

# Catalyst

## Redesigned Unit Ops Lab is Fully Operational

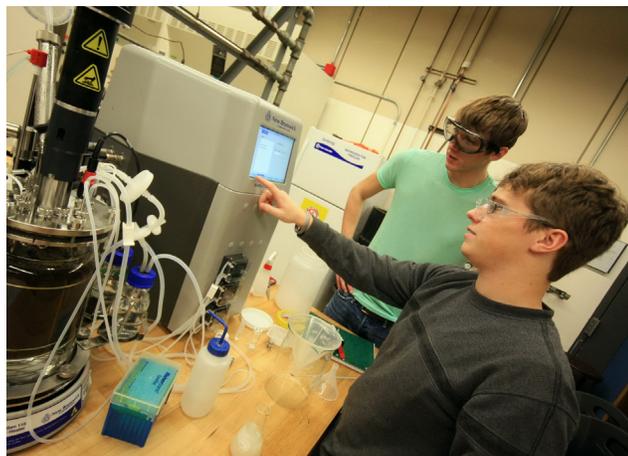
Better equipped, more connected, and focused on renewable energy. The Unit Ops Lab II (ChemE 437) has been re-structured and modernized with new equipment and connected experiments. Now with all major modifications implemented, ChemE 437 is a dynamic class that presents students with the real-world challenges of working in a biofuels processing plant.

In 2010, Prof. Pozzo and former lecturer Marvi Matos were awarded a National Science Foundation grant for \$200,000 to modernize the Unit Ops II lab. Before the grant and upgrade, the lab's sets of experiments didn't bridge well from the junior year's Unit Ops I (ChemE 436)

to the senior year's Unit Ops II (ChemE 437). With assistance from Prof. Jim Pfaendtner, Pozzo transformed the lab, adding new and upgrading existing instruments and experiments. With the addition of fermenting and biomass equipment, the disparate experiments now connect creating a more cohesive laboratory experience for the undergraduate students.

"Through an NSF grant that I lead, we secured funding to unify all of the laboratory experiments of this lab under the theme of bio-fuel processing. This effort resulted in the investment of more than \$200K in new equipment (e.g. fermenters, gas chromatographs and HPLC) and the modernization of modules," said Prof. Pozzo. "The new laboratory now

See Unit Ops pg. 2



ChemE undergraduates work on programming a bioreactor to start their ethanol fermentation experiment. The instrument is one of the two new bioreactors that were purchased with the NSF grant.

### IN THIS ISSUE

Page 2

Message from  
the Chair

Page 4

Alumna Starts  
Scholarship

Page 5

Chem-E Car Drives  
off with Awards

Page 8

Remembering Alum  
Donald Montrose

## Assistant Professor James Carothers Joins ChemE



Assistant Professor James Carothers joined the ChemE faculty this fall with a research focus in synthetic biology.

The start of the 2012-13 academic year brought some exciting changes to the department and campus. The new UW Molecular Engineering & Sciences Institute opened in September, where Engineering faculty come together to advance biotech and Clean Tech research. ChemE is also growing with the addition of a new faculty member, Assistant Professor James Carothers. Prof. Carothers, whose research focus is in synthetic biology, will collaborate with faculty in the MoIES Institute.

"I am extremely excited to have Prof. Carothers join our department," said ChemE Chair Daniel Schwartz. "His outstanding ability to design and control biological routes to chemicals, fuels, and medicines makes him a perfect fit for the department's goal to be a leader in the engineering of molecular and nanoscale systems."

Carothers made two visits to the UW campus earlier this year, meeting with faculty from the department and the college, talking to ChemE students, and touring

See Carothers, pg. 3



Daniel Schwartz

## Carothers *(Continued from cover)*

for doing great multi-disciplinary work: interesting areas of potential collaboration with friendly colleagues, hard-working graduate students and lots of resources within the department and across the campus," said Carothers.

With an office and lab located in the Institute, Carothers will continue his research in synthetic biology, using genetic engineering to improve renewable chemicals and fuels production and the development of new therapies. "Ultimately, we would like to develop full-fledged CAD (computer-aided design) platforms that make it easier to engineer biology both for industrial and therapeutic applications (to produce a renewable chemical, for therapeutic tissue engineering, and to provide a low-cost global health material), and for investigating fundamental questions about the role of information and control in biology."

Carothers is also interested in solving problems outside the lab. As a postdoc at Berkeley, he co-created a paid summer engineering research internship program (iCLEM) for low-income high school students and their teachers in the San Francisco Bay Area. "I am a big believer in extending opportunities in science and engineering early and often," he said. The program is now supported by the National Science Foundation and Joint BioEnergy Institute.

Carothers holds a Ph.D in Biological Chemistry and Molecular Pharmacology from Harvard, and a B.S. in Molecular Biophysics and Biochemistry from Yale. He recently completed a postdoctoral fellowship in Synthetic Biology at the University of California, Berkeley and Department of Energy Joint BioEnergy Institute, working under Prof. Jay D. Keasling. "One of the most important things I've learned from both my Ph.D. advisor Jack Szostak (a 2009 Nobel Prize winner in medicine) and Jay Keasling is to pick hard, interesting problems, and then have the patience to solve them. An important aspect of that is to try to build a research group where people are well supported and given enough freedom to be creative. I know I've been really lucky to have had such great places to do my work, and I'm going to try to create the same kinds of experiences for people in my group at UW." ■



Photo by Benjamin Benschneider, courtesy of ZGF Architects  
Prof. Carothers' new home—the Molecular Engineering & Sciences Institute, which opened September 2012.

## Great Grants!

### GAANN addresses engineer need

The department, under Principal Investigator Prof. Daniel Schwartz, has received a Graduate Assistance in Areas of National Need (GAANN) grant. The grant provides fellowship in fields of national need in the amount of \$133,266 for 2012-13, with 3 years of renewals possible.

### Hillhouse wins NSF SEP Grant

Rehnberg Chair Professor Hugh Hillhouse was awarded a National Science Foundation Sustainable Energy Pathways grant. Hillhouse will join a team of UW faculty members to improve the efficiency of solar cells made from earth abundant elements (CZTS).

## New Master's Program launched this Fall

A new kind of graduate student joined ChemE this fall. Six students have come to the UW to earn a Master of Chemical Engineering, the terminal master's degree launched this September. And unlike PhD graduate students supported through fellowships, and department and faculty funds, the new Master's graduate students will pay the entire cost of their education, making the program self-sustainable.

Associate Research Professor Qiuming Yu coordinates the program, recruiting students, marketing the program and shaping the program's curriculum, and helped with its launch. "We saw a rising interest in M.S.-level graduate education from the Far East, where students and industrial organizations value the M.S. education provided by top U.S. universities," said Yu. "The University of Washington has a strong reputation in Asia, and the Department of Chemical Engineering believes it can expand our impact and influence on the development of U.S. and overseas industries through this program."

The Master's students will enroll in regular core ChemE graduate courses, take electives in science, engineering, and business, and have the option for a thesis or non-thesis degree. They also will have the option conduct independent study supervised by the members of the core ChemE graduate faculty. Students will be required to make an oral presentation as a final exam.

The program is expected to grow in the coming years, taking 10 new students on average each year with plans to attract students from the US and overseas. "We also consider attracting students who are working in industry now but want to update their knowledge of the latest developments in their field to enhance their values and to prepare them for playing higher level and more challenged roles in their organizations." ■



Qiuming Yu

## Faculty Awards

Boeing-Roundhill Professor **Shaoyi Jiang** was named a 2012 UW Entrepreneurial Fellow. He also won the College of Engineering's Innovator Award in Research.

**Daniel Schwartz**, ChemE Chair and Boeing-Sutter Professor, was elected as a 2012 Electrochemical Society Fellow.

ChemE and Bioengineering Professor **Buddy Ratner** was named a Fellow of the Tissue Engineering and Regenerative International Society.

Professor Emeritus **Bruce Finlayson** published *Introduction to Chemical Engineering Computation*.

MolES Associate Director of Education and ChemE Professor **René Overney** received the College of Engineering's Innovator Award in Teaching.

Professor **John Berg** was named the 2012 University of Missouri ChemE Academy Lecturer.

## Unit Ops *(Continued from cover)*

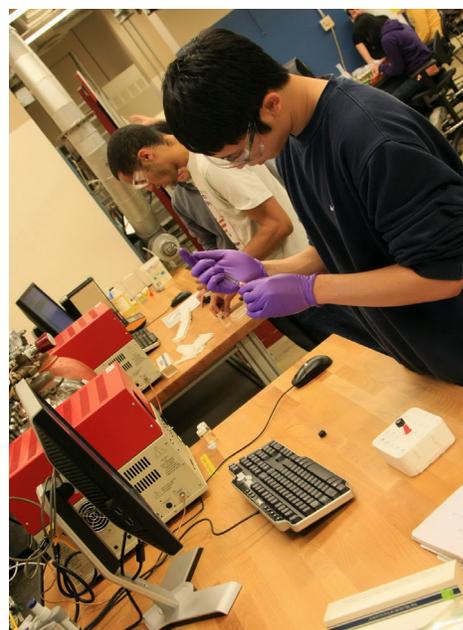
provides students with a more realistic industrial experience where group interactions are encouraged and are also essential to achieving success. Furthermore, students are now able to directly observe how changes to processing parameters in any unit cascade throughout a plant and can have profound and unexpected economic effects."

Students in Unit Ops II now work together in small groups at the mock company "Northwest Biofuels." They learn ChemE fundamentals in mass transportation, heat exchange, concepts for the energy and biotech industries, and undertake industry operations in distillation absorption, enzymatic reactions and fermentation processes.

Through student surveys and external evaluations, Pozzo has been collecting and analyzing data on the upgrades' effectiveness. "Students have said that the activities are a lot more relevant and they are more excited to perform the labs," Pozzo said. "But they also say that it is a LOT more work for them."

Chair Dan Schwartz has applauded Pozzo's efforts to upgrade the lab, which has benefitted the department, its curriculum, and undergrads. "I am especially excited about the new vision for the lab. By integrating experiments into a full process, students can now see that materials and information both flow through a process, and that idea is at the heart of modern automated manufacturing."

Unit Ops will continue to be improved and streamlined, like the new scrubber experiment being installed this year. "We keep updating the lab as we go. It is a constant work in progress," said Pozzo. ■



ChemE 437 students perform experiments on the two GC instruments. An NSF grant helped fund equipment upgrades in the Unit Operations Laboratory.

## Former Boeing VP, Advisory Board Member Gives Back to ChemE

Mary Armstrong (BS '79) knows the value of a good education. The former Vice President of Environment, Health, and Safety for the Boeing Company, grew up watching her mother balance a fulltime job, a family, and night school while working toward an associate's degree. Armstrong, learning the importance of a college degree by example, became the first in her family to earn a bachelor's degree. Through a recently established scholarship, she is now making it possible for a new generation of students to earn a ChemE degree.

Armstrong came to University with a passion for chemistry and the goals of receiving a degree and acquiring marketable skills for work after graduation. "I loved chemistry and wanted to be able to get a good job when I graduated. At that time, engineers were in huge demand so I thought that combining my natural interest in chemistry with engineering was a good choice," said Armstrong. "It was one of the smartest decisions that I have ever made."

With financial help from her family and the encouragement of her mother, Armstrong had the resources and motivation to get her ChemE degree. "My family was very supportive of me and all pitched in so that I could go to college," she said. "My mother, who was a single parent, always stressed the importance of education. She worked fulltime and went to night school when I was young to earn her accounting associate degree. I saw how hard she worked, and I was very determined to get my degree."

**“. . . to get a degree in ChemE, it's truly a life changer for the individual, and the world needs more chemical engineers to solve our biggest global issues."**

After earning a master's in Chemical Engineering from University of Rochester, Armstrong spent three years as a process engineer at the Chevron Research Company (then in Richmond, CA). Longing to return to the Pacific Northwest, she took a job with Boeing in its manufacturing research and development group. Over the next 27 years, Armstrong climbed the corporate ladder at Boeing, working as an engineer for both the commercial airplanes and electronics division, as a manager in environmental engineering areas, and ultimately a VP. "All of those assignments required a lot of ChemE background. As I moved through various management roles in different areas, I depended heavily on the 'systems thinking' that we learn as chemical engineers. It helped me move through increasingly higher levels of

management at Boeing." By the time of her retirement as VP of Environment, Health, and Safety, Armstrong implemented strategies for performance targets of 25 percent improvements in energy efficiency, greenhouse gas emissions intensity, hazardous waste generation, water consumption and recycling rates, and workplace safety. The company has met or is on track to meet all these targets.

Armstrong has utilized her years of business experience as a member of Chemical Engineering Advisory Board. Joining in 2011, she has teamed up with other industrial leaders to advise the department and college leadership on critical matters like curriculum reform and research. "The chemical engineering education and degree was the single most important factor in my career success. I want to show my appreciation for the department by serving on the board," she said. "I hope to help the department by continuing to help drive 'business thinking and continuous improvement' into how the department runs."



Mary Armstrong

She's also giving back to the department through a scholarship that was established this spring. The Armstrong Scholarship in Chemical Engineering will provide funding to a qualified Chemical Engineering undergraduate in need of financial assistance. "I created this scholarship to allow a person, who otherwise might not have the means, to get a degree in ChemE," Armstrong said. "It's truly a life changer for the individual, and the world needs more chemical engineers to solve our biggest global issues." ■

*Read about the first Armstrong Scholarship in Chemical Engineering recipient, Arin Greenwood on pg. 6.*

### NAME THAT ALUM!

As a chemical engineer, he changed the world. As an inventor, he worked at Proctor and Gamble when he ingeniously used the pulp mill to produce clean, absorbent paper to invent the disposable diaper. He helped launch the \$3 billion a year disposable diaper industry in 1961. What is his name?

*Send your responses to [kyoneda@uw.edu](mailto:kyoneda@uw.edu) by Dec. 15, 2012 for a chance to win a \$25 Amazon gift card. Answer will be revealed in the next issue of Catalyst.*

## Adieu to ChemE Advisory Board Member Mark Lawrence

**Name:** Mark A. Lawrence B.S., 1994

**Board Tenure:** 2007-2012

**Title & Company:** Managing Director, Solus Alternative Asset Management, New York, NY

**Why did you decide to serve on the Advisory Board?**

I was introduced to the advisory board by Linda Koffenberger (BS '69), former board member. She got me excited about the curriculum changes the department was starting at that time. She also convinced me a graduate who was on a very different career path than the average alumni might bring an interesting perspective to the meetings.

**What unique perspective do you bring to the board?**

Because of my non-traditional career path, I bring a voice to the board that values the ChemE background, but has chosen to use it differently. The board is well represented with academics and traditional engineers, but lacked someone with a more finance driven background. As Dan has introduced more entrepreneurial opportunities to the curriculum my experience allows me to weigh in these topics.

**You rotated off the board after the Fall 2012 meeting.**

**What board achievements are most proud of?**

Watching the faculty come together to implement the new undergraduate curriculum has been great. I have also really enjoyed being associated with Dan and the department as he puts his stamp on its future direction.

**Why did you decide to go into alternative investing?**

**How have you used your ChemE degree in your career?**

The process way of thinking that the chemical engineer-

ing curriculum teaches has been invaluable in my career. Starting at business school and realizing that not everyone thinks like we do was a revelation and helped me play to my strengths. Being able to be a bridge between process driven companies and their investors has been a key to my success in many situations. Additionally, having the solid technical background to understand a company and its products has allowed me to react much faster to opportunities than many of my fellow investors.

**You recently established the Lawrence Family Endowed Funds for Chemical Engineering. Why set up this fund and what do you hope to accomplish?**

Education has always been very important to my wife and me because both of our parents were educators. While on the board, it really stuck with me what then ChemE Chair Eric Stuve said about how hard it was to get resources for graduate students. I have good memories of the graduate students that were in the department while I was in school and how they helped me with my education. So the long term goal of the gift is to allow the department head some financial flexibility in supporting the graduate students of the department. ■

### About the ChemE Advisory Board

The board is comprised of industrial and academic leaders from across the county. Members promote and advocate for the department, and provide advise on programs, curriculum reform at the annual meeting.

## Leadership Seminar Stimulates Seniors' Career Aspirations

Alums from across the career spectrum are part of this Fall's Leadership Seminars, including CEOs, directors, lawyers, and engineers.

**Mike Roberts** (BS '69, MS '71), Program Manager of Energy and Sustainability Management, SFK

**Sarah Widder** (BS '09), Research Engineer, Pacific Northwest National Laboratory

**Chris Lyons** (BS '79), Senior Research Specialist, 3M Co.

**Karl Nelson** (MS '87, PhD '90), Technology Fellow, The Boeing Company

**Karl Schmidt** (BS '96), CEO, Mirador Biomedical

**Denny Roja** (MS '69), Managing Director and Founder, ValueQuest International

**Kevin Hodgson** (BS '78, PhD '86), Professor, Bioresource Science and Engineering, UW School of Forestry

**Teresa Jurgens-Kowal** (PhD '96), President, Global NP Solutions

**Jim McClain** (BS '61), Partner Emeritus, Brown Martin, Haller & McClain

*Leadership Seminar Speaker Denny Roja (MS '69) visits with Chair Dan Schwartz, Bruce Finlayson, and John Berg.*

## Girl Power! ChemE Junior Excels with Support of Mother, Alumna

ChemE junior and Armstrong Scholar Arin Greenwood shares similarities with her scholarship benefactor, Mary Armstrong (BS '79). She has a passion for chemistry, a desire to have a range of career options available after graduation, and has been inspired and supported by her single mother. She is the first student to be awarded the Armstrong Scholarship in Chemical Engineering.

Hailing from a small California town, Arin's desire to attend the University of Washington was two-fold. "Economically, there wasn't a significant difference between a UC and the UW. And after visiting a few times I had already fallen in love with Seattle," she said. "I dreamed of moving to what is in my opinion the greatest city and center of art, science, music, and culture in America. I now consider Seattle to be my home." Starting at the UW in 2010, Arin considered several factors before deciding to major in Chemical Engineering. "I wanted to pursue my passion for chemistry and science, and also wanted to be in a field with so many career possibilities and diverse post-graduation paths so as to not limit myself to academia or research." Career options she is considering include working in nanotechnology and microdevices, in semiconductor manufacturing, as a process engineer in energy or biotechnology, or becoming a professor. After interning this summer at NASA's Jet Propulsion Laboratory, she hopes to work there while earning her PhD.

But before starting a career, Arin is taking advantage of being a UW student. She is in the University marching band, is a swing dancer and archer, and minoring in math and anthropology. "To me, an education would not be nearly as valuable without taking advantage of as many opportunities as possible," she said. "I feel that it is not enough to simply excel in one field of study without exploring additional opportunities — whether these are academic or simply for fun." In addition to the extracurricular and academics, Arin has worked at the Nanotechnology User Facility on campus and held paid internships to help pay for her education, including rent and loan payments. Receiving the Armstrong Scholarship this year, will help her and her mother pay for college.

Like alumna Mary Armstrong, Arin's mother encouraged her to follow her dreams and sacrificed to make those dreams come true. "My mother has absolutely been supportive of my education from day one, and is the primary reason I am here now. She was not in a science field—she studied design in college and is a young adult author and freelance writer—but has always encouraged me to follow my dreams and helped to make those dreams become a reality for me," Arin said. "She is balancing three jobs and took out loans for nearly all of my tuition. She constantly makes sacrifices for my future and education, and for this I could not be more grateful."

Armstrong's mother also helped pay for her education, serving as a role model, working full time, raising a family, and taking night classes to earn an accounting degree. Armstrong is now making it easier for students to earn a ChemE degree through funding from the Armstrong Scholarship in Chemical Engineering, established in 2012.

While she has yet to meet her scholarship benefactor, Arin is inspired by Mary Armstrong's career and appreciates her support. "I am particularly proud to be connected to Mary by this scholarship and our shared goals and enthusiasm for science and engineering," she said. "I am honored and grateful to receive this scholarship, and look forward to the day when I will be able to donate to the UW's chemical engineering scholarship fund as well in order to encourage future generations in engineering." ■



Arin Greenwood

### ChemE by the Numbers

#### Student Demographics

Undergraduate enrollment: 141  
Bachelor's degrees awarded 2011-12: 63

69% 31%

Underrepresented Minorities 5%

Graduate enrollment: 80  
Master's degrees awarded: 10  
Doctoral degrees awarded: 10

74% 26%

Underrepresented Minorities 9%

■ Men ■ Women

#### About ChemE Faculty

19 core teaching and research faculty  
4 joint Faculty  
11 adjunct faculty  
17 affiliate faculty

#### Faculty Achievements

3 National Academy of Engineering Members  
2 American Association for the Advancement of Science Fellows  
2 Washington State Academy of Science Members  
2 UW Entrepreneurial Fellows  
1 Electrochemical Society Fellow

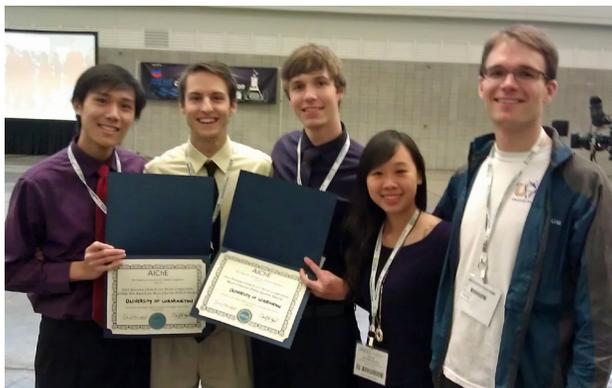
## ChemE Wins at Regional, National AIChE Meetings

ChemE undergraduates swept the competition at the Pacific Northwest Regional AIChE Conference in April. The students took first place in design and performance in the Chem-E Car competition, and moved on to compete at the AIChE Annual Meeting Global Finals in October in Pittsburgh. This win was especially momentous as last year's car did not move at all at the 2011 regional competition.

UW students also took all three of the Research Paper Competition prizes at regionals. Joseph Crowell took third place with his paper "Adhesion in Fiber-Reinforced Composites," and second place went to David Bergsman, with his paper "The Effect of Silane Treatments on the Surface Properties of Silica." John Geil took first place at regionals, with his paper entitled "Titania-Stabilized Pickering Emulsions for Skin Care Products." He advanced to the national competition and took third place there.

At the Chem-E Car Global Finals, the undergrad team won the "Most Creative Drive System Award" and the "Golden Tire Award: Most Creative Vehicle Design," both awards in the design-oriented category.

The UW ChemE team developed a thermoelectrically powered vehicle that extracts electrical energy from a thermal gradient produced by an exothermic reaction (hot-side) and a phase change (cold-side). It was the only vehicle using this power generation mechanism. The students won the award by explaining their design to professional evaluators and other students at a poster presentation prior to the field trials. ■



*The ChemE Car team holds their certificates after winning best-design awards at the AIChE National competition. Team members include (from left) Alex Kon, Ken Davidson, Alex Stark, Kelly Wang, and William O'Neill.*

## Congrats Class of '12



Photo by Alysa Joaquin

*The undergraduate class of 2012 gets serious about graduation and their futures.*

## Student Honors

Graduate student **Cori Bucherl** was named a 2012 American Institute of Chemical Engineers. The Award recognizes student AIChE volunteerism and service.

**Michael Siedlik** (BS '12) placed first at the Electrochemical Society Meeting's Student Poster Competition. He is the first undergraduate research to win first place in the competition.

Graduate student **Jeff Richards** won Outstanding Student Poster Presentation Prize at the American Conference on Neutron Scattering. He also placed 2nd at the AIChE National meeting in the Nanoscale Science and Engineering session.

**Emily Hollenbeck** (BS '12) received the Dean's Medal for Academic Excellence. The award recognizes student leadership, grades, research, and extracurricular activities. Hollenbeck is the second ChemE student to earn the medal.

**Matthew Crane** received a National Defense Science & Engineering Graduate Fellowship. Fellowships are awarded to students beginning their work toward a doctoral degree, selected for their academic ability by the Department of Defense.

Senior and ChemE's AIChE Student Chapter President **Kevin Kronvall** won the Donald F. & Mildred Topp Othmer National Scholarship Award at the AIChE Student Conference.

Graduate student **Rami Foster** was awarded a travel grant to attend the Nanobeams School in Luxembourg.

**Joe Baio** (PhD '11) received a National Science Foundation post-doctoral fellowship.

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# Catalyst

## Fund Established to Honor Alum

Alum and former AIChE (American Institute of Chemical Engineers) Class President Donald "Don" Montrose (BS '04) passed away on March 26, 2012 due to a pulmonary embolism.

"Don has a special place in my memory," said Prof. John Berg. "He a stellar student. I got to know him very well when I supervised his undergraduate research, and his insights and skills in the lab, as well as his eternally upbeat approach, paid off very well. He took first place in the research paper contest at the AIChE Regional Conference, and furthermore we were able to publish the results of the work in a scholarly journal."

Don had a vibrant career at Catalytic Solutions in Ventura, CA as a general manager. He is survived by his wife Chris and children Dominique and Dante.

A fund has been established in the department provide financial awards to ChemE undergraduate students in Don's name. For more information on Don or the Donald Montrose Memorial Fund, visit [www.cheme.washington.edu/alumni/memorial/montrose.html](http://www.cheme.washington.edu/alumni/memorial/montrose.html).



*Donald Montrose*

## 2012 Distinguished Alumnus Dan Evans



*Chair Daniel Schwartz (right) presents 2012 Distinguished Alumnus Dan Evans receives his Moulton Medal. Evans was recognized for his successful career at JH Kelly. He received the award at the 2012 Graduation Ceremony on June 8, 2012.*