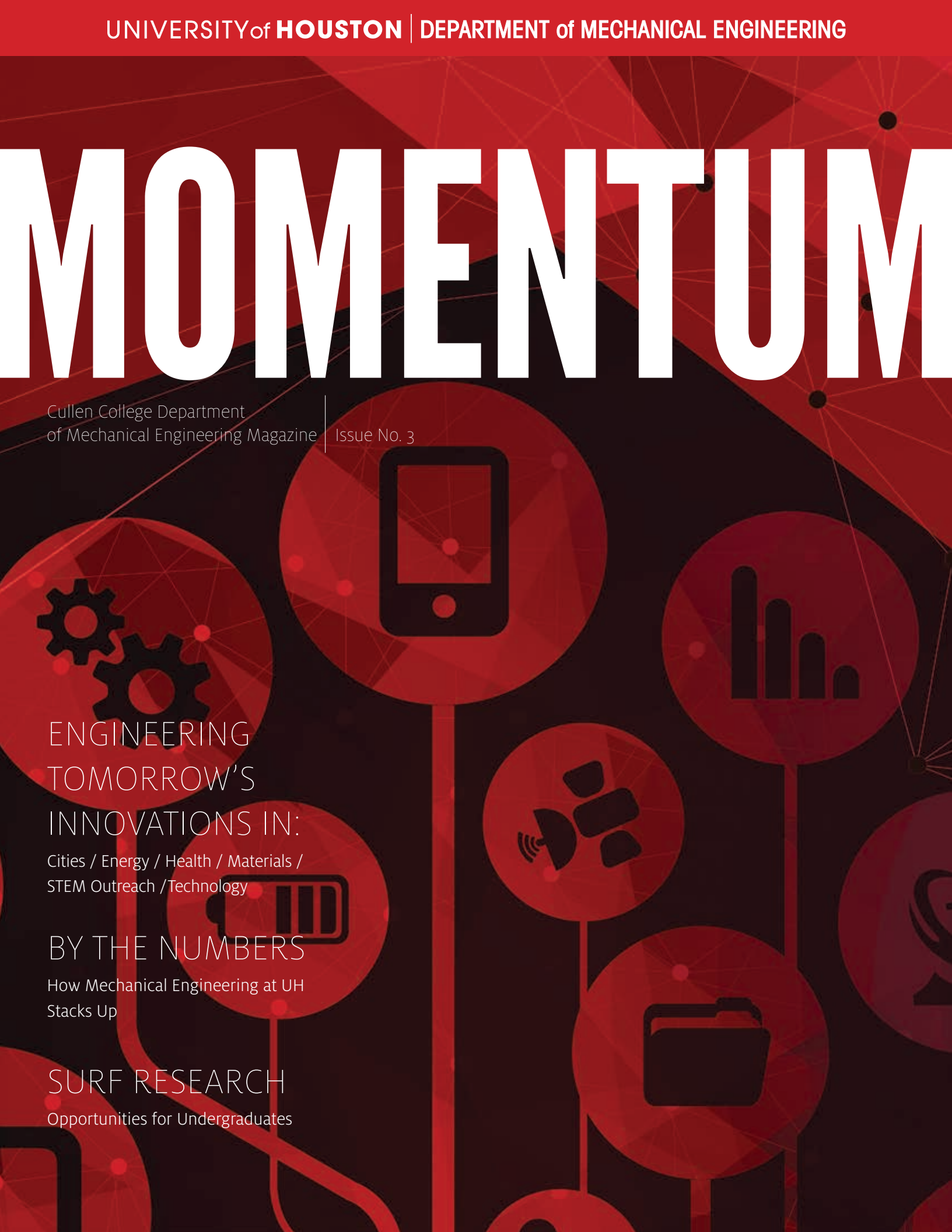
UNIVERSITY of HOUSTON | DEPARTMENT of MECHANICAL ENGINEERING

MOMENTUM

Cullen College Department of Mechanical Engineering Magazine | Issue No. 3



ENGINEERING TOMORROW'S INNOVATIONS IN:

Cities / Energy / Health / Materials / STEM Outreach / Technology

BY THE NUMBERS

How Mechanical Engineering at UH Stacks Up

SURF RESEARCH

Opportunities for Undergraduates

COMING IN 2016

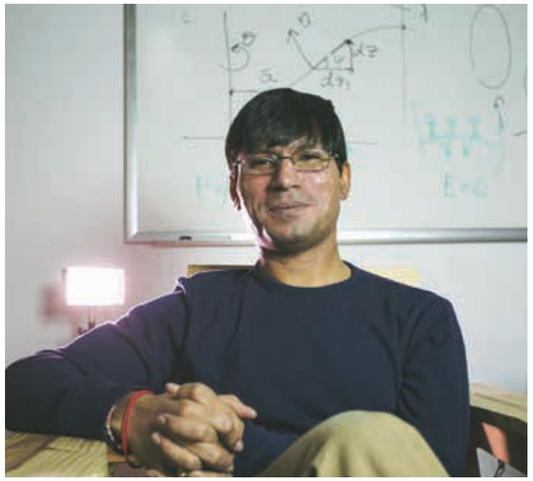
Multidisciplinary Research & Engineering Building (MREB)

The UH Cullen College of Engineering has met its fundraising goal of $10 million for the MREB – and the timing couldn't be better. The Cullen College will be doubling its size over the next 10 years, welcoming more than 4,000 new students and 50 new faculty members by 2025. The MREB will provide the critical infrastructure needed to increase student enrollment, associated faculty and research funding.

The MREB is expected to help generate approximately $36 million in research funding annually for the Cullen College of Engineering and to promote an approximate $612 million increase in annual economic activity in Houston alone. It will also allow UH to add more than 250 talented graduate students and hire new National Academy of Engineering faculty.

Construction began in November 2014. Completion is scheduled for the summer of 2016.

CONTENTS



MOMENTUM

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UNIVERSITY of HOUSTON
CULLEN COLLEGE of ENGINEERING

CHAIR'S MESSAGE

In the Mechanical Engineering (ME) Department at the University of Houston Cullen College of Engineering, our central mission is to educate the next generation of globally competitive engineers and to perform cutting-edge research in the broad area of mechanical sciences. In this issue of Momentum, we invite you to explore the ways in which we continue to succeed in this mission and to take a closer look at our plans to continue driving the field of mechanical engineering forward for generations to come.

A modern mechanical engineer is very versatile. In our department alone, our students and faculty are currently involved in research related to cell biology, drug delivery, missile design, radiation-hardened materials, quantum dots, hypersonic flights, shale gas exploration, nanostructured Li-ion batteries for energy storage, environmentally friendly engines, high temperature superconductive materials, subsea engineering, sensors, control of complex systems, thermal management, mechanics of complex fluids, artificial muscles and ultra-strong materials. This abbreviated list of active research within our department should give you at least a glimpse of the amazing array of career and research choices a mechanical engineer has in our current economy.

The University of Houston's highly-ranked ME department boasts very close ties with Houston's energy and engineering industrial complex as well as the medical center. Our graduates can be found in key positions in some of the leading companies both locally and around the world.

The ME program has seen record growth in recent years, with an undergraduate enrollment of over 700 students. Mechanical engineering is currently one of the most sought-after degrees within the Cullen College of Engineering. With our high standards of admission as well as passion for teaching, we prepare our graduates with a strong foundation in mathematics, physical sciences and engineering principles for applications in industry, research, and academia.

I invite you to explore our website at www.me.uh.edu to see what we have to offer. If you need more information about our programs or department, please email me at psharma@uh.edu.

Pradeep Sharma
M.D. Anderson Professor and Department Chair
Mechanical Engineering
Cullen College of Engineering
University of Houston

BRAGGING POINTS

1 **UH engineering students ranked 15th in the U.S.** for salary earning potential (Source: PayScale.com)

2 Named one of Princeton Review's **"best value colleges"** (2012, 2013)

3 Located in **"America's coolest city"** and **"one of the best places for 20-somethings"** (Source: Forbes.com and CreditDonkey, 2013)

4 Listed as one of the world's top universities **for grads who go on to become CEOs** (Source: The Times Higher Education of London)

5 Ranked #4 in the nation for **"top colleges where students get the best bang for their buck"** (Source: PolicyMic, 2013)

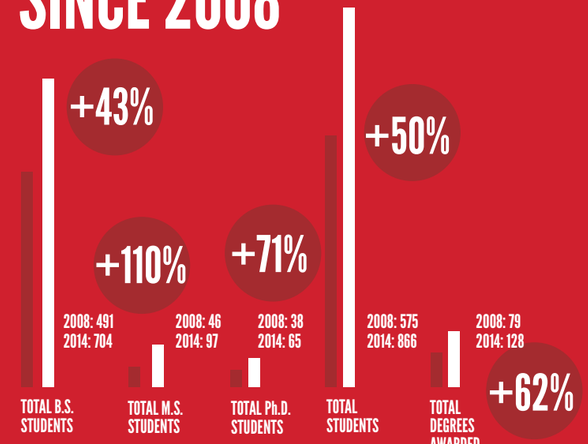
6 Ranked among the top 75 in the nation and **#1 in Houston for engineering research** and development expenditures (Source: National Science Foundation, 2011)

BY THE NUMBERS

20%
OF FACULTY MEMBERS ARE WOMEN

22:1
22:1 UNIVERSITY-WIDE STUDENT TO FACULTY RATIO

43% INCREASE IN STUDENT ENROLLMENT SINCE 2008



TOP 100
ENGINEERING SCHOOLS IN THE U.S.

80%
OF UH ENGINEERING UNDERGRADS ARE EMPLOYED IN TEXAS WITHIN ONE YEAR OF GRADUATION

$64,500
AVERAGE STARTING SALARY IN HOUSTON FOR B.S. IN MECHANICAL ENGINEERING
(NATIONAL ASSOCIATION OF COLLEGES AND EMPLOYERS 2014 SALARY SURVEY)

28
ENGINEERING STUDENT ORGANIZATIONS

$25.8M
IN RESEARCH EXPENDITURES

18,045
TOTAL ALUMNI OF THE CULLEN COLLEGE OF ENGINEERING

11 NATIONAL ACADEMY OF ENGINEERING FACULTY MEMBERS

UH ENGINEERING MAJORS RANKED 15TH IN U.S. FOR EARNING POTENTIAL

The University of Houston's Cullen College of Engineering was ranked among the top 20 schools in the country for graduating students with the highest salary potential by PayScale.com.

The 2013-2014 PayScale Potential Salary Report features the rankings of colleges by salary potential for graduates with degrees in nine specific major groupings, including humanities, engineering, social sciences and computer sciences. The University of Houston was ranked 15th for salary potential of engineering graduates. Other top 20 schools included Columbia University (#13) and MIT (#11).

PayScale.com is an online salary, benefits and compensation information company that offers users access to surveys determining what certain jobs might pay.

According to the PayScale report, UH engineering graduates earn $69,800 on average for their early career salaries and are earning about $123,500 by mid-career.

Read the full report at www.payscale.com/college-salary-report/best-schools-by-majors/engineering.

IN THE MEDIA

TV

ABC 13 Eyewitness News
University of Houston Receives $3.3M Grant to Promote Women in STEM Fields
Featuring UH Cullen College of Engineering
(Aired August 30, 2014)

PRINT

E&P Magazine
Training Tomorrow's Subsea Engineers
Featuring Phaneendra Kondapi, KBR Adjunct Professor of Mechanical Engineering
(Published August 1, 2014)

Houston Business Journal
Houston University Breaks Ground on $51 Million Research Facility
Featuring UH Cullen College of Engineering
(Published October 7, 2014)

Houston Chronicle
Houston Universities Working to Fix 'Gateway' Courses, Keep Students in STEM
Featuring UH Cullen College of Engineering
(Published June 6, 2014)

Finding New Energy Offers Never-Ending Challenges
Featuring David Shattuck, Associate Professor of Electrical and Computer Engineering and Associate Dean of Undergraduate Programs
(Published July 11, 2014)

New Energy Fuels School's Ambitions
Featuring Matthew Franchek, Director of the Subsea Engineering Program; Ramanan Krishnamoorti, Chief Energy Officer at the University of Houston; Venkat Selvamanickam, M.D. Anderson Chair Professor of Mechanical Engineering
(Published November 15, 2014)

UH Students Compete to Design HISD School
Featuring Students from the UH Cullen College of Engineering
(Published November 19, 2014)

Shale Industry Staying Busy with Activity
Featuring UH Cullen College of Engineering
(Published November 21, 2014)

Phys.org
Researchers Identify One of the World's Thinnest Piezoelectric Materials
Featuring Pradeep Sharma, Chairman of the Mechanical Engineering Department; Matthew Zelisko, Mechanical Engineering Doctoral Student

Rigzone
UH Takes Subsea Program to New Heights
Featuring Matthew Franchek, Director of the Subsea Engineering Program
(Published September 1, 2014)

YourHoustonNews.com
University of Houston Researcher Wins $1.5 Million Federal Solar Energy Award
Featuring Venkat Selvamanickam, M.D. Anderson Chair Professor of Mechanical Engineering
(Published October 23, 2014)

CULLEN COLLEGE SPEARHEADS $3.3M GRANT TO PROMOTE WOMEN IN STEM FIELDS

STEM

The University of Houston was awarded a $3.29 million grant over five years by the National Science Foundation's (NSF) ADVANCE program to increase the number and success of women faculty in the science, technology, engineering and mathematics (STEM) fields.

The focus of the ADVANCE program is to "increase the representation and advancement of women in academic science and engineering careers, thereby contributing to the development of a more diverse science and engineering workforce." This award will allow the university to establish a "Center for ADVANCING Faculty Success" to oversee the goal of increasing female STEM faculty recruitment, especially among women of color, as well as enhancing UH's infrastructure to make gender equity and diversity campus-wide priorities.

The Cullen College of Engineering spearheaded the grant proposal with support from the College of Technology, the College of Liberal Arts and Social Sciences, the College of Education and the College of Natural Sciences and Mathematics. Renu Khator, chancellor and president of the University of Houston, is the principal investigator on the grant.

Co-investigators include Joseph W. Tedesco, Elizabeth D. Rockwell Professor and Dean of the Cullen College of Engineering; Bonnie Dunbar, M.D. Anderson Professor of mechanical and biomedical engineering, director of the UH STEM Center and the aerospace engineering program; Dan Wells, interim dean of the College of Natural Sciences and Mathematics; and Holly Hutchins, associate professor of human development and consumer sciences in the College of Technology.

"The future of the engineering profession in the U.S. depends on recruiting more women and underrepresented minorities," Tedesco said. "In order to be successful, we need women and underrepresented minority role models in leadership positions throughout our STEM colleges. This grant will help UH to achieve that goal, and I'm extremely proud that the Cullen College of Engineering has taken a leadership role in this process."

The UH grant proposal included several goals in addition to attracting more women STEM faculty at senior, mid-career and junior levels. The center also hopes to increase the support and representation of women STEM faculty in administrative leadership positions at the department, college and university levels.

To achieve these goals, UH will establish mentorship programs between senior female STEM faculty members and their mid-career and junior counterparts. The ADVANCE Center will also launch diversity training and workshops for STEM chairs, deans and faculty members. Other programs to be implemented include leadership training for administrators, work-life integration activities for female employees and a "STEM in the Americas" speaker series.

Paula Myrick Short, senior vice chancellor for academic affairs for the UH system and provost of UH, will serve as the center's director. Lisa Robertson, executive director of external relations and strategic partnerships at the Cullen College, will serve as interim managing director.

In addition to creating an environment favorable to women STEM professionals, the proposal also establishes an ADVANCE Regional Network (ARN), linking Prairie View A&M University, Rice University, Texas A&M University and the University of Texas – Pan American with UH.

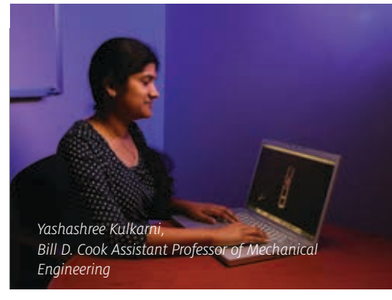
ARN will be the first-ever regional, multi-institutional ADVANCE network. Each of the ARN partners brings to the network a broad set of ADVANCE expertise that will be shared through mentoring programs, workshops, special events and webinars. ARN will provide a platform from which ADVANCE centers can reach out to other institutions to engage in dialogues about women faculty's experiences and help catalyze activities at those institutions to improve the success of women STEM faculty.

The period of performance for the NSF grant will run from Sept. 1, 2014 through Aug. 31, 2019.

To learn more about the UH ADVANCE Center, please visit: www.uh.edu/advance.

Bonnie J. Dunbar, co-investigator on ADVANCE grant and M.D. Anderson Professor of Mechanical Engineering

Haleh Ardebili, Bill D. Cook Assistant Professor of Mechanical Engineering



Yashashree Kulkarni, Bill D. Cook Assistant Professor of Mechanical Engineering

CULLEN COLLEGE OFFERS WORLD'S ONLY SPACE ARCHITECTURE GRADUATE PROGRAM

The University of Houston Cullen College of Engineering added a brand new and first-of-its-kind program to its academic offerings last fall: the world's first and only space architecture graduate program.

The space architecture graduate program at the Cullen College is led by **Bonnie J. Dunbar,** M.D. Anderson Professor of mechanical engineering and director of the aerospace engineering graduate program as well as the UH STEM Center. **Larry Bell,** founding director of the Sasakawa International Center for Space Architecture (SICSA) at the University of Houston, will serve as the program's co-director.

Together, Dunbar and Bell hope to lead the space architecture program at UH to new and unprecedented heights – and the two are uniquely equipped to take on such a task. Dunbar is a member of the National Academy of Engineering and a former NASA astronaut who logged more than 50 days in space and flew in five space missions. She is also an alumna of the Cullen College, having received her Ph.D. in engineering from the University of Houston.

Bell launched the world's first and only research and education program in space architecture at the University of Houston in 1987 – a strategic choice not only for Houston's reputation as the "Space Capital of the World," but for the university's unique access to the NASA Johnson Space Center. Bell also established SICSA at UH that same year.

Since then, Bell has both led and defined the field of space architecture, exploring what, how and where we call home. From the depths of the ocean floor to the heights of orbiting space stations and distant planets, Bell is pushing the field of space architecture beyond its earthly limits.

Bell and SICSA have provided comprehensive orbital and lunar/planetary space facility research and design services to NASA and numerous major aerospace companies. To this day, SICSA stands as the world's leading academic organization for the planning and design of habitats in space and other extreme environments.

Bell said that a key role of SICSA is to prepare others for professional opportunities in the field of space architecture. As a result, many alumni of the space architecture program at UH are enjoying influential careers at the NASA Johnson Space Center and other space-related entities throughout the world, much like Bell has.

"If we can solve difficult and critical problems in environments as extreme as space, then surely we can solve them in extreme environments on our own planet," Bell said. To this end, SICSA has, from its inception, addressed planning and design needs in such extreme environments and applications as polar research stations, offshore surface and underwater facilities, military deployment to remote regions and emergency disaster response accommodations.

"Many different extreme environments share common problems and are analogues for one another," Bell added. "There are huge construction and logistical challenges, where site locations are often very remote and difficult to access, and weather and working conditions are severe – often hazardous."

Bell stresses that space architects must have a very inclusive, multidisciplinary approach to understanding and solving incredibly diverse problems, as the space architecture field requires collaborations with professionals from many different disciplines. "This is what space architecture, and more broadly, the space program, brings to the world: the benefit of top-down problem-solving, big-picture thinking. That is something real that we can offer to the world," Bell explained.

The addition of the space architecture master's program to the aerospace engineering curriculum at the Cullen College represents one of the many positive changes that Dunbar has in store for aerospace engineering students. Dunbar said she is currently focused on revitalizing and reshaping the aerospace engineering program at the Cullen College by encouraging collaboration across disciplines and establishing an updated, interdisciplinary curriculum.

Dunbar said that her goal is to incorporate several disciplines into the updated aerospace engineering program, including engineering, space architecture, math, science and physics, in order to provide students with a comprehensive education in space operation, space flight, space training and space architecture all under one program.

"The way I see it, this gives us a chance to try to redefine and reshape our culture and our priorities when it comes to space and space exploration," Bell said.

Bell and Dunbar are also working with NASA, private industry, government and other academic institutions to explore future collaborations on research and academic learning centers, as well as the development of space exploration design reference missions and technology.

SCIENCE ENGINEERING FAIR OF HOUSTON TO BE HELD FEB. 27-28 AT THE UNIVERSITY OF HOUSTON

The 56th Annual Science Engineering Fair of Houston (SEFH), presented by Chevron Corporation, will be held on Feb. 27 - 28, 2015 at the University of Houston Main Campus Alumni Center. The winning students and Teacher of the Year will be celebrated at the awards ceremony on March 1 at the University of Houston's Cullen Performance Hall.

SEFH serves as one of the largest regional science and engineering fairs for all public, private, chartered and home-schooled junior and senior high school students in Houston as well as the 22 surrounding counties throughout southeast Texas. More than 1,300 middle and high school students from 125 schools are expected to compete at the 56th annual SEFH.

"It's an incredibly exciting event," said SEFH director **Bonnie J. Dunbar**, a professor of mechanical engineering at the UH Cullen College of Engineering. Dunbar is a former NASA astronaut and currently serves as director of the University of Houston STEM Center and the Cullen College's aerospace engineering program.

Inspiring young people across the country to pursue STEM (science, technology, engineering and mathematics) careers is one of Dunbar's primary passions. Science fairs, she said, are extremely important events for engaging students into STEM careers.

"The nation is facing a shortage of qualified scientists and engineers, a situation described in the 2012 report by President Obama's Council of Advisors on Science and Technology. The challenge to the nation is to graduate 1 million new scientists and engineers by 2020," Dunbar said.

"In order to graduate more scientists and engineers, we need more and better-prepared math and science high school students for our colleges of engineering, math and science," she said. "That translates into biology, chemistry and physics and four years of math by high school graduation. At the completion of a college education in engineering, math, biology, chemistry, and physics are a wealth of careers with opportunities to creatively solve some of the most pressing challenges of our time."

A 2013 Brookings Report identified a clear need in Houston. It reported that Houston ranked 5th in STEM career demand out of 100 U.S. cities, but 72nd in supplying STEM workers. About two-thirds of the local STEM workforce with at least a bachelor's degree comes from outside of Texas; almost one-fourth were born outside of the United States.

Local industries and research institutes are very interested in the success of SEFH. In addition to presenting sponsor Chevron Corporation, contributing sponsors include the University of Houston, Air Liquide, Exxon Mobil, Phillips 66, Shell and the Houston Geological Society.

For more information on the Science Engineering Fair of Houston, please visit www.sefhouston.org.

ENGINEERING TOMORROW'S INNOVATIONS IN:

CITIES/ENERGY/HEALTH/MATERIALS/STEM OUTREACH/TECHNOLOGY

ENERGY

RESEARCHER WINS $1.5M FEDERAL SOLAR ENERGY AWARD

A professor at the University of Houston Cullen College of Engineering is trying a novel approach to create high efficiency, low cost solar cells in an effort to bring the cost down to that of traditional electricity sources.

Venkat Selvamanickam, M.D. Anderson Chair professor of mechanical engineering and director of the Applied Research Hub at the Texas Center for Superconductivity at UH, received a $1,499,994 grant from the U.S. Department of Energy SunShot Initiative to produce high efficiency, inexpensive thin film photovoltaics.

The grant is part of the department's SunShot Initiative, created in 2011 to make solar energy cost-competitive with other forms of electricity by the end of the decade. Since then, it has funded more than 350 projects, with a goal of bringing the cost of solar electricity to about $0.06 per kilowatt-hour.

Selvamanickam, whose lab already produces thin film superconducting wire, said he began thinking several years ago about developing a technique to produce solar cells using a technique similar to the one he uses for coating semiconductors as thin films on low-cost metal substrates, based on a similar roll-to-roll manufacturing technology.

The solar cells targeted by Selvamanickam are different from the solar panels people are accustomed to seeing on rooftops. Solar cells traditionally are produced on silicon wafers, while the most efficient solar cells are composed of a germanium wafer, topped with gallium-arsenide.

But that type of solar cell is expensive, Selvamanickam said, both because of the high costs of the germanium wafer and the manufacturing process. And the germanium wafers are small, requiring a large number to cover the area. Consequently, they are used mainly for space applications.

His process involves using a metal foil tape with a germanium thin film – although he said another substance could be used as a base – and moving it at high speed with the roll-to-roll technology, coating it in a vacuum chamber with vapors of gallium and arsine.

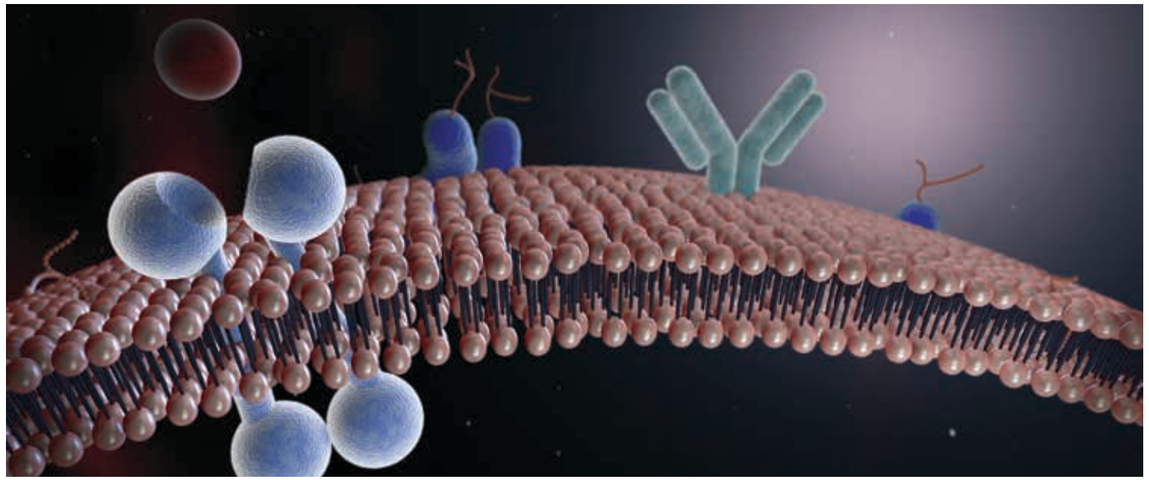
The work is being done in Selvamanickam's Energy Devices Fabrication Laboratory at the UH Energy Research Park (ERP). The ERP was established by the University in 2010 to conduct translational research to rapidly develop and transfer new technologies to industry. The new project with SunShot will be conducted in collaboration with the South Dakota School of Mines and Technology.

Selvamanickam said his team presented proof-of-concept with his application to the Energy Department, showing high-quality gallium arsenide thin films on metal foils. Those results were published in the journal Applied Physics Letters in September. Other researchers have used roll-to-roll manufacturing technology for solar cells but not with the germanium-gallium-arsenide materials and so they had much lower efficiency, he said.

Single-junction solar cells on germanium wafers produced with gallium-arsenide can operate at an efficiency of 28.5 percent, with a cost of several dollars per watt. Selvamanickam's goal is to produce a solar cell that operates at 24 percent efficiency at a cost of 20 cents per watt.

HEALTH

PROFESSOR EXAMINES UNDERLYING MECHANICS OF NUCLEUS MEMBRANES IN BIOLOGICAL CELLS



Ashutosh Agrawal, assistant professor of mechanical engineering, said he likes to tell his students at the Cullen College that many lessons on mechanics and structures can be gleaned from nature. "There is so much diversity and beauty in nature, and biological cells are a wonderful example of this," he said.

Agrawal was recently awarded $382,000 over three-years from the National Science Foundation (NSF) to study the underlying mechanics of the outer membranes of the nucleus that encapsulate the DNA of the cell.

"The same physical laws that govern the mechanics and design of skyscrapers and bridges also govern the structure and the physical response of biological cells," Agrawal said. Nature is full of structures where functionality and beauty have been balanced in a remarkable way. The interface of a nucleus in a cell, called a nuclear envelope, is an excellent example. One can think of it as a structure made up of thousands of tiny donut-shaped pores fused together. Inside of these pores are proteins that act as gatekeepers to the vital genetic information stored inside of the nucleus. It is one of the most fascinating structures inside of biological cells, but very little is understood about the nuclear envelope.

"If we can understand the structure and the adaptation of the nuclear envelope, we can gain insight into the organization of the genetic material inside of the nucleus," Agrawal said. The nuclear envelope can regulate gene expression by allowing proteins to access the DNA inside of the nucleus through the envelope's pores. By examining the proteins that regulate the structure of the nuclear envelope, researchers will have a much better understanding of many diseases that are linked to mutations in these proteins. Ultimately, this work would lead to more targeted treatments or even cures for diseases linked to the cell nucleus, he added.

Researchers have yet to understand how pores in these membranes are formed to allow the passage of proteins into the nucleus. "Cells create new pores throughout their lifecycle," Agrawal said. "This involves continuous remodeling of the nuclear membranes at the site of pore formation without disturbing the envelope away from the site. Understanding the mechanics of membrane remodeling is very relevant because if there's a defect of any kind, the process of creating new pores will stop."

To answer these questions, Agrawal and his team will develop models to look at the structure of the nuclear envelope and what it would take to fuse the two membranes within it together. "The models we develop will be able to predict how much energy is needed to bend the membranes, the energetics of pore formation from the two bilayers, and which proteins are up to the task of assisting in the formation of pores," he said.

Once Agrawal's team completes these models, they will share them with collaborators at the University of Florida led by Tanmay Lele, professor of chemical and biomedical engineering. Lele's experiments will involve making changes to the cell environment and then quantifying how those changes affect the cell structure and function. For instance, proteins will be systematically removed from the nuclear envelope and the subsequent changes in envelope structure and pore formation will be recorded.

Agrawal said this research could eventually lead to improved drug delivery using biomimetic drugs. "A multilayered structure already exists within cells, so if we can understand them, we can design sophisticated multifunctional drug delivery platforms," he said.

MATERIALS

ME CHAIRMAN AND STUDENT PUBLISH PAPER ON WORLD'S THINNEST PIEZOELECTRIC MATERIAL IN NATURE COMMUNICATIONS

There are a handful of naturally occurring materials, known as piezoelectric materials, which generate electricity when bent, stretched or influenced by another mechanical force, and vice versa. Voltages applied across the materials cause them to deform accordingly.

Pradeep Sharma, M.D. Anderson Chair Professor and mechanical engineering department chairman at the UH Cullen College of Engineering, and **Matthew Zelisko**, his doctoral student, have identified one of the thinnest possible piezoelectric materials on the planet – graphene nitride. The material measures just one atomic layer, which is one thousand times thinner than a single strand of human hair. Sharma, Zelisko and their collaborators published their findings in the journal Nature Communications.

Interestingly, graphene nitride wasn't supposed to have any piezoelectric properties. "Matthew did the calculations and simulations to show that it should be piezoelectric, which was unexpected," Sharma said. Sharma and Zelisko's experimental collaborators at Rice University, led by engineering professor Pulickel Ajayan, fabricated the graphene nitride sheet devices. Another group of collaborators, led by Professor Jiangyu Li at the University of Washington in Seattle, tested the material using a state-of-the-art apparatus and proved it was piezoelectric.

The reason for graphene nitride's unexpected piezoelectricity was predicted by Sharma in some of his earlier theoretical work on the topic. "Some of Pradeep's prior work identified that pure graphene with triangular holes can effectively become piezoelectric," Zelisko said.

Sharma and Zelisko proved through this latest research that any semiconducting material can be made piezoelectric by cutting triangular holes pointing in the same direction on the material. The reason for the triangular shape, Zelisko said, is that the holes cannot have mirror symmetry to become piezoelectric. "We did scientific theoretical work that told us this would work, but this was the first time we proved our prediction," Sharma said.

PROFESSOR DRAWS INSPIRATION FOR CAMOUFLAGE SYSTEM FROM MARINE LIFE

A Cullen College professor has developed a technology that allows a material to automatically read its environment and adapt to mimic its surroundings. The technology is described in a paper published last August in the Proceedings of the National Academy of Sciences.

Cunjiang Yu, assistant professor of mechanical engineering and lead author of the paper, said the optoelectronic camouflage system was inspired by the skins of cephalopods, a class of marine animals including octopuses, squid and cuttlefish, which can change coloration quickly, both for camouflage and as a form of warning.

Other researchers on the project include John A. Rogers of the University of Illinois at Urbana-Champaign and Yonggang Huang of Northwestern University.

Earlier camouflage systems didn't automatically adapt, he said. "Our device sees color and matches it. It reads the environment using thermochromatic material."

The prototype developed by the researchers works in black and white, with shades of gray, but Yu said it could be designed to work in the full color spectrum. Similarly, he said while the prototype is less than one-inch square, it can be easily scaled up for manufacturing.

The flexible skin of the device is comprised of ultrathin layers, combining semiconductor actuators, switching components and light sensors with inorganic reflectors and organic color-changing materials in such a way to allow autonomous matching to background coloration.

The researchers describe their work as including pixelated devices that have analogs to each of the key elements included in the skin of cephalopods, with two exceptions, the iridophores and central ocular organs.

While the most valuable applications would be for defense or industry, Yu said consumer applications such as toys and wearable electronics also could offer a market for such a technology.

Another possibility? Luxury carmakers now try to give a car's occupants the sensation that the car has disappeared by deploying cameras to shoot videos on the passenger side of the car and using LED mats to display the view. Yu said this technology could be incorporated for a similar purpose.

STEM OUTREACH

ENGINEERING OUTREACH IN HOUSTON SCHOOLS

SUBSEA ENGINEERING PROGRAM BRIDGES GAP BETWEEN ELEMENTARY SCHOOL AND COLLEGE WITH 'PASSPORT TO UH'

School may have been out of for the summer, but that didn't stop a group of young scientists from getting their hands dirty at the UH Cullen College of Engineering. A class of 40 fourth-graders from Memorial Elementary School toured the engineering complex, as well as other UH landmarks, courtesy of the Cullen College's subsea engineering program. They enjoyed lunch at the Cougar baseball field.

The event, dubbed "Passport to UH," is part of a new outreach partnership between Memorial Elementary and the Cullen College of Engineering led by Matthew Franchek, founding director of the subsea engineering program and professor of mechanical engineering. As part of the growing relationship between the schools, UH students also spent time with Memorial Elementary students last spring semester for an egg drop competition. Students were challenged to build homemade encasements to protect raw eggs dropped from a second-story balcony.

According to Franchek, the subsea engineering program and its students intend to expand their efforts to reach elementary school students throughout the Houston area.

To view photos from Passport to UH and other Cullen College events, please visit www.egr.uh.edu/news/photo-gallery.

$1.5M GRANT HELPS UH RE-THINK 'GATEWAY' MATH, SCIENCE CLASSES

The University of Houston has received a $1.5 million grant from the Howard Hughes Medical Institute to help solve a national shortage in the number of Americans with college degrees in science, technology, engineering and mathematics (STEM).

The goal is to find new ways to encourage freshmen and first-year transfer students who enroll in classes such as chemistry, biology, physics and math to stay the course, despite difficulties many might encounter.

The university will redesign these introductory courses and expand mentoring programs, said Bonnie J. Dunbar, principal investigator on the grant and director of the UH STEM Center.

UH was among 37 research universities to receive the grants, which total $60 million over five years.

"We are not changing the standards and content," said Dunbar, who is also director of the Cullen College of Engineering's aerospace engineering program and a former NASA astronaut. "We are changing the way we present the material, to more proactively engage the students in learning through hands-on projects, and to provide academic assistance when students arrive not fully prepared from high school or community college."

In addition to changing classroom instruction, the university proposed that Houston Public Media produce short documentaries about successful alumni for use in classrooms. Also outlined was the development of social support communities for students through undergraduate technical societies.

Co-investigators on the project include Dan Wells, interim dean of the College of Natural Sciences and Mathematics; James Briggs, interim chairman of the department of biology and biochemistry; Jacqueline Hawkins, associate professor of education; David Hoffman, chairman of the department of chemistry, and Jeffrey Morgan, associate provost for education innovation and technology.

ENERGY INSTITUTE HIGH SCHOOL SEES THE FUTURE AT UH

Students from the Houston Independent School District's new Energy Institute High School, a magnet school for energy careers, spent a day last August at the University of Houston for an introduction to renewable energy, sponsored by UH Energy. The camp closed with students building solar-powered cars and racing them on a track behind the University's Athletics/Alumni Center.

Students at the school, which opened in fall 2013, can focus on one of three tracks: geosciences, offshore technology and alternative energy. The morning sessions of the camp focused on giving students more information about renewable energy from both UH faculty and graduate students, as well as professionals from industry and NASA, said Ramanan Krishnamoorti, chief energy officer at UH.

UH Energy hosted its first camp for students at the Energy Institute on July 31. The camps are just one of the ways UH Energy works with the energy magnet high school, Krishnamoorti said.

TECHNOLOGY

PROFESSOR WINS NASA AWARD TO DEVELOP FLEXIBLE BATTERIES FOR SPACESUITS

***Haleh Ardebili**, assistant professor of mechanical engineering at the UH Cullen College of Engineering, has won a one-year, $10,000 New Investigator Award from the NASA Texas Space Center Grant Consortium to develop flexible, stretchable batteries for spacesuits.*

With this grant, Ardebili said she will be building on current research to develop an altogether new application for stretchable batteries. "Our research is very compatible with space applications, and especially spacesuits," she said.

In 2012, Ardebili won the highly competitive National Science Foundation CAREER Award to explore the fundamental scientific underpinnings of flexible and stretchable lithium-ion batteries. When sewn into fabric, the batteries could be used to power equipment worn by soldiers in the field or as medical patches placed on the skin to monitor or diagnose patients. Worn around the wrist, the batteries could provide backup power for devices such as smartphones.

Traditional lithium-ion batteries use organic liquid electrolytes, which perform well at the expense of several favorable properties, such as stability and non-flammability. Constant risk of leakage of the unsafe liquid is another drawback. As a result, lithium-ion batteries must be protected by a hard case, such as traditional battery packs used to power toys and other electronics. The same is currently true for spacesuits, which feature hard, bulky battery packs that add significant weight and volume.

Ardebili is developing a battery that uses electrolyte gel or solid polymer rather than liquid. "The solid or gel generally gives us a safer component," she said. "It also gives us flexibility and the ability to make thin films, so from those aspects we have more advantages with these materials."

Additionally, since there is no longer any danger of having an unsafe liquid leak out, the batteries don't have the same restrictions on packaging as traditional lithium-ion batteries. That is to say, spacesuits may suddenly become a lot lighter and more flexible thanks to Ardebili's research. "If we could remove that hard, heavy battery case on current spacesuits and make the batteries into a thin, flexible film that could be embedded in a pocket or even within the lining of the spacesuit, well, that would be great," she said.

PROFESSOR EARNS GRANT TO PURSUE ENERGY-SAVING SEMICONDUCTORS

Silicon, despite inefficiencies, has been an effective electrical energy conversion and control material for hybrid-electric vehicles and numerous other power electronics. However, the semiconductor is reaching its physical limits in many important applications, such as next-generation electric vehicles and smart grid systems.

An engineering professor at the University of Houston is exploring the use of gallium nitride, GaN, as a more energy-efficient semiconductor alternative to silicon, Si, which is the most dominant material currently used.

Jae-Hyun Ryou, assistant professor of mechanical engineering in the Cullen College of Engineering, recently earned a three-year, $270,000 grant from Technology Engine of Science to develop a high-current, high-voltage switching and conversion device to power the next generation of electronics.

Silicon material has reached its maximum capacity in power conversions, and gallium nitride has potential to close the inefficiency gaps, Ryou said. In electric power grids, for example, silicon semiconductor switching devices that regulate voltage and currents of electricity in distribution lines cannot be closed above a particular voltage, which results in huge energy losses. Silicon devices only optimize electricity flow below certain voltage levels.

Researchers have already demonstrated proof-of-concept for the emerging gallium nitride semiconductor technology.

Ryou and his UH engineering team, which includes Seunghwan Kim, post-doctoral research fellow, and Weijie Wang and Shahab Shervin, both doctoral students, are collaborating with the University of Texas-Dallas, the Korea Institute of Industrial Technology and the Technology Engine of Science.

Together, their goal is to design and construct the switching device using gallium nitride, which is commonly used by researchers for various purposes. In fact, three researchers won the Nobel Prize in physics this year for their application of the compound to the development of blue light-emitting diodes, or LEDs.

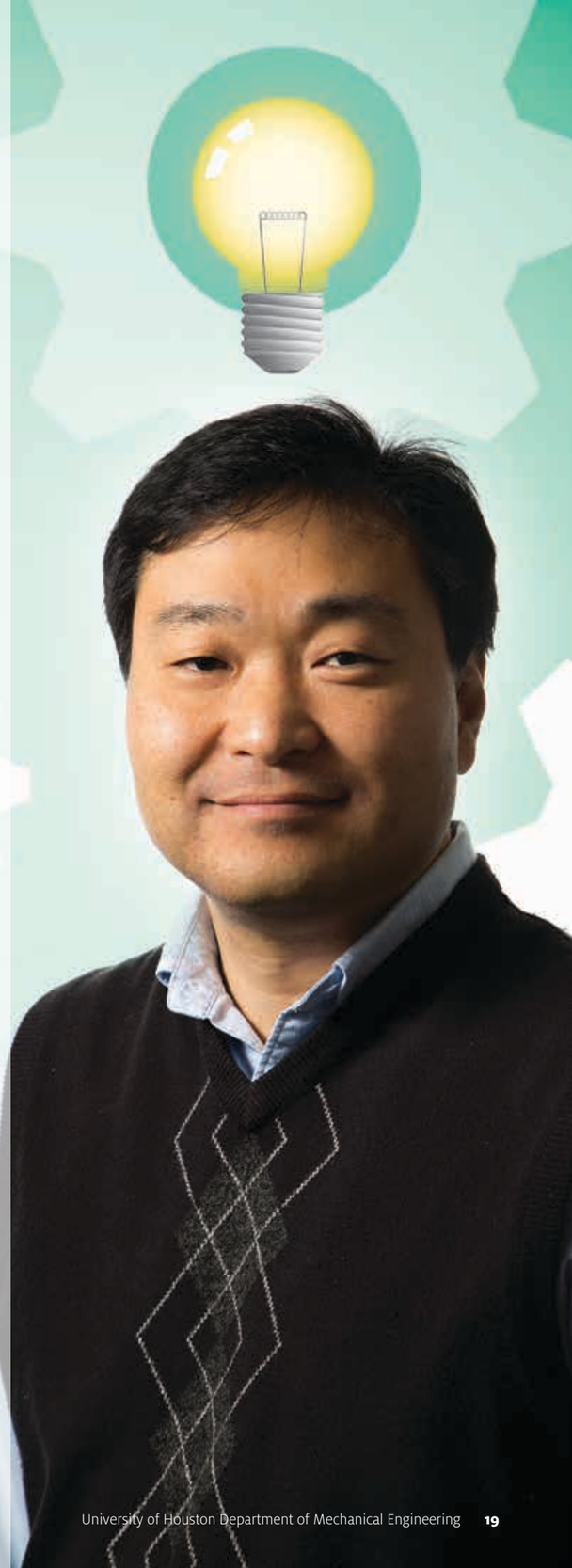
"We hope to further expand the practical use of GaN in other applications beyond the LEDs," Ryou said.

Unique physical and chemical properties of gallium nitride provide technical benefits for demanding applications. The semiconductor material, which is more thermally and chemically stable than silicon, permits devices to operate at higher voltages, frequencies and temperatures than their silicon-counterparts. In fact, gallium nitride can carry electrical currents at three times the velocity of silicon, and the material withstands breakdown 10 times better than silicon.

To develop the new semiconductor technology, Ryou and his team must overcome technical challenges. They must minimize imperfections in the gallium nitride material through an innovative chemical vapor deposition process used to produce thin high-performance films in the semiconductor industry. Furthermore, the researchers must develop the material structure at the maximum performance suggested by theoretical studies in order to demonstrate high-performing devices.

Ryou is performing the theoretical modeling of materials and devices. Technology Engine of Science and other collaborators possess the capabilities to develop and manufacture the devices.

"We want to have a prototype device that can be applied to any power conversion applications at the end of the three-year grant," Ryou said.



MEET THE NEW FACULTY MEMBERS: HADI GHASEMI AND DI YANG

The UH Cullen College of Engineering's Department of Mechanical Engineering welcomed two new faculty members this year. Along with their top-notch research, they bring to UH a slew of awards, grants and publications. We are proud to welcome these world-class educators and researchers to the Cullen College of Engineering!

HADI GHASEMI

Assistant Professor, Mechanical Engineering

Ghasemi has been performing postdoctoral research at MIT since 2011. His recent research has been on harvesting solar energy by localization of heat. He is also interested in nanoscale energy transport, solar-thermal harvesting, evaporation kinetics, interfacial energy transport, physics of wetting, physics of adsorption, surface physics and sustainable energies. He was nominated for a 2014 World Technology Award in the energy category for creating a graphite 'solar sponge' that converts sunlight into steam with 85 percent efficiency while he was working as a postdoctoral researcher at MIT.

DI YANG

Assistant Professor, Mechanical Engineering

Yang served as a research assistant and postdoctoral fellow at Johns Hopkins University since 2004. During this time, Yang gained nine years' worth of research experience in fluid mechanics and modeling of turbulent flows with applications to renewable wind energy and ocean science engineering. His primary research interests are computational and theoretical studies of turbulent flows, atmospheric boundary layer flows over ocean waves and land terrain, offshore wind farm dynamics and wind energy harvesting, upper ocean dynamics and turbulent dispersion of oil spills, and light propagation in ocean euphotic zones.

UNIVERSITY RECOGNIZES FACULTY FOR EXCELLENCE IN TEACHING, RESEARCH

Each spring, the University of Houston recognizes exceptional faculty members across the university at the annual UH Faculty Excellence Awards Ceremony. This year, four faculty members from the Cullen College's Department of Mechanical Engineering received awards in teaching and research.

John and Rebecca Moores Professorship: Gangbing Song

Gangbing Song received one of the university's highest honors, the John and Rebecca Moores Professorship.

The Moores Professorship is awarded annually to UH faculty members who make outstanding contributions in research, teaching and service. Each Moores professor receives a stipend, and the professorship is renewable every five years. Song said the award is the unequivocal highlight of his year.

Song said he measures his success by assessing his students' success. "My students' success is my success," he said.

Song focuses on creating an environment of support and friendship with students at the Cullen College. He keeps in touch with many of his former students long after they graduate. "I enjoy seeing them be successful after graduation," he said. "I hope they [would describe me] as a great mentor and friend."

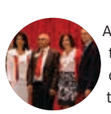
Teaching his students to perform research, Song said, is particularly important to him. Song's smart materials and structures research includes adaptive control, robust control, dynamics, robotics and friction compensation. He is the founding director of the Smart Materials and Structures Laboratory.

Song said his research is very rewarding, but maintains that the central focus of his career is teaching students. "Professors who care about their students are the great professors. That's what I try to be."

Teaching Excellence Award – Graduate Teaching Assistant: Jiabiao Ruan

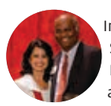
Jiabiao Ruan's work in the Cullen College's Vibration and Control Laboratory course already won him last year's Teaching Assistant Excellence Award from the University of Houston. This year, Ruan's continued dedication to excellence in teaching won him yet another teaching award. Ruan is well-known in the Cullen College for his extraordinary work ethic and his willingness to go above and beyond for his students, even offering free tutoring sessions and assistance beyond scheduled office hours. As a result, Ruan received the highest score for a teaching assistant in the course.

Teaching Excellence Award – Group Teaching: Pradeep Sharma



Although Pradeep Sharma stays busy as the chair of the mechanical engineering department, he always manages to make time for conducting research and teaching students. This dedication to research and teaching led to Sharma's involvement in the Cullen College's GK-12 Program, one of the college's many STEM (science, technology, engineering and math) outreach programs. The purpose of the GK-12 Program is to teach doctoral engineering students how to convey the technical aspects of their research, primarily in nanotechnology, to an audience of K-12 students and teachers. Sharma has been involved in the program for the past five years along with fellow engineering professors Fritz Claydon, Stuart Long, Hanadi Rifai and education professor Eugene Chiappetta, all of whom also received the university's group teaching award.

Research Excellence Award (Professor): Venkat Selvamanickam



In a span of five years, Venkat Selvamanickam, M.D. Anderson Chair Professor of mechanical engineering and director of the Applied Research Hub at the Texas Center for Superconductivity at UH, has established internationally lauded research programs such as the Energy Device Fabrication Lab. He has published more than 70 papers and delivered nearly 100 conference presentations. Five of his inventions have been licensed by industry. In 2004, Superconductor Week named him the Superconductor Industry Person of the Year. Selvamanickam also serves as a professor in physics, chemical engineering and materials engineering.

BONNIE DUNBAR RECEIVES HONORARY DOCTORATE OF SCIENCE AT UNIVERSITY OF STRATHCLYDE'S 2014 COMMENCEMENT

Bonnie Dunbar, M.D. Anderson Professor of mechanical engineering and director of the aerospace engineering program at the UH Cullen College of Engineering, was honored by the University of Strathclyde in Glasgow, Scotland, where she received an honorary Doctorate of Science at the university's commencement ceremonies. The 2014 commencement marks the university's 50th anniversary.

Dunbar, who also serves as director of the University of Houston STEM Center, came to UH in 2013 after a long tenure as a NASA astronaut, where she logged over 1,208 hours (50 days) in space. In addition to her honorary doctorate from the University of Strathclyde, Dunbar also earned her bachelor's degree and master's degree in ceramic engineering from the University of Washington in 1971 and 1975, respectively. She earned her doctoral degree in mechanical/biomedical engineering from the University of Houston in 1983.

PROFESSOR WINS IEEE AWARD FOR SUPERCONDUCTING MATERIALS RESEARCH

Venkat "Selva" Selvamanickam, M.D. Anderson Chair Professor of mechanical engineering and director of the Applied Research Hub at the Texas Center for Superconductivity at UH, has been named one of the first recipients of the inaugural 2014 IEEE (Institute for Electrical and Electronics Engineers) Dr. James Wong Award for Continuing and Significant Contributions to Applied Superconductor Materials Technology.

According to the IEEE website, this award is intended to recognize individuals for "meritorious achievements and outstanding technical contributions" throughout their career in the field of applied superconductor materials technology.

"It was very fulfilling to get the news that I won this award," Selva said. "This award is intended to honor a body of work, and I began working in this field 27 years ago, so it encompasses the range of all of the work I've done. That really means a lot to me."

Selva earned his master's degree in mechanical engineering and his doctoral degree in materials engineering from the UH Cullen College of Engineering in 1988 and 1992, respectively. By the time Selva completed his master's degree, he had invented a new method for creating bulk superconductors with very high current carrying capacity.

Selva and his research partners at UH published these findings in the journal Applied Physics Letters in 1989. The article has been cited over 600 times since then, making it the one of the most-cited scientific papers on the topic of superconductor materials engineering of all time.

After graduating from the Cullen College of Engineering, Selva co-founded SuperPower Inc. in 2000, a company specializing in manufacturing superconducting wire, where he eventually rose to vice president and chief technology officer. While there, he developed a novel method of manufacturing superconducting wires.

Selva and the SuperPower team were the first to manufacture thin film superconductor wire with 300 times the current-carrying capacity of traditional copper wire. SuperPower's superconducting wire was used in 2008 to power 25,000 households in Albany, N.Y., and now is used by more than 200 institutions around the world for applications including wind generators, energy storage, power transmission cables, magnetically levitated trains, medical imaging and defense applications.

After eight years with SuperPower, Selva made the decision to return to the UH Cullen College of Engineering – and this time, he brought the research division of SuperPower with him.

When Selva returned to the Cullen College in 2008, he started up the Applied Research Hub of the Texas Center for Superconductivity with a $3.5 million grant from the state of Texas Emerging Technology Fund. He established a pilot-scale superconducting wire manufacturing research facility at the UH Energy Research Park with this support.

Nearly every year since his return to UH, Selva and his team have won major awards; In 2009, they received an International Technical Achievement Award from Wire & Cable Technology Magazine. In 2010 and 2012, they won R&D 100 Awards, "the Oscars of Innovation," from R&D Magazine. In 2009 and 2010, his superconductor wire development program with SuperPower was ranked the top research project in the U.S. Department of Energy's superconductivity program, as voted on by an international panel of 12 experts in the field.

Through his research and his leadership of the Applied Research Hub at UH, Selva is now pioneering the development of advanced processing techniques for high-performance materials for energy and electronics applications, including high-temperature superconducting thin film wires, thin film photovoltaics and flexible electronics.

The success he's experienced since moving into academia, Selva said he owes in great part to the time he spent in industry. "I've brought a lot of the lessons I learned in industry to the table when I came back to UH," said Selva. "I understand what it takes to move a technology past the R&D phase, beyond the valley of death, and into the consumer market. This knowledge helps me every day as a researcher, as a teacher and as a leader at the Applied Research Hub."

In 1996, Selva received the Presidential Early Career Achievement award from the White House, which is the highest award given to scientists and engineers beginning their independent careers. He was named Superconductor Industry Person of the Year in 2004 by Superconductor Week, the leading publication on superconductor business and technology. He holds 41 U.S. patents and 12 pending U.S. patents. In 2014, Selva was inducted into the U.S. National Academy of Inventors.

FACULTY SPOTLIGHT: ASHUTOSH AGRAWAL

WHAT IS YOUR TEACHING PHILOSOPHY?

I try to make sure the students understand the fundamentals in a way that it is fun. I don't want it to be a boring experience, because [the subject] isn't. If you look around, engineering has contributed to everything that we see in our lives. Therefore, we have numerous demonstrations all around us that can be used to communicate different physical concepts.

HOW WAS THE ADJUSTMENT FROM LIFE IN INDIA TO LIFE IN THE UNITED STATES?

One of the culture shocks I had was my first lunch at Rice University. We'd just landed in Houston and we were served something wrapped in aluminum foil. We did not know what it was, we were all clueless. We opened it up and it was a big baked potato, and we didn't know what to do with it. In India, we eat potatoes, but not just a baked plain potato. We eat it cut up and covered in spices. It was the first culture shock I had: my first baked potato. Barring this trivial point, the transition was a valuable learning experience. The professional work environment, and interactions with people from diverse countries and cultural backgrounds gave new perspectives in life.

WHAT HAVE YOU FOUND TO BE THE MOST EFFECTIVE METHOD OF TEACHING?

Personally, I prefer complementing theory with videos and demonstrations to explain the fundamentals and develop intuition. For teaching theory, I heavily rely on the whiteboard.

WHAT INSPIRED YOU TO PURSUE ACADEMIA?

I found inspiration in graduate school. Prior to that, I feel that I was just following the path that many other children in India are encouraged to follow: to either become a doctor or engineer. But after moving to Berkeley [in California] for graduate school, I worked with a professor and I saw the excitement in him about research, and that was infectious. I started enjoying research. The notion of finding something new and creating something new excited me. I also started enjoying my experience as a teaching assistant. While working towards your Ph.D., you have highs and lows, and the teaching experience is what made me happy every week. I found it truly rewarding to interact with the students and see them understand what I was explaining – this motivated me to further continue this route to academia.

WHAT DO YOU DO FOR FUN?

I have a hobby of doing interior decoration. I spend my time creating different art pieces for my house, or something in the backyard. One of the most recent pieces is a modification of the kitchen light. I used some recycled material to create a design on the light.

WHAT'S YOUR FAVORITE PART OF YOUR WORK DAY?

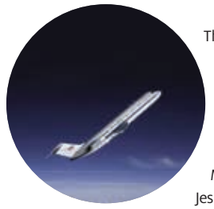
Brainstorming to get down to the bottom of a scientific mystery. Going to a café, sitting outside and just thinking about a problem. I find that the most gratifying.

WHAT ADVICE AND ENCOURAGEMENT DO YOU GIVE TO YOUR STUDENTS?

I think the students here know what they want to do. I tell them that they should be aware of the opportunities out there in Houston. There are more opportunities than they think there are. The basic notion is that there is the oil industry, and the companies that support the oil industry. But we also have the world's largest medical center. It's a totally untapped market for mechanical engineers. We can be a part of it. We can help in creating the future technology for health sciences. I advise them to have a broader frame of mind with respect to career options. They should be daring. It's simply remarkable what they can do, what they can create. And that's what engineering is about. They shouldn't just go to companies and work for companies; they should start their own companies. Engineering students at the University of Houston have the potential, they can think outside the box.

STUDENT NEWS

TEAM NEO EXPERIMENTS IN ZERO GRAVITY WITH NASA



The Cullen College of Engineering has once again sent a team of undergraduate engineers up in NASA's zero-gravity simulation airplane, the "vomit comet."

The group consisted of Hector Alba, Andrew McClain, Zachary Hoffpauir, James Broussard, Jesus Mora and Jimmy Le, collectively known on the mission as "Team NEO" (NEO stands for Near Earth Objects). The undergraduate team was mentored by former astronaut Bonnie Dunbar, director of both the aerospace engineering graduate program at the Cullen College and the UH STEM Center.

Each year, NASA hosts a Reduced Gravity Education Flight Program, which allows undergraduate college students in STEM fields to perform assigned experiments during 25-second bouts of weightlessness on the reduced gravity aircraft. The program is intended to increase minority student interest in math and sciences fields.

Team NEO's experiment was titled "Characterization of Forces and Mechanisms Required to Separate Material Particle Sizes In Situ at Near Earth Objects (NEO)." NASA recently included NEOs in its design reference missions.For example, it extracted water from NEOs for use in fuel synthesis and life support systems. Processing, however, is problematic for the microgravity environment typical of a NEO, so Team NEO experimented with different mining methods to extract water in these environments.

AMERICAN SOCIETY OF INDIAN ENGINEERS RECOGNIZES STUDENTS WITH SCHOLARSHIPS

This fall, the American Society of Indian Engineers (ASIE) took notice of several Cullen College of Engineering students and awarded their academic excellence with scholarships ranging from $1,000 to $5,000.

Mechanical engineering students Sonika Gahlawat, Abhilash Reddy and Himani Agrawal were just a few of the students honored by the ASIE at their banquet in November. Ken White, professor of mechanical engineering, also attended.

Gahlawat said her scholarship of $1,500 was the fourth scholarship she received this fall. White is her advisor. She said the scholarships are helpful financially because, due to visa limitations for international students, they often are unable to work off-campus. She said her scholarship would cover her semester fees.

Reddy's advisor is Hadi Ghasemi, assistant professor of mechanical engineering. Ghasemi said only 11 students in the Houston area are awarded an ASIE scholarship annually. Reddy and Ghasemi are currently working on development of a new platform for remote actuation of fluid flow with laser.

SOCIETY FOR WOMEN ENGINEERS TRAVELS TO BRAZIL FOR 'ONE DAY IN ENGINEERING'

The Society for Women Engineers (SWE) once again travelled to Teresopolis, Brazil last summer for "One Day in Engineering" ("Um Dia na Engenharia"), an outreach event organized by the student group to introduce local high school students to the engineering discipline.

SWE members Natalia Caid, Fontaine Wilson and Ali Siddique traveled to the small town, which is located near Rio de Janeiro. Gabriela Bernardes, who spearheaded last year's trip, did not attend the event in person but helped with the planning. In Teresopolis, they were joined by local volunteers who helped coordinate the event and translate between Portuguese and English.

Over the two-day event, 125 students from 10 area schools learned about petroleum, electrical, mechanical and civil engineering through fun workshops designed to make the discipline more approachable to younger minds.

For petroleum engineering, they used straws to perform "logging" exercises on different colored sands meant to represent hydrocarbons in the earth. They played circuit bingo as a way to learn electrical engineering, and built straw towers as an introduction to civil engineering. For mechanical engineering, the students were told to transport a ping-pong ball from one location to another using nothing but random knick-knacks.

Both Bernardes and Caid are originally from Brazil, and their families helped out with the event as well, including providing lodging for the SWE members.

"This kind of event is not common in Brazil. They don't really do outreach events for engineering... especially in the public schools, it's even more rare," Bernardes said.

Attendance increased from last year's event to this year's, and she said volunteer interest also increased since last summer.

"I think the event was a great experience for us and the students. They were very engaged and very excited about all the activities," said Caid. "They definitely learned a lot about engineering in a very, very fun way. It was a great learning experience for everyone."

Siddique said that although he spends a lot of time with high school students as a Sunday School teacher, the students he encountered during this trip were particularly impressive to him. "I've never seen students that excited, that respectful. You can tell they paid attention, even though engineering can be abstract and complex," he said.

The SWE volunteers surveyed the students after the event, and while 65 percent said they were interested in engineering before the day's activities, that number increased to 84 percent after the event.

Wilson said events like One Day in Engineering are important for promoting greater diversity in the field of engineering. "For a long time it was just men [in engineering]," she said. "We're able to reach people who might not have thought of engineering as a career and spark that interest."

To view more photos from One Day in Engineering, please visit www.egr.uh.edu/news/photo-gallery/set/72157647203108015.

SURF PROVIDES RESEARCH OPPORTUNITY FOR CULLEN COLLEGE UNDERGRAD

Plenty of college students use the summer months to catch up on their favorite television shows, work on their base tans and reconnect with old friends. However, the three-month break provided one Cullen College junior with the perfect opportunity to sharpen her analytical skills by diving headfirst into the world of undergraduate research.

Abby Zinecker, a junior studying mechanical engineering, participated in the Summer Undergraduate Research Fellowship (SURF), researching flexible, stretchable batteries under the mentorship of Haleh Ardebili, assistant professor of mechanical engineering. Ardebili recently received a one-year, $10,000 New Investigator Award from the NASA Texas Space Center Grant Consortium to develop flexible batteries for spacesuits.

The SURF program provides funding for UH undergraduate students to pursue full-time, 10-week research projects under the direction of UH faculty members during the summer. Course credit isn't offered for the fellowship, but students earn invaluable experience with hands-on research and analysis in real-world laboratory settings. For Zinecker, the opportunity was too good to pass up.

"I've wanted to do undergraduate research basically since I started at UH," she said. "I looked up [Dr. Ardebili's] research online and it looked really interesting – the flexible batteries – so I emailed her and asked if she was looking for any undergrad research assistants... and here I am."

Zinecker specifically looked at the performance aspect of the batteries, or how much energy the batteries can output. "It's very exciting as an undergraduate to be able to get this opportunity," she said. "I know a lot of people aren't that lucky."

While any undergraduate research project would have provided learning opportunities, Zinecker found batteries for spacesuits greatly appealing. "I've always stayed up late to watch launches on TV and whatnot, I've always liked space," she said. "I do hope to get into the space industry somehow, either at NASA or some other commercial company. I would really just like to design something that goes up into space."

Abby Zinecker

HOW TO APPLY

for the Summer Undergraduate Research Fellowship Program

CHECKLIST: BEFORE YOU APPLY

- Must be rising sophomore, junior or senior
- Must have at least a 3.0 GPA

HOW TO APPLY

Visit www.uh.edu/honors/undergraduate-research/uh-research/surf

WHAT TO EXPECT

- Full-time participation in 10-week program
- Hands-on experience conducting cutting-edge research
- Participation in Undergraduate Research Day

GRACE HOPPER CELEBRATION CHOOSES PH.D. STUDENT FOR CONFERENCE SCHOLARSHIP

According to the U.S. Department of Commerce, less than one of every four workers in a STEM field in the United States is a woman. The science, technology, engineering and mathematics fields are unequivocally male-dominated, and while more movements are gaining traction in encouraging women to pursue STEM careers, most U.S. women are still choosing other career paths.

Enter the Grace Hopper Celebration of Women in Computing, the world's largest technical conference dedicated to bringing the research and career interests of women in computing to the forefront. The conference is named for U.S. Navy Rear Admiral Grace Hopper, an early computer scientist and one of the first programmers of the Harvard Mark I computer as well as the first compiler for a computer programming language.

The gathering took place last October in Phoenix, and the event attracted close to 10,000 women from around the world.

Himani Agrawal, a Ph.D. student studying mechanical engineering at the University of Houston Cullen College of Engineering, was one of those women. She received a full scholarship to attend the conference free of charge.

"This conference is about celebration," Agrawal said. "The conference is to celebrate the successes of women in computing. This conference encourages women to take careers in STEM fields, and it's about the recruitment and retention of women in these fields."

Agrawal said she discovered her love for biology and mathematics as a student in India, where she earned her bachelor's degree in civil engineering. Computing, she said, is the link that bridges the gap between all the STEM fields.

During her undergraduate education, Agrawal said she experienced the gender disparity issue first hand. "My [undergraduate class] was less than 10 percent women. The whole group was divided into sub-batches, and I was the only woman in my sub-batch," she said. "But I love science, I love math, and I think math and science are not just for men. They are for everyone. Everyone can love math and science. It's not gender specific."

At the Cullen College, Agrawal is active in the Society of Women Engineers' (SWE). She also volunteered as a lecturer for last summer's G.R.A.D.E. (Girls Reaching and Demonstrating Excellence) Camp sessions.

She said the conference will further inspire her to empower her fellow female engineers. The equality, she says, can only benefit everyone.

"You really make a contribution to society by being in technology. It's really important that women pursue STEM fields, because right now, the percentage of women taking careers in STEM fields is going down. When you see the top leadership positions, there are very, very few women in technology," she said. "Our countries and our companies are not run by women, they're run by men. The women's voices are not heard equally."

Learn more about the Grace Hopper Celebration of Women in Computing Conference at www.gracehopper.org.

ALUMNUS GIVES BACK WITH ENDOWED PROFESSORSHIP

M.S. Kalsi (MSME '70, PhD ME '75) has been a long-time supporter of the UH Cullen College of Engineering and its mechanical engineering department. Now, Kalsi is giving back to the Cullen College by establishing an endowed professorship in the mechanical engineering department.

The Dr. Manmohan Singh Kalsi and Dr. Marie-Luise Schubert Kalsi Endowed Professorship in the amount of $ 500,000 was initiated in 2014 and honors the memory of Professor Gabriel Andrews Fazekas.

Kalsi said this endowed professorship will help the Cullen College's mechanical engineering department to recruit and retain the best mechanical engineering professors the world has to offer. "The professors in the mechanical engineering department at UH are world-class educators and researchers," Kalsi said. "This professorship will allow the department to add more top engineering faculty to their roster."

Without the world-class education he received as a graduate and doctoral student in the mechanical engineering department, Kalsi said he might never have gone on to build his own engineering consulting firm from the ground up. Kalsi is the founding owner of Kalsi Engineering, a Houston-based engineering consulting firm that also specializes in research and development for valve and sealing technologies.

"The University [of Houston] gave me a head start," Kalsi said. "If I didn't have that head start, I wouldn't be as successful, and our company would not have made the world-wide impact that it has today."

ENGINEERING CAREER FAIR

The fall 2014 Engineering Career Fair drew crowds of nearly 2,000 students and more than 400 company representatives on Sept. 18. The Engineering Career Fair connects engineering students with regional and national employers offering positions for co-ops, internships and full-time jobs. In total, 114 companies were represented and collected at least 1,800 resumes from Cullen College students. Watch a video from the 2014 career fair at www.egr.uh.edu/career-fair-video-2014.





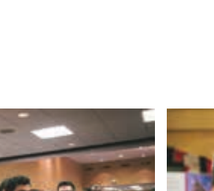


STEM OUTREACH: PASSPORT TO UH

The University of Houston Cullen College of Engineering has formed a new partnership with Memorial Elementary School to help teach science, technology, engineering and math (STEM) concepts to young students with fun, hands-on demonstrations and activities. The event, dubbed "Passport to UH," is organized by the Cullen College's subsea engineering program. (Turn to page 17 to learn more about Passport to UH.)


SWE BRAZIL OUTREACH

The Society for Women Engineers (SWE) once again travelled to Teresopolis, Brazil this summer for "One Day in Engineering" ("Um Dia na Engenharia"), an outreach event organized by the student group to introduce local high school students to the engineering discipline. Over the two-day event, 125 students from 10 area schools learned about petroleum, electrical, mechanical and civil engineering through fun workshops designed to make the disciplines more accessible to younger minds.



PROMES REUNION











The PROMES 40th Anniversary Mixer & BBQ was held at the UH Cullen College of Engineering on May 31. Hundreds of current PROMES students and PROMES alumni gathered to celebrate the history, longevity and success of the program. PROMES (Program for Mastery in Engineering Studies) serves as a community for undergraduate engineering students and offers academic support and skills development. Partygoers enjoyed free food and beer, a dunk tank, an inflatable slide and a photo booth complete with wacky props and costumes.

DEPARTMENT OF MECHANICAL ENGINEERING STAFF PHOTO 2015

Pictured from left:
TRINA JOHNSON
KARINA ACUNA
TRACY PRINGER
APRIL BLOUNT
TAMMY ENGELBOSCH
JOANA TAN
GENE WEBSTER
Not pictured:
JERRY CLIFTON
JENNA DONNELLY
MARK SMITH

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