

# TRANSPORT

The University of Houston Department of Chemical and Biomolecular Engineering

Spring 2012

## DEPARTMENT WINS TWO NSF CAREER AWARDS

Two faculty members in the  
UH department of Chemical  
and Biomolecular Engineering have  
received National Science Foundation CAREER Awards.

Assistant Professors Gila Stein and Jacinta Conrad are two of  
five Cullen College of Engineering faculty members who have  
been awarded the prestigious grant in 2012.



**GILA STEIN** received a five-year, \$500,000 grant to improve polymer-based solar cells, which promise an attractive alternative to standard silicon-based cells. They are lighter and more durable, easier to manufacture and have a lower raw materials cost, although they have low efficiency in converting sunlight to electricity.

Stein's research will improve low-cost solar energy conversion by studying the interface between the active layer structure and electronic function, and controlling the relationship between the materials that donate and accept electrons in the device. Here, the electron donor is a polymer, and the electron acceptor is a spherical carbon molecule known as fullerene. Stein is focusing on ways to control the distribution of polymer and fullerene to optimize the interface.

In conjunction with her research, Stein has integrated education and outreach activities to advance knowledge about polymer science in the community. She encourages research participation within diverse groups of high school, undergraduate and graduate students, and leads programs that introduce principles of research to under-represented groups in science and engineering.



### JACINTA CONRAD

received a five-year, \$400,000 grant to develop surfaces that limit bacterial motility. Motility

is a critical factor in the formation of biofilms, colonies of bacteria that are protected by an extracellular matrix of proteins. Biofilms are extremely difficult to remove and are implicated in such damaging phenomenon as pipeline contamination and hospital-acquired infections.

Conrad's research has revealed new methods of bacterial motility, demonstrating that bacteria optimize the use of their appendages (pili) to move efficiently on a wide range of surfaces prior to forming biofilms. This newfound understanding will influence the future design of surfaces that inhibit biofilm formation by identifying properties that keep pili from sticking to a surface. Optimized antifouling coatings will benefit the petroleum and biomedical industries.

To engage participation of diverse groups within the Houston engineering landscape, Conrad's research on biofouling will be combined with teaching and outreach efforts in local high schools, at the undergraduate and graduate level, and through interdisciplinary workshops on engineering for biology.

# Preston Broom

2011-2012 *Outstanding Junior*

Cullen College of Engineering named chemical engineering major Preston Broom as its 2011-2012 Outstanding Junior. Broom was selected from a group of top students representing the college's eight undergraduate programs.

Broom is involved in the student chapters of American Institute of Chemical Engineers (AIChE) and the American Chemical Society (ACS). This summer, Broom will intern at Valero's Houston refinery, a position he acquired through the Engineering Career Fair. Broom notes that he has gained a solid foundation in engineering concepts through the courses he has taken at Cullen College. When Broom is not studying, he is at the Recreation Center participating in a number of intramural sports. He plans to work after graduation to gain practical experience. His long-term goal is to pursue a Ph.D.



## Chemical Engineering Certificates

Process design and chemical companies are seeking advanced/professional training for their employees to sustain the knowledge necessary to compete with the increasing demands of complex engineering and management.

The UH Executive Certificates of Chemical Engineering were created out of necessity for industry and as widespread applications for engineers through the chemical engineering field. Certificate programs offered are:

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Chemical Engineering in Safety, Operations and Management

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## UH ChBE Graduate Student Wins Award at Annual Meeting

**Pranit Metkar**, a graduate research assistant in the Department of Chemical and Biomolecular Engineering, was selected as a winner at the Catalysis and Reaction Engineering Poster Session held during the 2011 AIChE Annual Meeting in Minneapolis for his poster entitled "Determination of Controlling Regimes for Various SCR Reactions on Zeolite Based Monolithic Catalysts."

As part of Professor Michael Harold's research team, Metkar focuses on the area of catalytic reaction engineering with the objectives of reducing the emission of harmful pollutants like NO<sub>x</sub> in the atmosphere. NO<sub>x</sub> is

the cause of ground level ozone formation, a respiratory irritant. It is also a major cause of smog and acid rain formation.

Diesel engine vehicles are one of the biggest producers of NO<sub>x</sub>. Metkar is working on the catalyst technology used in catalytic converters in vehicular applications to reduce NO<sub>x</sub> emissions.

Metkar completed his undergraduate degree from the University Institute of Chemical Technology in Mumbai. He will complete his Ph.D. in summer 2012 and seeks an industrial research position.



# 2012 AIChE *Southwest* REGIONAL CONFERENCE

The UH student chapter of the American Institute of Chemical Engineers (AIChE) hosted the 2012 Southwest Regional Conference on March 23 – 25, 2012 on the UH campus. Students and professionals were invited to attend this event for networking and learning opportunities, including a career fair, competitions and workshops covering topics in exploration and production, refining and chemicals, midstream trading, and intellectual property law.

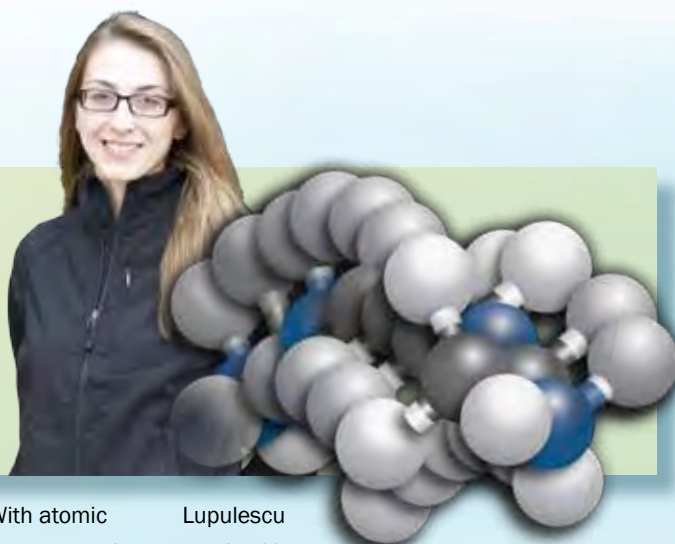
This year's keynote address featured Dr. R. Gerald Bailey, chairman of Bailey Petroleum LLC in Houston. He discussed the future of the chemical engineering field, particularly career paths and energy policy, with an emphasis on the role of hydrocarbon engineering.

The intercollegiate Chem-E Car competition took place during the conference, in which chemical engineering student teams from the region were challenged to design and construct a size-limited car that is powered by a controlled chemical reaction. UH Chem-E car team members Joshua Dillon, An Dinh, Vincent Nguyen, William Payne, Samir Rostane and Sheli Wilson built a car that uses the catalyzed decomposition of hydrogen peroxide to create oxygen, which is fed to an air motor that powers the car. The team placed second in the regional competition and will advance to the national competition in October.



## Student Profile

Alexandra Lupulescu is a third-year Ph.D. candidate in the UH Department of Chemical Engineering. She works with assistant professor Jeffrey Rimer's team, optimizing zeolites, a type of catalyst.



"Zeolites are crystalline materials that contain silica and alumina, which are used in a large variety of chemical processes throughout industry," said Lupulescu. "We're trying to change not the type of material but the overall shape, so that it can better serve its purposes. We're going to use it for environmentally-friendly applications, like nitrogen oxide reduction, which in Houston is a pretty big issue." Lupulescu recently co-authored a paper with Professor Rimer, "Tailoring Silicalite-1 Crystal Morphology with Molecular Modifiers," which was published in *Angewandte Chemie International Edition*.

As part of her regular lab techniques, Lupulescu uses atomic force microscopy, scanning electron microscopy, and dynamic light scattering for zeolite crystallization analysis. "Because the scale that we're working on for the zeolites is on the order of tens of microns, and they're very anisotropic, I can't measure them otherwise; I need a

visual tool," Lupulescu noted. "With atomic force microscopy, we're excited because we're trying to be the first to do in situ studies. Real-time zeolite growth rate is extremely slow, so it could take anywhere from ten to 20 hours to notice a 50 nanometer change in size. We've had to overcome a lot of issues from an instrumental standpoint."

Lupulescu, originally from Romania, moved with her family to the U.S. in 1997. Her parents are Ph.D.s who encouraged her to earn a Ph.D. Lupulescu actually started out in mechanical engineering but her first semester as an undergraduate at Tulane University was put on hold by Hurricane Katrina. She went back to her hometown of Troy, N.Y. to attend Rensselaer Polytechnic Institute.

When she returned to Tulane the next semester, she found out that her program had been cut due to budget restrictions, so she switched to chemical engineering. After

Lupulescu received her bachelor's in chemical engineering, she visited UH on the recommendation of the department chair at Tulane, who knew the UH chemical engineering department chair, Professor Ramanan Krishnamoorti.

"I really liked UH, and for personal and educational reasons I came here," Lupulescu said. "I started in the fall of 2009 and it was around the same time that Dr. Rimer started here. It's been a really good experience. I've been very impressed with the quality of teachers here, and the research."

Lupulescu plans to work in industry after she completes her Ph.D., which will allow her the flexibility of working for various projects for a wide range of companies. "I hope to stay in the catalysis field and work on energy or environmental-related projects," she said.

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Look for ChBE in the  
dropdown menu.

As we celebrate the 60th anniversary of our department, we would like to establish a **Chemical Engineering Alumni Endowment Fund** to provide educational and research support for our student scholars and exceptional faculty. The creation of this endowment can make a major impact on the success of the department with your philanthropic support. As coveted alumni, friends of our department, and valued community supporters, we thank you and celebrate all the accomplishments of UH Chemical and Biomolecular Engineering as we look toward the future.

Join us in helping support the ongoing excellence of our ChE department! The Chemical Engineering Alumni Endowment Fund can be supported by your generous donation and the return of the support card.



**Dr. Ramanan Krishnamoorti, Ph.D.**

*Dow Professor & Chair of Chemical & Biomolecular Engineering  
University of Houston*

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**THANK YOU FOR YOUR SUPPORT!**

AFBAT

# UH ChBE CELEBRATES



The UH Department of Chemical and Biomolecular Engineering celebrated its 60th anniversary in celebratory fashion with alumni, friends of the department, dedicated faculty and staff members, and students on Saturday, May 5, 2012. This event marked a milestone achievement for the department, as it continues to grow and expand the positive impact the Cullen College of Engineering is making at the University of Houston, and throughout the greater Houston region, nationally and internationally.

The department celebrated and acknowledged many of its alumni for their exemplary service and leadership. ChE has launched an incredibly successful undergraduate degree in petroleum engineering. The department has grown to employ 20 distinguished faculty, who are awarded for their efforts in research and development. Their leadership is needed to make UH Chemical and Biomolecular Engineering one of the best programs in the country.

## Awards Recipients:

<i>Name</i>	<i>Reason</i>
Marvin <b>Radney</b>	Class of 1952
Enos <b>Bonham</b>	Outstanding Senior (1957)
Norman <b>Gerber</b>	Class of 1957
Chris <b>Santner</b>	Outstanding Senior (1972)
Rick <b>Ng</b>	Outstanding Senior (1983)
Randall <b>Collum</b>	Outstanding Senior (2001)
May <b>Shek</b>	Outstanding Senior (2002)
Dan <b>Baker</b>	Most Patents Award
Tony <b>Catalano</b>	Entrepreneur Award and Inaugural IAB Member
Randall <b>Collum</b>	Young Entrepreneur Award
Jim <b>Culpepper</b>	Community Service Award
Micky <b>Fleischer</b>	Alumnus and Faculty Member
Ravi <b>Singhania</b>	Engineering Distinguished Alumnus
Pia <b>Greenberg</b>	60th Anniversary Committee Member
Ramanan <b>Krishnamoorti</b>	Dow Chair Professor
Dennis <b>McCullough</b>	Alumnus and IAB Member
Ven <b>Pinjala</b>	Alumnus and IAB Member
Randall <b>Sitton</b>	Alumni Service Award and Distinguished Alumnus

## Sponsors:

Randall **Collum** (BSChE '01, MPE '04)  
\$10,000 Scholarship Fund Supporter  
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Chris **Fair** (BSChE '94, MSPE '97)  
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Gabe **Cuadra** (BSChE '88)  
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## Special Thanks:

**Omega Chi Epsilon** \$3500 Gift to PROMES

For a listing of attendees, please visit:  
<http://bit.ly/L6UHYM>



## Connect with UH Chemical Engineering

To ensure that your information is included on the Chemical Engineering Alumni database please contact Linda Keng at [LKeng@uh.edu](mailto:LKeng@uh.edu) and provide her with your current physical address, email address and telephone numbers.



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