

SUMMER 2010

CLEMSON[®]

CHEMICAL AND BIOMOLECULAR ENGINEERING

FAST FACTS:

- Number of tenured/
tenure-track faculty: 10
- Undergraduate/graduate
enrollments: 150 (UG),
30 (Ph.D)
- Number of graduates:
33 B.S.; 1 M.S.; 2 Ph.D.
AY2009-10
- Research expenditures:
\$3.9 million
- Research thrusts:
 - ◇ Advanced Materials
 - ◇ Kinetics and Catalysis
 - ◇ Energy
 - ◇ Chemical and
Biochemical Separations
 - ◇ Molecular Modeling and
Simulation
 - ◇ Biosensors and Biochips

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Dear Alumni and Friends of the Department:

Greetings from Clemson and I hope you are doing well. There are many exciting things happening in the Department, from further renovations to Earle Hall to hiring new faculty. Those items will be described in the next edition of our newsletter – this edition focuses on education and student accomplishments.

The lexicon of the day includes the word transformative. For example, the National Science Foundation has been encouraging investigators to describe the transformative concepts that underlie their proposed research – concepts that lead to a major change in technology development. **It is also certainly true that our educational enterprise is transformative.** Consider the knowledge-base and skill-level of our sophomores entering the material and energy balances course compared to those of our graduating seniors. The difference is, and should be, huge. But that transformation does not occur overnight – there is a steady gain in facts, processes, problem-solving abilities, communication skills, etc. The gain is even more pronounced, and indeed more challenging to achieve, as we integrate more material in the curriculum: statistics, biotechnology, teamwork, leadership skills, project management, ethics, and entrepreneurship. Moreover, the modes of educational delivery in the classroom are varied as we seek to connect with students who have a blend of different learning styles. But it is also well-known that most of the learning and comprehension occurs outside the classroom, in study groups, faculty offices during office hours, research labs, unit ops labs, and working in solitude on a particularly difficult homework set. These are the places where cognitive growth unquestionably flourishes and leads to student successes, and many of those student successes are featured in this edition of the newsletter. We also highlight one of our award-winning educators, Prof. Charlie Gooding, who has transformed the lives of over a thousand chemical engineering graduates.



I will end with a quote from an editorial piece I read in the newspaper recently. The quote comes from Dr. Ed Leap, a physician at Oconee Medical Center, who was addressing the issue of educating medical students. It also applies to our undergraduate and graduate students and the intellectual transformation they experience combined with their drive to succeed: **“Students must see medicine [engineering] not merely as a job to choose, but as a calling to obey. The truth is, not everyone can do it. No, the material is not inherently hard. It is that not everyone can endure, can think critically while sleepless... The ability to become a good physician [engineer] is a unique gift.”** Have a great summer!

Doug Hirt
Interim Department Chair

Alumni News

Doug Haugh received the College of Engineering and Science Outstanding Young Alumni Award

Doug Haugh received the **College of Engineering and Science Outstanding Young Alumni Award**, which was established to recognize young scientists and engineers (less than 40 years of age) who have achieved significant success in their careers. Doug was honored for his many accomplishments in the energy and technology industries over the past 15 years. After graduating from Clemson in 1994 with a B.S. degree in chemical engineering, Doug began his career with Exxon in marketing and business development, eventually leading business development activities for lubricant and specialty products across the Western U.S. He left Exxon in 1998 to run a fuels and lubricants distribution business, growing company revenues from \$25 million to \$55 million in less than three years. Doug then went on to co-found FuelQuest Inc., which provides supply chain management and tax automation solutions across the downstream energy industry with over 750 clients. **Based on the company's success, Doug and his co-founder Rich Cilento were awarded Ernst & Young's prestigious Entrepreneur of the Year award for Energy Technology in 2006.** Doug currently serves as the Executive Vice President and CIO of Mansfield Oil Company, a nationwide provider of fuel supply, distribution logistics, and delivery services. He also serves on the Board of BioBlend Renewable Resources, a biolubricants company that formulates, manufactures, and distributes high-performance lubricants based on sustainable and biodegradable feedstocks. Doug currently serves on our departmental Advisory Board.



Doug Haugh receives the College of Engineering and Science Outstanding Young Alumni Award from Dean Esin Gulari

Class of 2010

Best wishes to the Class of 2010!!



The Chemical and Biomolecular Department is proud to recognize the Senior Class of 2010. The students were honored at a Senior Reception on April 29th at the Madren Center and at a Department Open House on Graduation Day, May 7th. The faculty and staff of ChBE want to wish all of our graduates the best of everything!

Student Achievements



Daniel Wandera won the Elias Klein Founders' Travel Award from the North American Membrane Society

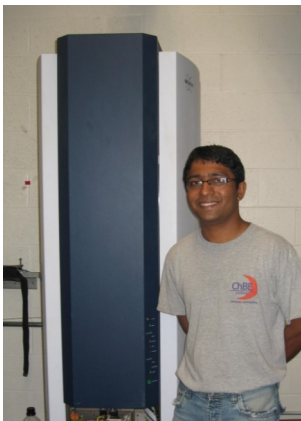
Ph.D. student **Daniel Wandera** won an Elias Klein Founders' Travel Award from the North American Membrane Society. He will present his research on development of advanced membranes for water treatment at NAMS 2010. Daniel conducts research under the guidance of **Prof. Scott Husson**.



Seth Broster named to the Academic All-District Team by ESPN The Magazine

Undergraduate **Seth Broster** was named to the second team Academic All-District men's at-large team by ESPN The Magazine in May. Seth, whose hometown is Lexington, Kentucky, has a cumulative GPA of 3.82 in Chemical & Biomolecular Engineering. Broster was also recognized by the ACC for his academic achievements this season and was named to the All-ACC

Academic Team. He has had a strong season in the pool as well, as he has earned five NCAA B times in five events at the ACC Championships this past season.

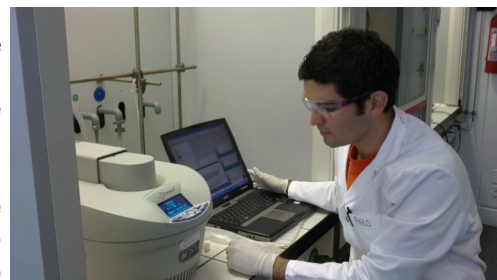


Sourabh Kulkarni won the ACS Petroleum Chemistry Division Student Award

Sourabh Kulkarni won the ACS Petroleum Chemistry Division Student Award at the ACS 2010 Spring National Meeting in San Francisco. Nominees were judged based both on the quality of the written preprint and oral presentation, and on the novelty of the research presented. The award was announced during the Fuel and Petroleum Chemistry Division dinner in San Francisco. Sourabh works with **Prof. Mark Thies** in the area of heavy petroleum macromolecules.

Juan Pablo Hinestrosa was selected to participate in a special symposium entitled "Excellence In Graduate Polymer Research" and held at the National ACS Meeting in San Francisco on March 21-22, 2010. The purposes of this symposium are to provide recognition to outstanding graduate students in polymer science and engineering, to foster networking and exposure, and to help develop the careers of future leaders in those fields. Juan Pablo conducts research under the

guidance of **Dr. Mike Kilbey**, now at ORNL with a joint appointment at UT-Knoxville.



Juan Pablo Hinestrosa selected to participate in a special symposium entitled "Excellence in Graduate Polymer Research"



Paul Hernley is shown here receiving his AIChE Award from Dean Esin Gulari and Dr. Doug Hirt

Undergraduate **Chas McGill** won 2nd place overall in the undergraduate poster competition at the American Institute of Chemical Engineers Southern Regional Conference. Chas conducts research under the guidance of **Prof. Scott Husson**. At the same conference, **Jennifer Moffitt** won a 2nd place award in the oral-presentation competition. Jennifer conducts undergraduate research with **Prof. Christopher Kitchens** in the area of cellulose nanocrystals.

Paul Hernley, who graduated with a B.S. in May, received the Western South Carolina Section of AIChE Award for Outstanding Senior. Paul will begin his Ph.D. program in ChE at the University of Michigan this fall.

Faculty Highlights

Dr. Charles Gooding receives the 2010 Murray Stokely Award for Excellence in Teaching

Prof. David Bruce is the coordinator for all simulation efforts in a multi-university Energy Frontier Research Center (EFRC) funded with \$12.5 million from the U.S. Department of Energy. The Center for Atomic-Level Catalyst Design (CALCD) is focused on the development of new catalysts for the production of clean fuels and chemicals from renewable sources. David will receive \$714,000 over five years to use advanced computational methods to help prepare catalyst materials that are optimally suited to convert cellulose and other waste organic materials into renewable liquid fuels and bio-derived chemicals.

Prof. Anthony Guiseppi-Elie, Dow Chemical Professor, has been appointed organizing session chair in bionics at the 2011 Annual General Meeting of the Institute of Biological Engineering and is an invited speaker at the 2nd Asia-Pacific Conference on NanoBionics, Wollongong, Australia, and the CMOS Emerging Technologies Conference, Vancouver and Whistler, British Columbia, Canada. Also, having served on the National Academies Panel on Electronics and Electrical Engineering to conduct a review of the National Institute of Standards and Technology (NIST) Electronics and Electrical Engineering Laboratory, Tony has been selected to participate in strategic planning efforts to guide the development of emerging standards and metrology in bioelectronics within the Semiconductor Electronics Division of NIST.

Prof. Charlie Gooding received the 2010 Murray Stokely Award for Excellence in Teaching from the College of Engineering and Science. Charlie was selected in recognition of his outstanding teaching abilities, his enormous contributions to the educational mission of the department, and his dedication to our students and their personal and professional development. The strengths of Charlie's nomination packet were numerous statements and reflections from former students, for example, "I cannot begin to count the number of times I have been able to work through challenging problems using the tools that Charlie taught me." Also, "I owe my degree to Dr. Gooding because he is the reason I didn't quit, helping me work through my difficulties with the subject and my expectations, teaching me that being different isn't a bad thing." For all he has done and continues to do, he is hugely appreciated by his students and fellow faculty members. Congratulations Charlie!



Dr. Scott Husson elected to the Board of Directors of the North American Membrane Society

Prof. Scott Husson was elected to the Board of Directors of the North American Membrane Society. Scott also received a grant from the National Science Foundation to generate the technical knowledge needed to produce more selective, more permeable, and more robust membranes for carbon dioxide separation from natural gas. The research and education program entails collaboration between Clemson University and Tetramer Technologies, L.L.C. (Pendleton, SC). The overall goal is to develop fundamental structure-property relationships for thin films prepared from a new class of polymers and use these relationships as the foundation for improved design and production practices of membranes with enhanced resistance to compaction and plasticization by CO₂ and hydrocarbons. A result would be a lower cost operation for natural gas pretreatment. Since natural gas is the fastest growing primary energy source in the world and provides over 20% of all energy used in the US, the economic impact could be tremendous.

Prof. Amod Ogale was awarded research grants of over \$1 million by the Army Research Labs, Air Force Research Labs, National Science Foundation, and industry. These research projects are directed toward the development of ultrahigh performance carbon and polymeric fibers from novel precursors including those derived from ecologically sustainable sources. He is also serving as the Director of the Center for Advanced Engineering Fibers and Films.

Teaching Philosophy

by Charles H. Gooding, Ph.D., P.E.

My teaching philosophy consists of an evolving set of principles that I have learned and developed over 30 years of teaching and 60-plus years of living and working with people. Some of these principles apply specifically to the discipline of chemical engineering, but most are much broader. In no particular order (because they are all important), my guiding principles are as follows:

A teacher must have empathy to understand where students are, perspective to understand where they need to go, and wisdom to know how to lead them on the journey. That said, education, like life, is not really a destination but a process that no one ever completes.

To teach well, you must first know the subject well. Then you must plan, organize, and prepare. Good teaching takes a lot of time. Most of the rewards are not tangible.

Analogy is a powerful teaching tool. Start with what the students know.

The best classroom experiences involve student participation. Real learning takes practice. If you want to understand what your students know and how they think, assign fresh, meaningful homework every semester and grade some of it yourself.

Be real. Don't bluff when you don't know something. Allow students to see you work through the process of figuring it out.

Be accessible. Only a small fraction of what students learn occurs in a classroom.

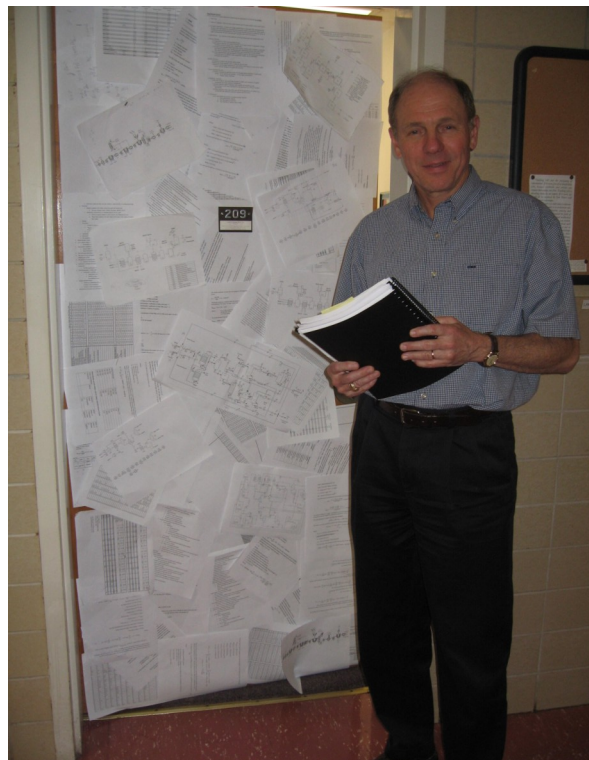
From an educational standpoint graduate research starts with teaching subordinates, but it should gradually transition into coaching professional peers. Over a four-year period, teaching a cohort of engineering undergraduates should follow a similar path.

Most engineering students have to be taught how to think analytically, and they must be challenged to grow intellectually. This often means requiring them to work harder than they knew they could or would ever want to. All of this must be done while nurturing their curiosity and helping them to build self-confidence through real accomplishments.

Undergraduate engineering education should be a compromise between two sometimes competing objectives: (1) to provide the theoretical foundation that will allow students to build on their knowledge in graduate school or through later self-study, and (2) to provide enough practical knowledge to prepare students for useful work in an entry level job.

Most of chemical engineering comes down to the application of four principles: (1) mass is conserved, (2) energy is conserved, (3) left alone, nature moves toward thermodynamic equilibrium, (4) the rate of progress toward equilibrium is proportional to the departure from it. Chemical engineering graduates must know how to use these principles.

Always treat students with respect.



Professor Gooding proudly stands in front of his office door that the Seniors decorated with their hard work from their design projects.

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***"...The ability to become a good
engineer is a unique gift..."***

Dear Alumni and Friends of the Department:

We hope that this newsletter will bring you up-to-date on all of the exciting things that are happening in our department. For more information, please visit our website www.ces.clemson.edu/chemeng.

Financial support is always critical to the operation of the department. If you would like to donate to our department, please make checks payable to Clemson University Foundation and mail to Clemson University, Department of Chemical and Biomolecular Engineering, Box 340909, Clemson, SC 29634-0909.

If you have any questions or comments, please feel free to contact me at 864-656-0822 or at [@hirt@clemson.edu](mailto:hirt@d). Thank you for your support!! Sincerely, Doug Hirt, Interim Department Chair

www.ces.clemson.edu/chemeng

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