimensions using continuous and scalable fabrication methods, such as roll-to-roll processing. Work funded through this project will help to overcome existing material and manufacturing limitations for supercapacitors, devices that effectively operate as extremely fast batteries by combining the high discharge rates of capacitors with energy densities comparable to conventional batteries.

Advancements in supercapacitor development will impact a diverse range of applications from household electronics and power tools to energy management and conservation.

Roberts' research group is focused on developing functional electronic polymers, specifically for electrochemical and energy storage applications, and will contribute to this project by integrating redox polymers with various carbon materials to increase the energy capacity of nanocomposite electrodes.





FACULTY HIGHLIGHTS

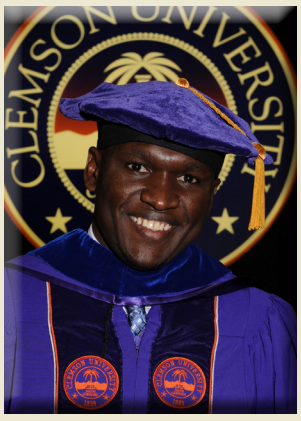
Prof. Anthony Guiseppi-Elie, was the keynote speaker in Uganda at the international higher education, science and technology conference of the Council for Frontiers of Knowledge (The CFK) in November. The conference theme was "Western Science Meets African Reality". Dr. Guiseppi-Elie delivered a speech entitled, "Technology Transfer: The Academic Entrepreneurs' Perspective." Later in November, Dr. Guiseppi-Elie delivered the Qualcomm Distinguished Lecture in Microsystems Research at the Institute for Systems Research at the James A. Clark School of Engineering at the University of Maryland, College Park. His talk entitled "Implantable Microsystems to Allow Quantitative Measurement of Biomolecules for the Management of Hemorrhagic Shock" was delivered to faculty and graduate students from across the mechanical, biomedical, electrical and chemical engineering departments of the James A. Clark School of Engineering.

Prof. Scott Husson was elected to the North American Membrane Society Executive Committee as Treasurer. Dr. Husson had the honor of being selected as one of the Most Cited Authors of the Journal of Membrane Science. He was cited for his article on Stimuli-Responsive Membranes, which contributed significantly to the increased 2011 Impact Factor. Dr. Husson is also the recipient of three new grants: Ultra-Trace-Level Quantification of Alpha-and Beta-Emitting Radionuclides with Extractive Scintillating Resin, co-PI with Dr. Tim Devol, which is sponsored by the Defense Threat Reduction Agency (DTRA) totaling $1,050,000; Alternative Sample Loading Preparation for Thermal Ionization Mass Spectrometry, PI with Dr. Brian Powell in EE&ES, sponsored by the Department of Energy-National Nuclear Security Agency; and Multimodal Membranes for High-Throughput Bioseparations.

Prof. Chris Kitchens is the recipient of a new grant sponsored by VFRC (The Virtual Fertilizer Research Center) titled "Enhanced Nitrogen Use Efficiency through a Protein Byproduct Delivery Mechanism". Dr. Kitchens will be working on this project with fellow professors Dr. Stephen Klaine (BioSci), Dr. Jaclyn Kropp (SAFES), Dr. Thompson Mefford (MS&E), Dr. Nishanth Tharayil (SAFES), and Dr. Christina Wells (SAFES). The purpose of this project is to produce an economical fertilizer in pellet form utilizing rendered animal proteins that will provide controlled nitrogen release and a source of additional available nutrients. They will test the nitrogen use efficiency on food crops in greenhouse and field applications.

Prof. Mark Thies is the recipient of a three-year grant sponsored by the National Science Foundation titled "GOALI: Low-Ash Lignin Biofuel from Black-Liquor Streams." This GOALI grant (Grant Opportunities for Academic Liaison with Industry) is in collaboration with Liquid Lignin Company. The research team on this project has discovered that lignin can be precipitated from paper mill black liquor in the form of a nonviscous, easy-to-process liquid. The SLRP process is being developed based on this discovery. The objective of the GOALI is to understand the fundamentals of the formation and properties of the liquid lignin by fractionating and characterizing the lignin by molecular weight, chemical structure, and salt content.

PhD GRADUATES



Dr. Daniel Wandera
Dissertation: **"Design of Advanced Fouling-Resistant and Self-Cleaning Membranes for Treatment of Oily and Impaired Waters"**
Advisor: Dr. Scott Husson
Current Position: Senior Scientist
Hydration Technology Innovations, LLC
Albany, Oregon

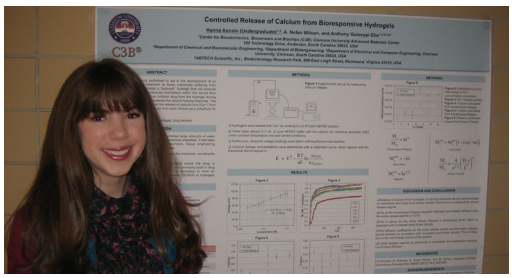
Dr. Fiaz Mohammed
Dissertation: **"Application of Carbon Dioxide Towards the Development of Smart Materials, Green Reaction Schemes and Metallic Nanoparticle Synthesis"**
Advisor: Dr. Chris Kitchens
Current Position: Post Doc
Georgia Institute of Technology
Atlanta, Georgia

STUDENT HIGHLIGHTS

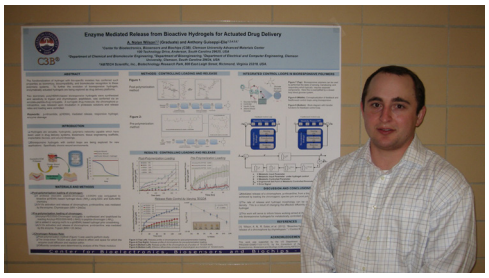
Daniel Wandera, who graduated with his Ph.D in August, was named the winner of a **2012 AIChE Separations Division Graduate Student Research Award**. This is a highly competitive award with a global request for nominations. The award is sponsored by the AIChE Separations Division along with Millipore and Air Products. Daniel, who graduated in August with his Ph.D., was presented a plaque and a check for $200 at the Separations Divisions Dinner on October 29th at the Annual Meeting in Pittsburgh. His Advisor is Dr. Scott Husson.

Graduate student **Jinxiang Zhou** won second place in the student competition for Gas Separations Research at the North American Membrane Society annual meeting held in New Orleans. His Advisor is Dr. Scott Husson.

Graduate student **Heather Chenette** received the Elias Klein Founders' Travel Award to attend the North American Membrane Society (NAMS) meeting in New Orleans, LA, in June 2012. Heather also attended the Gordon Research Conference and Seminar (GRC) on Membranes: Materials & Processes, New London, CT, in Aug 2012. At the seminar, she was elected to serve as a Co-Chair for this GRS (student seminars that precede this GRC) in 2014. Her Advisor is Dr. Scott Husson.



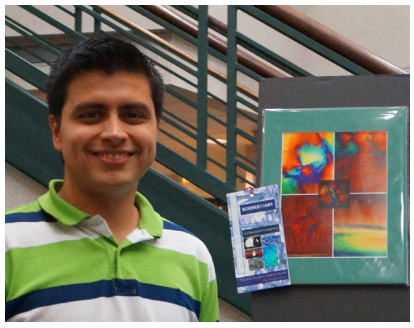
Hanna Aucoin won "Best Poster Presentation by an Undergraduate Student", and **Nolan Wilson** won "Best Poster Presentation by a Graduate Student" at the Clemson University Biomaterials Day hosted by the Society of Biomaterials. Their Advisor is Dr. Anthony Guiseppi-Elie.



Felipe Polo Garzon, a doctoral student working with Dr. Bruce, won the Outstanding Presentation in Chemical Engineering Award at the 2012 Annual Meeting of the Society for the Advancement of Chicanos and Native Americans in Science (SACNAS), which was held in Seattle, Washington. His presentation was titled "Dry Reforming of Methane: A Study of Pyrochlore Catalyst Performance".

Ming He, a senior doctoral student working with Dr. Bruce on the development of novel catalysts for a variety of advanced energy applications, won the **Outstanding Poster Award (1st place) at the 2012 Southeastern Catalysis Society Meeting** in Asheville, NC. The title of Ming's poster was "A Mechanistic Study of CO Oxidation on Supported Gold Nanoparticles".

The **Science as Art Exhibit** and Meet the Artist Reception was held on November 19th at the Hendrix Center. In this event, **Jose Luis Orellana** and **Fiaz Mohammed,** both students for Dr. Christopher Kitchens, received an **Honorable Mention** in the Photography session because of their work "Cellulose Nanocrystals Mosaics". The photographs were the result of observing cellulose nanocrystals through a polarized optical microscope indicating the neat arrangement and optical properties of cellulose. The results showed that cellulose seems to arrange in small building blocks that may resemble those used in the mosaic art techniques. The investigation of the cellulose nanocrystals for the fabrication of advanced materials is an important field of investigation in Dr. Kitchen's research group.



Departmental Honors Research Grants were awarded to four ChBE students: **J.T. Helms, Alexandra Kleven, Hanna Aucoin, and Anthony D'Amato**. These competitive grants are provided by the Calhoun Honors College to support their undergraduate honors research over the next year. Congratulations to our Honors Students for their successful proposals!! Pictured left to right are J.T. Helms, Prof. Anthony Guiseppi-Elie, Prof. Mark Roberts, Alexandra Kleven, Hanna Aucoin, and Anthony D'Amato.

HOMECOMING ALUMNI REUNION

Class of 1976 Front Row - Brad Peacock, Joe Roddey, Bill Jackson, Ron Sterghos, John Skardon, Parker Downing, Denise Stanford, Rick Wolfe, Tom Smith, John Frazer, Andy Long, Danny Henderson, Greg Royster. Back Row - Jeff Watkins, Rick Boyleston, Steve Lober, Chip McClard, Tommy Ford, Boyd Shuler, Jerry Galloway, Steve Douglas, Victor Bull, Michael Matheson, John Stoney, Chuck Kizer, Ricky Davenport.

Class of 1976 Reunion

Dr. Hirt is shown above with Rick Wolfe from the Class of 1976. Rick was instrumental in organizing the Class of 1976 reunion this year at our homecoming tailgate. They had a great turnout!

Class of 1976 Today - Front Row - Danny Henderson, Greg Royster, Tommy Ford, John Stoney, Bill Jackson, Parker Downing, Steve Lober, Tom Smith, Jeff Watkins, John Frazer, Brad Peacock, Steve Douglas. (Rick Wolfe is pictured above with Dr. Hirt.)

"Thanks for a wonderful weekend. The Homecoming Tailgate was a great success. We in the Class of 76 had a great time. For most of us, it was the first time we had seen each other since 1976. The only downer was that we just ran out of time talking to each other. Wow, what an overwhelming emotion. The ghosts of Earle Hall came rushing out. It just doesn't seem that long ago that we were the carefree kids roaming that building. Thank You for setting the stage so that we could once again live in that time."

John Frazer

Raymond Taylor (Class of 1998) with family.

Kim (Nelson) Brooks (Class of 1984) and Brian Brooks (1983) with family.

Brian Skroback - Class of 2008.

Billy Bruggeman (1969) with granddaughter.

Prof. Emeritus Bud Rice talking with Alumni.

Our department hosted our **Annual Alumni Homecoming Tailgate on November 10th.** We had over 50 alumni attend, representing **classes from 1966 through 2012.** Over half of the Class of 1976 attended. It was great fun and a great time! A special thank you to all of our alumni who took the time to visit us at Earle Hall!!

Bill Price (right) from the Class of 1966 with Dr. Mark Thies.

Daniel Crandall, Leigh Tyson, and Grant Provost all from Class of 2011 with Dr. Hirt.

Matthew Blackstone (2005) with family.

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DONORS - FISCAL YEAR 2012

The Department of Chemical and Biomolecular Engineering would like to honor the following donors to our department from FY2012 (07/01/11- 06/30/12). Financial support is always critical to the operation of the department - without it we would not be able to fund our initiatives that help us attract the best students and faculty. Thank you so much to the donors listed below. Your generosity is sincerely appreciated!

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