University of Houston Cullen College of Engineering

[ParamETErs]

Spring 2005

Engineering A Better Experience

DEAN'S MESSAGE

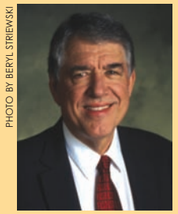

PHOTO BY BERYL STRIEWSKI

Any goal truly worth achieving is difficult to attain: There are no short cuts in the pursuit of excellence.

With that thought in mind, I look at the college today and am pleased with recent achievements, especially those highlighted in this issue of your *Parameters* magazine.

We've taken major steps forward with our undergraduate services and facilities. Our Engineering Career Center continues to develop its company base, providing students increased opportunities to interview and find competitive jobs. Likewise, because the industry now prefers to hire students with experience, we're expanding our Co-op offerings to provide students pre-professional experience before they enter the workplace. We have totally renovated our computer labs, providing students access to twice as many computers as a year ago. Enhancements to the printing system have cut paper waste and put the student in complete control over the printing process. The net result is dramatic cost savings, freeing up funds that can support other important areas—thus making us better stewards of our funds.

We are also offering students improved academic support through expanded "red shirt camps" and further extensions of our heralded new programs designed to improve student retention and recruitment. The addition of a new director of technical communication instruction, Chad Wilson, and additional courses that stress communications are ensuring that our students are better equipped in written and verbal communications. Further, our new director of undergraduate student recruitment and retention, Julie Trenor, is also making great strides in recruiting top students to the college.

As always, our research efforts continue to be a great strength, and our ties to the Texas Medical Center grow even stronger. This spring marked another milestone, with the announcement of an official memorandum of understanding between the University of Houston System and The Methodist Hospital. A number of our faculty are involved, with one example being Ralph Metcalfe, professor of mechanical engineering, who is featured in this issue. Professor Metcalfe is working closely with medical researchers at Baylor College of Medicine and The Methodist Hospital.

We take great pleasure in seeing our alumni flourish in their work, and Manmohan Kalsi is a wonderful example. Kalsi graduated with his Ph.D. in mechanical engineering 30 years ago, and his accomplishments have revolutionized oil field technology in the realm of rotary shaft seals, valves and bearings. We are delighted to highlight his accomplishments in this issue.

As we prepare for another academic year, we appreciate the support of our strong donor and alumni base, our world-class faculty, our quality student body and our dedicated staff. Their efforts are allowing us to continuously improve and to become a better college.

Sincerely,

Raymond W. Flumerfelt, *Dean*
Elizabeth D. Rockwell Endowed Chair

pa·ram·e·ter

Pronunciation: pə-'ram-ə-tər
Function: noun
Etymology: New Latin, from para- + Greek metron measure
Date: 1656

1: *a.* an arbitrary constant whose value characterizes a member of a system (as a family of curves); also: a quantity (as a mean or variance) that describes a statistical population
b. an independent variable used to express the coordinates of a variable point and functions of them — compare PARAMETRIC EQUATION

2: any of a set of physical properties whose values determine the characteristics or behavior of something
<parameters of the atmosphere such as temperature, pressure and density>

3: something represented by a parameter: a characteristic element; broadly: CHARACTERISTIC, ELEMENT, FACTOR
<political dissent as a parameter of modern life>

4: LIMIT, BOUNDARY — usually used in plural
<the parameters of science fiction>

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Parameters is published biannually by the University of Houston Cullen College of Engineering, Office of Communications.

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Engineering a Better Experience
Frank Serafini is a senior mechanical engineering student interning as an applications engineer for Flowserve Pump Division. He is also one of many undergraduate engineering students benefiting from a flurry of improvements in programs and facilities at the UH Cullen College of Engineering. From adding a new career center to the addition of new computer equipment and facilities, the college has completed a multitude of major upgrades to enhance the quality of undergraduate education.

New Publication Offers Hard-hitting Analysis of Energy Sector

Michael Economides, UH chemical engineering professor, and authors of *World Energy* magazine launched a new energy publication, *World Energy Monthly Review*, which debuted in April. It focuses more on analysis and commentary with more in-depth editorial independence than its sister magazine. It provides a discussion forum for energy's role in becoming a strategic factor in global geopolitics. While the authors of *World Energy* magazine have been mostly top CEOs in the energy industry, *World Energy Monthly Review* is more analytical and evaluative in nature.

With Economides as editor-in-chief and senior writer Robert Bryce, a noted reporter and author of "Pipe Dreams" and "Cronies," at the helm, the editorial board includes a host of Russian, Chinese and American editors. The review is funded through numerous external sources, subscription fees and partially through *World Energy* magazine. For the full story, visit www.egr.uh.edu/news/0405/?e=economides.

First Dean's Cup Awarded at 16th Annual Golf Tournament

Approximately 100 golfers helped raise money to support the UH Cullen College of Engineering at the 16th Annual Engineering Golf Tournament on April 4 at Hearthstone Country Club. The first Dean's Cup was awarded to Low Gross winners (pictured) Rusty Beyer, Nancy Beyer, John Rodriguez and Charlie Beyer (1972 BSCE, 1977 MCE) with Beyer Construction. The Dean's Cup placed competition between teams that represent different departments in the college. The winning team members' names will be added to the cup. Also, $1,000 of discretionary funds was awarded to the Department of Civil and Environmental Engineering. For the full story, visit www.egr.uh.edu/news/0405/?e=golf.

Two Distinguished Faculty Join College

Two new professors joined the college this spring. Akhil Bidani (1975 PhD ChE) was named the John S. Dunn professor of biomedical engineering and professor of chemical and mechanical engineering. Peter Strasser joined the college as an assistant professor of chemical engineering.

Bidani is a professor of medicine and director of Pulmonary and Critical Care at the University of Texas Health Science Center at Houston. He is a nationally preeminent investigator in the mechanisms and kinetics of microvascular gas and ion transport, intracellular pH and its regulation in lung cells, mechanisms of pulmonary uptake of toxic reactive gases, and the pathophysiology of lung function abnormalities in acute lung injury. His research, which has been supported by grants from the National Institutes of Health, has resulted in more than 190 scholarly publications in leading journals and textbooks. Among his many honors are elections to the American Society of Clinical Investigation and elected a fellow of the American College of Critical Care Medicine, the American College of Physicians and the American College of Chest Physicians. He is also an award-winning educator and a greatly admired clinician in pulmonary and critical care medicine. He received a B.S. in chemical engineering from Punjab University, Ph.D. in chemical engineering from UH and an M.D. from UTMB. For more about Bidani, visit www.chee.uh.edu/faculty/bidani.

Akhil Bidani

Strasser joined the college after working four years for Symyx Technologies, Inc. in Santa Clara, Calif. His research focuses on electrocatalysis of low-temperature fuel cells, environmental catalysis and bio-electrochemistry. He received his B.S. and M.S. in chemistry from the University of Tuebingen in Germany and Ph.D. in physical chemistry from the Fritz-Haber-Institute of the Max-Planck-Society in Germany. He received the Otto-Hahn-Medal of the Max-Planck-Society and the German National Fellowship Foundation. He also received a visiting research scholarship from the SONY Corporation in Japan, Pisa University in Italy and Stanford University. For more about Strasser, visit www.chee.uh.edu/faculty/strasser.

Peter Strasser

Engineering Alumni Association Hosts 'The Engineer' and Other Engineers Week Events

The Engineering Alumni Association hosted several activities during National Engineers Week. "The Engineer," a spin-off of "The Apprentice" TV show, was performed by (pictured clockwise from left) Odis Cobb (1971 BSCE, 1979 MSCE) from Cobb, Fendley & Associates, Inc., William Miller (1970 BSME) from Control Systems Engineering, Gary Poole (1977 BSME) from CH&P Associates, Inc., Durga Agrawal (1969 MSIE, 1974 PhD IE) from Piping Technology & Products, Inc., and Quincy Allen (1990 BSCE) from Texas Department of Transportation with UH Engineering Leadership and Entrepreneurism Program students Cheryl Gonzales, Daniel Marquez, Jeswin Manakalathil, Ahmed Megahed (2005 BSComE) and Dorota Bernatek (2005 BSEE). At a special reception on Feb. 22, more than 130 engineering alumni, faculty, staff and students recognized 13 UH engineering students and two student organizations for their top performance in the Engineering Outreach Competition and Re-engineered Fairy Tale Contest. Cash awards totaling $5,000 were presented to these students by local companies, engineering organizations and EAA. For photos of the winners, visit www.egr.uh.edu/alumni/?e=eweekphoto1.

Partnership with Cummins Yields New Opportunities in Research, Education

John C. Wall, chief technical officer of Cummins Inc., partners with Matthew Franchek, chair of the UH mechanical engineering department and director of the biomedical engineering program, to create research and educational opportunities for students.

Cummins Inc., a Fortune 500 company best known for its world-class diesel engines, donated an engine dynamometer and engine to the UH Diesel Engine Controls Research Facility in the UH Department of Mechanical Engineering. The company has also recently underwritten a $30,000 fellowship for UH mechanical engineering students, and has played host to two summer interns in its hometown headquarters in Columbus, Ind.

As generous as these gifts are, there is something even more valuable taking shape—a working partnership in research and education with the corporation. Matthew Franchek, chair of the UH Department of Mechanical Engineering and director of the biomedical engineering program, is working with long-time friend and chief technical officer John C. Wall to bring this idea to fruition.

"If we're going to be world class, we've got to partner with people like Cummins," said Franchek. "They help educate faculty to relevant problems, provide funding for our students and an education for them on what it is like to build a product. And I think at the end of the day we have a very outstanding student, second to none."

Cummins already has highly evolved research partnerships with Purdue University, Massachusetts Institute of Technology and the University of Wisconsin. Wall sees great potential in the growing relationship between UH and Cummins. "I expect one thing of a university research partner for Cummins—Be the best!" Wall says. "We cannot develop very many broad relationships—we just don't have the people and the time. Based on our initial visits to Houston, I am confident that the university can play a key role in our 'R&D continuum,' especially in the areas of overall system dynamics and controls and exhaust after-treatment systems. I think Cummins can challenge the university to maintain high standards and can help focus its research work on solving problems that are important not only to Cummins but also to the engine and power systems industry and to the environment."

Faculty in two engineering departments—chemical and mechanical—are working together to integrate disciplines to overcome the formidable challenges of meeting ever tougher environmental standards.

Michael Harold (1985 PhD ChE), chair of the UH Department of Chemical Engineering, agrees, "This triad works because chemical and mechanical bring different capabilities to the table. Mechanical brings expertise in engine control and diagnostics, and in combustion and engine understanding. Chemical brings expertise in after-treatment technology—in catalysis and reaction engineering—which goes into the catalytic converter technology."

Harold says meeting the emissions requirements for diesel engines is complex, but well worth the pay off because of diesel's superior fuel efficiency and durability.

"We need diesel," Harold says. "It's the engine of commerce and it's not going away. If anything, we need strong growth in diesel vehicles because of their higher fuel economy. But meeting the emission reductions on these vehicles is a challenge because the exhaust is more difficult to clean up than the exhaust from gasoline vehicles. The technology that is under development to reduce soot and NOx emissions is highly sophisticated. The engine and the catalytic converter have to work in synergy with the help of sensors and an onboard computer. In fact, it is a case of the tail wagging the dog."

Two UH graduate students, Javier Franco (2003 BSME) and Charudatta Mehendale, spent last summer as visiting interns at Cummins, and both were deeply involved in real problem-solving efforts that are underway as the company develops its next-generation of diesel engines.

Franco, a graduate student in mechanical engineering, worked in the advanced engineering department, where he applied his knowledge of mathematics and physics to help resolve the torque estimation in relation to automatic transmission shifting—a project that will ultimately lead to smoother shifting, better drivability, and improved performance and fuel economy.

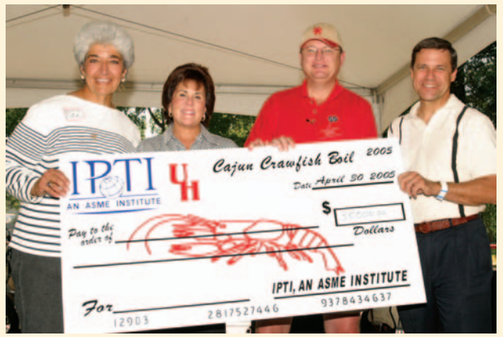
Mehendale, a doctoral student in mechanical engineering, worked at Cummins on the engine control module, the brain that controls the engine's operation. He worked on the development of software that will arbitrate between the engine controller and the after-treatment controller. That process determines the correct amount of exhaust to be sent back into the engine—a process that ultimately lowers the amount of hazardous emissions such as nitrogen oxides and particulate matter, or soot.

Franchek adds that the combination of academic and industry research creates a complementary pathway to better engineering education: "Cummins is going to teach students things that we can't teach them here. Things like how to build a product. At the end of the day, our students are hyper competitive, super employable. From a student's point of view, I can't imagine a better education."

Both Franchek and Wall agree that a UH partnership with Cummins will produce not just a better progression of research practices for both organizations, but also a better education for the students, and ultimately a better engineer who is ready to contribute to industry in ways that will fuel invention and discovery.

For the full story, visit www.egr.uh.edu/news/1204/?e=cummins.

17th Annual UH/ASME Cajun Crawfish Boil Kicks off OTC



On May 1, nearly 5,000 people converged on the UH campus to enjoy crawfish and festivities at the 17th Annual UH/ASME Cajun Crawfish Boil, the kick-off event to the Offshore Technology Conference. Guests consumed 5.56 tons of crawfish, 1,000 pounds of brisket and 350 pounds of sausage, danced to live Zydeco music, and many walked away with prizes worth thousands of dollars through the raffle drawings. Children enjoyed the moonwalk, games and face painting.

Also, the American Society of Mechanical Engineers presented a $35,000 check to the UH Cullen College of Engineering, from the proceeds from this year's event. Pictured are Vita Como, director of the UH Engineering Career Center; Diane Ashen, 2005 chair; Greg Williams (1979 BSME), 2005 vice chair; and David Starnes, development director for the college.

The economic welfare and security of the United States is threatened by an impending shortage of scientists and engineers, and the University of Houston Cullen College of Engineering is responding to the challenge with several recent successful initiatives.

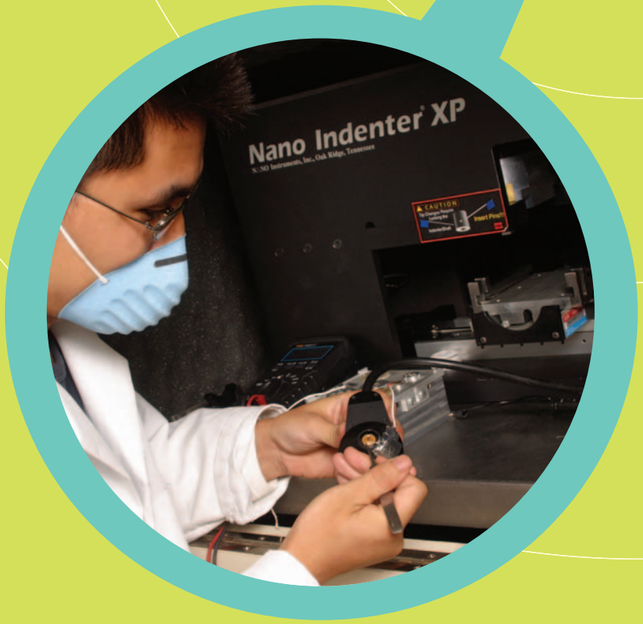
Enhancing the UNDERGRADUATE STUDENT EXPERIENCE

According to the National Science Board (NSB), which publishes a report every two years on trends in science and technology, the demand for technically skilled workers is expected to rise dramatically in the next five years while the number of citizens pursuing an education in science and engineering will, at best, remain level. The consequential gap has created an "Emerging and Critical Problem of the Science and Engineering Labor Force," according to NSB. This means our work educating engineers has become vital for national competitiveness.

In response to this challenge, administrators and faculty at the UH Cullen College of Engineering are improving undergraduate student retention and strengthening the college's productivity, a move that will ultimately provide the labor force with more, and better trained engineers. At the core of the college's attempt to boost retention is the wildly successful Program for Mastery in Engineering Studies (PROMES), the brainchild of Gerhard Paskusz, professor of electrical and computer engineering. The program has become a benchmark for success, and has helped open the door to a recent acquisition of millions of dollars in grant awards designed to help more UH students become successful engineers.

The college has made dramatic recent improvements by adding a new career center, doubling the number of computers available to students, creating new internship and scholarship opportunities, launching programs to enhance the students' business leadership skills and technical communications skills, and by creating camps and workshops designed to prepare students to be successful in the toughest courses in the engineering curriculum.

The result: Today, the college is doing more than ever before to enhance the undergraduate student experience and deliver polished, professional engineers for the country's engineering work force.



FEATURES BY BRIAN ALLEN & PORTIA-ELAINE GANT
PHOTOS BY JEFF SHAW

- Jose Martinez, Tom Nguyen and Ben Babaoye
- Joel Roberts (2003 BSChE)
- Travis Conant (2004 BSChE)
- Shelly Daniel (2004 BSIE) and Kate Brown (2004 BSIE)
- Duo Liu (2004 PhD MatE)
- Murat Aydin

UNDERGRADUATES

Benefit From Expanded Programs, New Facilities

Prompted in part by a growing national concern of impending labor shortages in science and engineering, the UH Cullen College of Engineering has added a wealth of new programs and services, all designed to enhance the undergraduate student experience and improve each student's chances of successfully completing the curriculum and becoming outstanding young engineers.

Students Jude Nwoko (2005 BSEE), Jennifer Benoit and Adewale Adeniji-Adele access coursework in the new Engineering Educational Resource Center.

"Colleges of engineering have to continue to improve and come up with ways to retain students once they decide they want to be engineering majors because successfully educating future engineers is critical if you're going to have a stable, technology-driven workforce," says Frank "Fritz" Claydon, associate dean for undergraduate programs and computer facilities for the college.

UH is one of the most diverse universities in the U.S. with many first-generation college students or first in their families to pursue an engineering degree.

Several programs help students succeed, but the first was the Program for Mastery in Engineering Studies (PROMES). Founded in 1973 by professor Gerhard Paskusz, PROMES offers a model for group learning techniques, workshops and other student support functions now being implemented on a broader scale across the college. Some of these new initiatives recently received more than three million dollars in funding from state and national sources.

The college has added a new director of undergraduate student recruitment and retention, Julie Trenor, who also teaches introductory courses to freshmen engineering students. The college has also launched a new Engineering Career Center, improved the Industrial Scholar Interns Program, added an Engineering Leadership and Entrepreneurism Program, expanded the emphasis on technical communications throughout the curriculum and nearly doubled the number of computers available to students.

"This is something the dean has wanted for a long time," Claydon says, "we now have a director of recruiting who has a Ph.D. in engineering. That's very important because Julie is able to effectively communicate to parents and to students the expectations and demands of an engineering curriculum."

The undergraduate population today is approximately 1,800 students, a number Dean Raymond Flumerfelt has said he is happy with. So the recruiting effort is focused on doing a better job recruiting more "high ability" students, meaning students with high SAT scores and high school class rank.

"What we're trying to do is target kids who have high SAT scores," says Claydon. "UH can offer very nice scholarship support, relative to our competitors."

The added push for more technical communications in the curriculum will help UH engineering graduates become more effective professionals once they enter the workforce, and the addition of Chad Wilson, a new director of technical communication instruction, who has a Ph.D. in English Literature from UH, has brought new focus and leadership to that effort.

"Our Technical Communications course, ENGI 2304, is now an approved part of the university core curriculum," says Claydon. "The idea is that the technical communications course is intended to be the backbone, if you will, for future efforts by faculty and students in junior level and senior level courses. The idea is to start with the backbone of the ENGI 2304 and then each degree program develops a thread of courses in which they continue to develop technical communications for students at the junior and senior level."

Last October, the Engineering Computing Center (ECC) opened a new 32-station PC laboratory within the ECC complex. The computers in this laboratory can operate both in the Windows XP and LINUX environment, as the user sees fit. The costs associated with this laboratory were funded in part with Undergraduate Equipment Access Fees and College of Engineering Technology Fees.

In April, the college opened a new 28-seat facility, dedicated for faculty and student instruction as well as training, which is located in the Engineering Educational Resource Center.

"What that's going to mean," explains Claydon, "is that when a faculty member wants to bring students to the computer lab for direct instruction during class time, all of those activities will go to our new facility instead of occupying some of the primary ECC complex. The existing ECC will always be open to students for general use. And that's a net increase of 60 seats in the last seven months."

The third improvement on behalf of the students is in the hiring of a full-time lab manager, Bobby DeWees, and the implementation of a new printing system in the computer labs.

"Uniprint provides the cure to printing in volume for students as well as eliminating waste in the lab," says Claydon. Under the new system, the student releases a job from his or her computer and then goes to a separate print station where they swipe their Cougar 1Card. Only then does the printer process the job, which means the student is the only one that can print the job. In addition, if a student doesn't print his or her job in four hours, the job gets flushed from the queue, and that's eliminating a lot of the waste, according to Claydon. "On average, we cut waste by about 90 percent." ■

TECHNICAL COMMUNICATION CENTER

Better Prepares Students for the Workplace

The Engineering Technical Communications Center, under the direction of professor Chad Wilson, opened last fall in conjunction with a new technical communications course (ENGI 2304). The new course was developed with the help of the UH Writing Center to enable all engineering graduates to communicate effectively in the workplace.

"Engineering graduates will spend 40 to 60 percent of their time doing written or oral communication," said Wilson.

ENGI 2304 expands on information students get from the core curriculum requirements of Communications 1 and 2 (ENGL 1303 and 1304) and concentrates on writing for engineers. In this technical communications class, which is limited to 20 students per class, students learn various types of engineering writing. Also included in the curriculum are lessons on oral and group presentations.

This course is only part of the department-wide effort to further integrate writing into the curriculum. This course is already a requirement for the Department of Electrical and Computer Engineering, and the Department of Civil and Environmental Engineering has made it a requirement for students entering Fall 2005. Wilson said it is expected that the rest of the departments will add the course as a requirement, especially now that it is under the university's new core curriculum, ENGI 2304, which fulfills the writing intensive requirement.

In previous semesters, the college has used the Capstone Design course to introduce writing as the last course for graduating seniors through the Writing Center's workshops.

"We have the opportunity to enhance communications skills before students enter the workforce," said Paul Ruchhoeft (1998 MSEE, 2000 PhD EE), assistant professor of electrical and computer engineering. "We're focusing on teaching students the connection between solving problems and the communication process—students who can communicate clearly tend to do better with their projects."

Currently, the Technical Communications Center is in the process of identifying required courses in each engineering degree program that will make use of the writing instruction and the Writing Center's writing consultants. Wilson said that while the Capstone Design course is beneficial for students, "the idea is to weave communication throughout the curriculum." ■

Professor Chad Wilson teaches communications skills to engineering undergraduates.

ENGINEERING CAREER CENTER

Partners with Companies to Help Students Find Better Jobs

Engineering students, and the employers who hire them, have a new resource to help them achieve their goals: a recently launched Engineering Career Center that provides job leads and many other resources.

The Engineering Career Center team is dedicated to helping students find pre-professional jobs that relate to their studies and have the promise of opening doors for them after they graduate. Helping students get those jobs is the core mission of the new center, which was launched last March as part of the dean's initiative to offer undergraduate students more services and better facilities.

The center helps current students investigate job choices in engineering; identify their skills and interests; and develop a plan to achieve their employment goals.

> *"Our students work, and our goal is for them to have the best job possible,"*
>
> *says Vita Como, director of the center.*

"We help students find jobs in engineering," Como says. "We are not career counselors. Students who want to take a Myers-Briggs, or want to identify their personal strengths and weaknesses, are referred to experts across campus. We do those things that help students polish their skills, particularly the skills that will help them get jobs.

CAREER SERVICES FOR STUDENTS

- Job search strategies
- Resume and cover letter critiques
- Tips on evaluating and negotiating job offers
- Practice interviews
- Online recruiting system for interviewing and job postings
- One-on-one employment-related coaching

The Engineering Career Center staff includes director Vita Como, Gerald Davenport, James Simpson, Restella Roberts and Leslie Coward.

"I just started as a full-time employee at Kellogg Brown and Root, but I interned with KBR for two and a half years before graduating. I know the company fairly well, and I built a lot of good relationships during my internship. Electrical engineering is very broad, so everything that you learn in class will not be directly applicable to work, but I saw a couple of things at work maybe a year before I would have seen them in the classroom."

Wes Gryder (2004 BSEE), who joined KBR after interning through the college's Industrial Scholar Interns Program.

"My Co-op at Flowserve has further developed my interpersonal skills by giving me the opportunity to work with others in the company, and negotiate with customers everyday. I have also become more organized through working on multiple projects on a weekly basis."

Frank Serafini, mechanical engineering senior interning at Flowserve Pump Division

"I really wanted to get some experience; I felt like I needed it. The Engineering Career Center has the contacts and knew how to get me out there. It's very hard to get in contact with a company on your own, but through the career center, they understand what you're looking for. They critiqued my resume and helped make it look the way an employer expects a resume to look. It's a hard thing to venture into the job market; I'm glad the career center was here to help."

Micah Bennett, mechanical engineering graduate student interning at Flowserve Flow Solutions Division

The career center staff also works closely with companies and engineering firms to meet their hiring goals and is putting effort and resources into identifying new corporate partners.

The center team has an ongoing program to systematically identify "new to the college" employers that have the kind of jobs engineering students might want.

"We can offer companies a full menu of ways to interact with our students, and that's really one of the blessings to have at the center. We can talk about internships, ISIP, Co-op and permanent placement," Como says.

Staff in the center is available to take appointments during regular office hours from 8 a.m. to 5 p.m., Monday through Friday, and ongoing workshops are scheduled throughout the semester.

The type of employment opportunities available to students varies widely, and sometimes the greatest service the center can provide is helping students identify what they don't want to do.

"We've tried to convince students that part of the luxury of having an internship is that very often you might take a job and discover more about the kind of job you really want. That insight can be extremely important," Como says.

Although a relative newcomer to the college, the center is already having an impact. From March to December 2004, the center distributed 2,366 resumes to 72 companies. In addition, the center already has had approximately 1,500 student visits.

The center is an umbrella organization for two services already offered at the college: **Cooperative Education**, which is directed by Gerald Davenport, and the **Industrial Intern Scholars Program**, which is led by Leslie Coward.

Cooperative Education *(Co-op) is a program that enables college students to receive career training with pay as they work with professionals in their major fields of study. Work experience in government, business, industry and human services enhances a student's academic training. This valuable experience is documented on a student's official transcript.*

The ***Industrial Scholar Interns Program*** *(ISIP) is a highly selective program that provides the opportunity for undergraduate engineering students to obtain scholarship funding plus earn extra money and valuable work experience. The program helps students finance their education, provides important work experience, assists companies in meeting professional recruiting needs and provides an expanded, diverse engineering work force to the Houston area.*

Recent changes in the way ISIP operates will create even greater opportunities for students. Beginning in August, every scholarship recipient in the Cullen College of Engineering is a potential ISIP participant.

The center's focus on providing workshops in interviewing skills, dressing for success, professional and business etiquette, and job search techniques, to name a few, has provided students with a chance to polish their style as well as their resumes.

"I've done a workshop on how to have a successful business meal," says Como, who served for many years as the college's director of development before tackling the challenge of leading the new center. "It's really about being comfortable and self-assured. After the workshop, students know what to do with their napkin when dinner is over. We had a discussion in one session about how to signal a waiter that you're finished with your meal. You put your knife and fork, tines down, on the plate. Little things like that are about being polished and you know what? It makes the difference."

"I enjoy sharing this—a picture of a kitten looking at its reflection in the mirror and seeing a lion," says Como. "Philosophically, that's where we're coming from—helping students to know they are going to be excellent employees, that each has something very special to offer—they are unique and valuable."

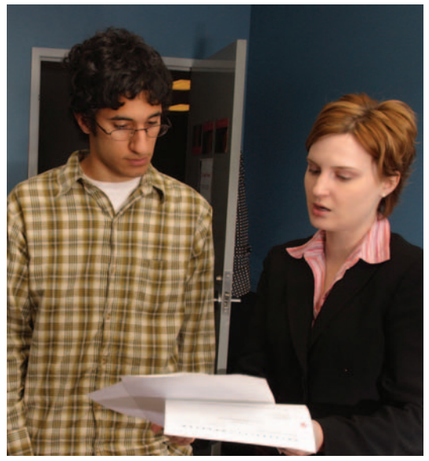
For more information about the center, visit www.egr.uh.edu/career. ■

"Employers will hire somebody who's had experience over someone with a great GPA. Because I'm interning at a small firm, I get a lot more experience in the total design process. I do AutoCAD drawing and construction documents, where I also meet with clients and do site and building inspections."

Jane Powell, civil engineering senior interning at Polhemus Engineering

RECRUITING EFFORTS

Led by Experienced Engineering Professor



Top: Professor Julie Trenor discusses scholarship opportunities with Salman Hasan, an incoming engineering academic merit scholar.

Bottom: Freshman Leyder Cuellar reviews plans for a design project with professor Julie Trenor.

The UH Cullen College of Engineering motto is, "Quality Education with a Personal Touch," and in many cases that philosophy is placed into action even before students decide to enroll at UH.

How is that possible? Meet Julie Trenor, the new director of undergraduate student recruitment and retention. Trenor is identifying and recruiting prospective "high-ability" students that might otherwise miss out on the rich rewards of choosing a UH engineering education. Trenor lives by the college motto, establishing the kind of one-to-one personal connection that has become the hallmark of the undergraduate experience at the Cullen College of Engineering.

But Trenor isn't just recruiting excellent students; she's also *teaching* many of them in their first engineering classes. She taught in the freshman engineering program at Virginia Polytechnic Institute and State University. It was there that she discovered her passion for teaching introductory courses to first-year students.

Trenor's unique combination of skills and experience is a huge advantage, but it is her ability to relate to the students on multiple levels that is her greatest asset.

"I was once in their shoes," says Trenor, who holds a Ph.D. in materials science and engineering.

Engineering class sizes are small, and undergraduate classes are actually taught by faculty members, not by graduate students.

"One of the things I stress when I'm talking with prospective students is that when they're in their engineering classes, they are not going to be taught by teaching assistants and never have contact with the professor. They're going to be taught by a professor who has a Ph.D. in engineering, a technical expert who runs world-class research programs and likely brings in significant amounts of research grant money to the university."

Sometimes half the battle is just getting recruits to visit campus.

"Many of these students have lived in Houston or surrounding area their whole lives," says Trenor. "They've never stopped to discover that our campus is full of trees, fountains and sculptures, and that it's such a nice place. One of my goals is to actually get them on campus to show them the engineering departments and other places on campus, to have them meet current students and professors. When they do that, the prospective students realize that we're friendly, we're personable and we do really want them to come here. They also see that we have a commitment to undergraduate teaching. If they come to the Cullen College of Engineering, they're not going to be treated like a number."

UH has another distinct advantage, which Trenor is not shy about advertising. "Students who have a combined score of 1200 on the math and verbal sections of the SAT and are in the top 15 percent of their class are getting $6,000 a year in scholarship money as an engineering major here—every year for four years. At UH, that award basically covers their tuition and fees. At many other institutions, the same students get nothing in the way of merit-based scholarship money."

Because Trenor is typically working with these top students, another thing that she promotes is the close relationship that the Cullen College of Engineering has with The Honors College.

"While our students will almost always be in small classes, and will be taught by great professors for their engineering coursework, if a student is a member of The Honors College, then they have an intimate academic learning community for those non-engineering introductory classes as well. Students generally take their core classes with the same group of people."

To make the picture even more appealing, The Honors College has a beautiful new facility in the new wing of the M.D. Anderson Library. Plus, the professors associated with The Honors College are typically some of the top teaching professors at UH, and they concentrate on giving students a broad education.

In addition to visiting individually with prospective students, Trenor organizes and hosts several events to attract groups of prospective students to campus, which include HonorE Day for high school seniors and their parents, and Pre-Engineering Day for students in local pre-engineering programs held during National Engineers Week.

Trenor serves as director of the college's Research Experience for Undergraduates, a nationally funded program that brings top-quality high school students from around the country to the college to learn first-hand how advanced engineering research is conducted. She also serves as director of the Research Experience for Teachers, another nationally funded program that brings area high school teachers to campus to work with faculty on engineering research projects so they can take their new knowledge and enthusiasm for engineering back into their classrooms. When you put all these pieces together, it makes for a powerful combination of recruiting tools.

"I think what the scholarship money does, in my short experience here," says Trenor, "is that it gets some of these top students to look at the University of Houston. The award money gets their attention, and once we get them to campus, they meet our students and faculty, they see our facilities, they hear about our classes and all the other things that make them realize: This university that's been in my backyard my whole life is really a jewel that I never knew about." ■

AUTOMATIC ACADEMIC MERIT SCHOLARSHIP OFFERS

Criteria	University Academic Merit Scholarship	Engineering Scholarship	Total
≥1500 SAT (math & verbal) and Top 5% class rank	$7,000/yr*	$2,500/yr*	$9,500/yr*
≥1400 SAT (math & verbal) and Top 5% class rank	$6,500/yr*	$2,500/yr*	$9,000/yr*
≥1300 SAT (math & verbal) and Top 10% class rank	$5,500/yr*	$2,000/yr*	$7,500/yr*
≥1200 SAT (math & verbal) and Top 15% class rank	$4,500/yr*	$1,500/yr*	$6,000/yr*

*These scholarship amounts listed are for entering in Fall 2005 and may be subject to change in future semesters. Awards are given on a first-come first-serve basis to applicants to the University of Houston. It is highly recommended that qualifying students apply during the fall semester of their senior year of high school. These awards only apply to first-time-in-college students and are not available to transfer students.

UH Alumnus Uses Artist's Insight to Engineer

World-Class Design Innovations

By Brian Allen

Whether it's the painter's thoughtful journey as he works the canvas of a landscape painting, or the pianist's understanding as he expresses the music of a classical composition, the sometimes winding and undisciplined path of the artist is a familiar one to ***Manmohan Kalsi*** *(1970 MSME, 1975 PhD ME). In fact, his artistic side has guided him to some of his most insightful engineering innovations.* ▸▸

Although more a painter at heart, Manmohan Kalsi has always considered music an important interest in his life. Kalsi is a student of the piano and especially enjoys playing classical compositions.

This painting is a copy of one of Manmohan Kalsi's original works, of a landscape of a Black Forrest country road in Germany, which is the homeland of his wife, Marie-Luise Shubert Kalsi, whom he met at UH in 1967 while she was pursuing her master's degree in philosophy.

Today Kalsi is the owner of a very successful high technology mechanical engineering firm, founded in 1978 to provide consulting engineering services in research and development, design, analysis and testing of mechanical equipment, seals, valves and downhole drilling equipment. Kalsi Engineering is world-renowned for its consulting expertise in valve technology, especially wherever the demand of safety and reliability is very high, such as in nuclear power plants and petrochemical plants, where the failure of a valve can trigger heavy financial losses or loss of life.

The firm also manufactures and markets a family of very successful rotary shaft seals, Kalsi Seals®, which are used worldwide for harsh applications involving high pressures, abrasives, extreme shock and vibration and frequent stop/starts. Kalsi attributes these unique seal designs, as well as many other technical innovations including a recently developed load responsive hydrodynamic bearing—directly to the excellent education he received at the UH Cullen College of Engineering.

Kalsi, who worked as manager of research and development for WKM Valves before launching his own engineering firm over 25 years ago, personally holds more than 30 patents related to seals, valves and other mechanical equipment. Throughout his career, Kalsi has been successful at analyzing and developing innovative solutions to equipment limitations under the harshest imaginable conditions. Reflecting on his career, Kalsi says some of his most successful innovations are the result of the workings of his intuition, of the "undisciplined" part of his brain that allows him to go beyond rigorous analysis and testing.

Kalsi was born in 1945 in Quetta, Baluchistan, which was, at that time, part of India. Two years later, when India gained independence and Pakistan was created, Kalsi's family was forced to flee from their hometown. They joined hundreds of thousands in refugee quarters in India, where his father, a civil engineer who had a successful construction firm in Quetta, eventually re-established his business.

He remembers developing a love of art and music at an early age. "Before I went into engineering," says Kalsi, "artwork was always very, very important to me. At 11, I did sketches, portraits, landscapes with water paints, and then I started to do some oil paintings as a teenager. I liked art just as much as I liked science, especially physics. But for a profession, I figured there's no way I can really make a living doing art, especially because there were really not many professional opportunities in India for artists."

Kalsi completed his higher secondary education at regular government schools. At 15, he was accepted to Punjab University in Chandigarh, India, where there was no minimum age restriction.

"I'd always had in my mind the desire to go to the United States to do my graduate studies and research," Kalsi says, "because the United States was the most advanced country for research."

After receiving offers from several universities in the U.S. and Canada, Kalsi chose the University of Houston, based upon good advice from Ms. Pfeifer, his international student advisor at UH.

During his pursuit of graduate studies, Kalsi was influenced most by professor Gabriel Fazekas, a Hungarian who was educated in Switzerland and had worked for years in industry in the United Kingdom and in the U.S. before turning to teaching at UH.

"He was an outstanding engineer and teacher due to his experience from having worked in the industry for many years, and it was only after holding several positions as chief engineer at large corporations that he decided to go into teaching," Kalsi recalls.

It was a bit of Fazekas' "unfinished business" in research that ultimately sparked Kalsi's imagination and led to his master's thesis on rotary shaft seals. Fazekas had explored an idea for a rotary seal in 1957 when he was a chief engineer at American Machine and Foundry, to simply put an O-ring in a slanted groove to create a hydroplaning action, which would bring in the lubricant at the shaft-to-seal interface. The conventional O-ring installed in a straight groove has no such hydroplaning action and instead it directly bears down against the shaft, causing high friction and wear.

"In conventional seals, such as an O-ring, if the seal is doing a good job of sealing, it does a very poor job of lubricating the shaft-to-seal interface," Kalsi says. "But by slanting the O-ring you're creating a mechanism of wiping the film of oil under the seal—just like when you stomp hard on your brakes and lock your tires on a wet road, you go sliding, or hydroplaning."

The subtlety of the idea lay in part in the fact that the resulting seal of thin lubricant would never seal perfectly. There would always be a very minute transfer of lubricant across the seal-to-shaft interface, Kalsi explains, but it is enough to cut the friction and wear down to a negligible level.

They tried his idea at American Machine and Foundry, but it didn't work. Fazekas believed that these original experiments failed because sufficient analytical work had not been done to model the behavior and determine precisely what the design parameters should be before testing a prototype.

"So that's exactly what I took on as a challenge for part of my master's thesis," Kalsi says. "I developed a one-dimensional elasto-hydrodynamic model to predict seal performance. From there I determined the slant of the O-ring, the hardness of the rubber, the speed, pressure, temperature, etc.—all of the parameters that would affect the seal performance."

When Kalsi tested his model with experiments, the difference was immediately clear. "I tested the straight O-ring seal and found that the friction was very high and erratic. Then I tested the slanted O-ring seal and its friction was dramatically lower, more than an order of magnitude less. The performance was very stable, and the slanted seal would operate under much higher pressure and speed combinations."

Kalsi finished his master's degree in January 1970 and started to work in industry. He recognized early that this basic rotary seal concept had commercial potential, which is why later, when he started to pursue his Ph.D. while working full-time, his research took this concept a step further. Professors Fazekas and Patrick Hedgecox became his co-advisors.

Just three years after finishing his Ph.D., Kalsi started his own consulting business in 1978. He discovered while working in the drilling industry that rotary shaft sealing in this harsh environment was a tough challenge that had not been successfully addressed by any existing rotary seal technologies.

His first rotary shaft seal patent had to do with combining the slanted O-ring concept with another innovation that was needed to keep the abrasives away from the sealing interface.

"One of the important things that I was able to accomplish, and that was probably because of my artistic side," Kalsi says, "was to make a jump between how the rotating shaft seal worked and how that concept could be further extended to exclude abrasives. Part of the insight that led to the ultimate design was putting all of the complexity of the previous invention into the rubber seal element, leaving the machining of the metal part as simple as it always had been. That was a conceptual leap."

"This was the undisciplined jump," Kalsi says with a smile. "Even though I had not developed two-dimensional theoretical models, I was convinced that the two-dimensional spreading action of the lubricant would lubricate the entire seal-to-shaft interface while simultaneously keeping the abrasives away from the interface."

The result? The very first prototype worked exactly as hoped.

Kalsi Engineering has altogether more than 40 patents, 22 of which pertain to rotating shaft seals. Impressive numbers for a small firm. But that too is by design. Kalsi has always placed a premium on innovation and expertise, not on growing a business in areas where it does not have a technical advantage, or merely for the sake of growing in size.

For more than 25 years, UH mechanical engineering alumnus Manmohan Kalsi has provided the leadership for his Houston-based engineering consulting firm, and the results have generated numerous innovative products covered by 40 patents, some of which are framed on the wall behind him.

DONOR ROLL CALL [SEPTEMBER 1, 2003 – AUGUST 31, 2004]

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Manmohan Kalsi (1970 MSME, 1975 PhD ME) supports UH by serving on the dean's Engineering Leadership Board and with other significant contributions. Pictured with Kalsi (standing) are some of his employees who are also UH graduates: Zach Leutwyler (2002 BSME, 2004 MSME), John Schroeder (1996 BSME, 2005 MIE), Vinod Sharma (1988 MSME), Aaron Richie (2002 BSME), Jeffrey Gobeli (1996 MSPE), Daniel Alvarez (1972 BSMT) and Bahir Eldiwany (1984 PhD ME).

The patents and numerous technical publications represent technical advances and improvements in valves, seals and drilling products. These achievements were possible because of big contributions from a very dedicated staff of brilliant engineers, designers and technicians. Eight of Kalsi's engineers are graduates of the UH Cullen College of Engineering (pictured above).

"Our goal has always been to work on well-defined areas of technology, areas where we add significant innovative value," Kalsi says. "This is our goal, rather than getting siphoned off into doing other things which others can do equally well, such as manufacturing seals. Our company is always trying to break the barriers to technology. And the choice has been a good one for my team and me. We have very good quality manufacturers and suppliers and we work very closely with them."

How was he able to keep innovating through the years?

"Our staff here is extremely technically capable, and very sharp," Kalsi says. "Many members of our staff have contributed toward advancement of technologies that have industry-wide impact. Because of our focus on innovation and an excellent working environment, we are able to keep our talented team together and challenged throughout their careers."

One of the recent innovative tribological achievements of Kalsi Engineering is the load-responsive hydrodynamic bearing, which was developed in part by an award from the U.S. Department of Energy's Small Business Innovation Research Program. The bearing extends the performance envelope of drill bits and downhole motors and other downhole tools to operate under higher loads and speeds.

"The bearing is a one-piece construction, an idea along the same lines as the hydroplaning principle used in Kalsi Seals®," Kalsi says. "Under load, the bearing's dynamic surface, which is initially flat, elastically deflects to a desirable shape that can create hydroplaning. We developed analytical models for the bearing, which showed a remarkably good agreement with the actual test results."

This one-piece design is significantly more compact, cheaper and more efficient, and it replaces other more complicated multi-piece designs, e.g., tilting pad bearings.

Kalsi Engineering has won several other Small Business Innovation Research awards from the Department of Energy, Department of Defense, Nuclear Regulatory Commission and NASA.

Through his decades of innovation, Kalsi has been a master at striking just the right balance between the aesthetic and the pragmatic. And it's not by accident. It's something he strives for.

"To come up with a simple, elegant solution takes a lot more design maturity and a diligent pursuit," Kalsi notes. "And to me, aesthetics ends up being a very important element of the design. Whenever I look at certain design options, what doesn't look right probably is not right." ■

(DONOR ROLL CALL *continued*)

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DONOR PROFILES

GEORGE & MYRAJANE HALL

George Hall (1959 BS Math, 1977 BSIE) and his wife of 25 years, Myrajane, recognize the value of education and know from experience that academic scholarships can make a difference in the life of a college student. They are ardent supporters of academic and sports programs at UH and are members of Cougar Pride and the 1927 Society. They are also long-time season ticket holders for UH basketball and football and Life Members of the Houston Alumni Organization.

"The University of Houston is an important part of our lives. We've invested our time, energy and resources into the programs we have been a part of or believe in," said George, who worked 38 years for various NASA contractors in Safety, Reliability and Quality Engineering. After retiring from The Boeing Company and Loral Aerospace, he retired in January 2000 after five years with Oceaneering Space Systems.

George and Myrajane recently gave a generous cash gift to the college that will be matched by The Boeing Company to create the George Leroy and Myrajane Ereckson Hall Industrial Engineering Scholarship Endowment to provide student scholarships in industrial engineering.

ERNEST & BARBARA HENLEY

Ernest Henley and his wife, Barbara, recently established the Ernest J. and Barbara M. Henley Chemical Engineering College Professorship Endowment to support a faculty member in chemical engineering who can advance innovative teaching, spearhead new research or scholarship and enhance community outreach.

The Henley's have devoted a lifetime to UH. Ernest is professor emeritus of chemical engineering, having retired from UH in 1998 after 32 years of service. He continues to teach in the UH Department of Chemical Engineering and serves on the dean's Engineering Leadership Board. Barbara is a clinical instructor for the UH Graduate School of Social Work, where she previously was an assistant to the dean.

"I consider myself fortunate to be able to make financial contributions to the university, my employer for so many years," said Henley, who was instrumental in the late 1960s and 1970s as associate dean in the tremendous growth and development of the college. He also started six successful commercial enterprises, including Henley Healthcare Inc., noted at the time as the largest manufacturer of physical medicine modalities in the world. For his accomplishments, he has received national and international recognition, including the ASEE Excellence in Computing in Chemical Engineering Education Award and the Biennial International Award for Personal Achievement in Chemical Engineering, one of three awards granted by *McGraw-Hill Chemical* Magazine.

THOMAS & LAURA HSU

Thomas T. C. (Tom) Hsu and his wife, Laura, recently established the Thomas and Laura Hsu Professorship in Engineering Endowment. Tom, a UH professor since 1980, is himself a holder of an endowed professorship.

"Houston and the University of Houston have given us the two most valuable things in our life," said Tom, *"We have a home in a vibrant city and the opportunity to build a career in a great university."* By establishing a professorship at UH, they hope to help the university in its effort to reward, recruit and retain outstanding faculty. The idea of a number of named professorship endowments supported by faculty, staff and students caught the attention of UH President Jay Gogue and Interim Provost Jerald Strickland. Through university matching funding and encouragements, 25 professorship endowments have been established to date across the UH campus. This is a first for UH, and a model for other institutions.

Tom is a John and Rebecca Moores Professor of Civil and Environmental Engineering. He served as chair of the department from 1980–84, and the founding director of the Thomas T. C. Hsu Structural Research Laboratory. He has authored more than a hundred technical publications and two books. His national awards include ACI's Anderson Award for Research and Wason Medal for Materials Research, ASCE's Huber Civil Engineering Research Prize and ASEE's Research Award. Laura Ling Hsu, Ph.D. is associate dean of Continuing Studies at Rice University. For the past 20 years, Laura has created and directed the majority of Rice's public educational programs in the humanities, social studies and international affairs. She is also the founding director of Rice's Institute of Human Resource Education.

LARRY & GERRI SNIDER

Larry Snider (1955 BSIE) and his wife, Gerri, recently made a planned gift to the UH Cullen College of Engineering by establishing a charitable gift annuity and plan to create additional gift annuities in future years. Their life-income gift, established at the University of Houston Foundation, allows them to receive fixed quarterly payments for life, a charitable deduction and establish their legacy today at the college. Upon their deaths, the remainder of the gift annuity will be used to set up the R. Larry and Gerri R. Snider Endowment to provide scholarships for UH engineering students who are Native American Indians.

The Sniders wanted to establish this to commemorate their Native American heritage and recognize benefits they received from Larry's engineering education at UH. Gerri's ancestors are Choctaw Indians. Larry has both Choctaw and Cherokee ancestors and is a voting member of the Cherokee tribe. Larry's great grandmother was on the Cherokee Trail of Tears from Georgia to Oklahoma and his great grandfather was First Representative of Five Civilized Tribes (Cherokee, Choctaw, Creek, Chickasaw and Seminole) in Washington. Larry knows from personal experience as he was the first member of his or his wife's family to graduate from college, how difficult it is to obtain financial support for college. *"We wanted to make financial support for an engineering education more readily available to Native American Indians and UH to gain diversity by having engineering students with Native American Indian heritage,"* said the Sniders.

JIM & JOAN SYMONS

Jim Symons, a professor emeritus of environmental engineering at UH, and his wife, Joan, recently gave the college a planned gift of two paid life insurance policies to establish two endowments to support the environmental engineering program: the Virginia Thompson Symons Endowment and the Virginia Thompson Symons Presidential Endowed Fellowship.

Their objective was for the environmental engineering program to receive a significant surrender value from both policies in order to immediately fund the two endowments in memory of Jim's mother, Virginia Thompson Symons, who was involved in education throughout her life. She was a member of P.E.O., The National Society of the Daughters of the American Revolution, and The American Association of University Women, where she became an Honorary Life Member after 56 years of service.

Like his parents, Jim distinguished himself in the ranks of higher education as a faculty member, teacher, researcher and author in the UH Department of Civil and Environmental Engineering. He began his service to the department as a professor in 1982, served six years as program director for environmental engineering, chaired the department from 1985–89, and was a Cullen Distinguished Professor from 1995–97. He is a member of the National Academy of Engineering.


Hall


Henley


Hsu


Snider


Symons

Chemical engineering professor Ramanan Krishnamoorti stands before a Cessna Citation 7 airplane at the Houston George Bush Intercontinental Airport. His research may lead to major improvements in the safety and performance of tomorrow's airplanes and cars.

RESEARCH MAY LEAD TO SAFER, MORE DURABLE CARS AND AIRPLANES

BY BRIAN ALLEN

faculty research showcased

UH Engineer Details Governing Principles Behind Processing of Nanocomposites in Polymers

Ramanan Krishnamoorti has been working on nanotechnology since before the funding boom, years before President Bush signed the National Nanotechnology Initiative in 2003 allocating $3.7 billion in federal support.

Today his research is establishing the governing principles that will lead to lighter, safer and more durable cars and airplanes, and it holds promise for other groundbreaking improvements in polymer-based products. »

"I started here in 1996, and since then we've been working on what are called polymer nanocomposites, and the idea is to disperse nanoparticles of various kinds in to polymeric matrices," says Krishnamoorti, UH professor of chemical engineering. The underlying goal of his research is to radically improve products made of plastic, rubber, nylon and other such materials by strategically adding carbon nanotubes or layered silicates during processing. Carbon nanotubes are cylindrical-shaped molecules with exceptional properties of strength, toughness, stiffness, and electrical and thermal conductivity.

Why would you want to do something like that? People have long been putting macroscopic fillers like carbon black and glass fibers or talc into polymers to reinforce them, to simply make the materials stronger. The downside of those traditional fillers is they increase the weight of the polymers by 40 to 50 percent. By contrast, Krishnamoorti's nanoparticles typically increase the weight by 0.1 to 5 percent, and the benefits in mechanical properties far surpass those achieved by the use of traditional fillers.

Krishnamoorti's work with nanocomposites received a major boost in 1999 when he was awarded a prestigious CAREER grant from the National Science Foundation. Today, his work is funded by a multitude of public and private entities, including ExxonMobil, which funds work on layered silicates, and NASA Langley, which provides funds through its University Research and Engineering Technology Institutes (URETI). The purpose of URETI is to research and exploit innovative and emerging opportunities in technology that can have a revolutionary impact on the missions NASA pursues in the future.

The stunning success of nanocomposites over traditional fillers provides a clear illustration of the kind of improvements that can be realized by the application of Krishnamoorti's discoveries in commercial products.

"Our approach uses nanoparticles, which are comparable in weight to many of these macroscopic fillers, but we use an order of magnitude lower amount of it and the benefits are exponentially greater," says Krishnamoorti, who holds a Ph.D. in chemical engineering from Princeton University. "The idea is, I can use very small amounts of very expensive nanotubes in a very cheap polymer, keep the cost down and have synergistic properties that you could never achieve before at those kinds of loadings. I've essentially not altered the density of the material. We exploit the fact that nanotubes have a very high surface area-to-volume ratio, which affects the way they connect to the polymer."

Why does the surface area matter so much?

"If I put a large surface area there, then by interaction with that surface, the polymer gets reinforced," he says. "You don't need to get covalent chemical bonding to get stress transfer. All you need is intimate mixing and attraction between the polymer and the nanotubes. We've done this with a variety of materials and we have several patents that are being issued right now."

One such application is in automobiles.

"We're trying to lightweight automobiles," Krishnamoorti says. "For instance, gas tanks are made of polyethylene, and one of the problems with these materials is they do let some of the gasoline out through the polyethylene into the air. We use layered silicates—nanometer-thick materials, disk-like objects that have basically the aspect ratio of a sheet of paper—to serve as a barrier within the polyethylene. The silicate is very thin but very large in lateral size. It can be half a micron in diameter but one nanometer in thickness. We disperse it within the polymer, and these silicates, because they are hard ceramic materials, will not let a gas pass through them. Instead, it must go around. Essentially, we increase the path dramatically by which the molecule has to traverse to get out into the air."

Krishnamoorti has several patents pending in the area of nanotubes. His research group takes naturally clustered nanotubes, unclusters them and then disperses them in the polymer. His group holds the record for the lowest dispersion of nanotubes in polymers.

"There are three ways of trying to achieve efficient dispersion of nanotubes in polymers," explains Krishnamoorti. "One is by doing chemical functionalization. The second is to put the nanotubes in some kind polymerizable monomer: You do an in-situ polymerization, just a physical mixing. The third way is surfactant-assisted. You take soap-like molecules in a very small amount, and they act as a compatibilizing agent."

The Holy Grail of nanotube research, according to Krishnamoorti, is discovering how to extend this process to the polymers of commercial interest that are produced in large amounts, and to achieve these desired properties with low concentrations of nanotubes. Low concentrations are important because nanotubes are very expensive as additives.

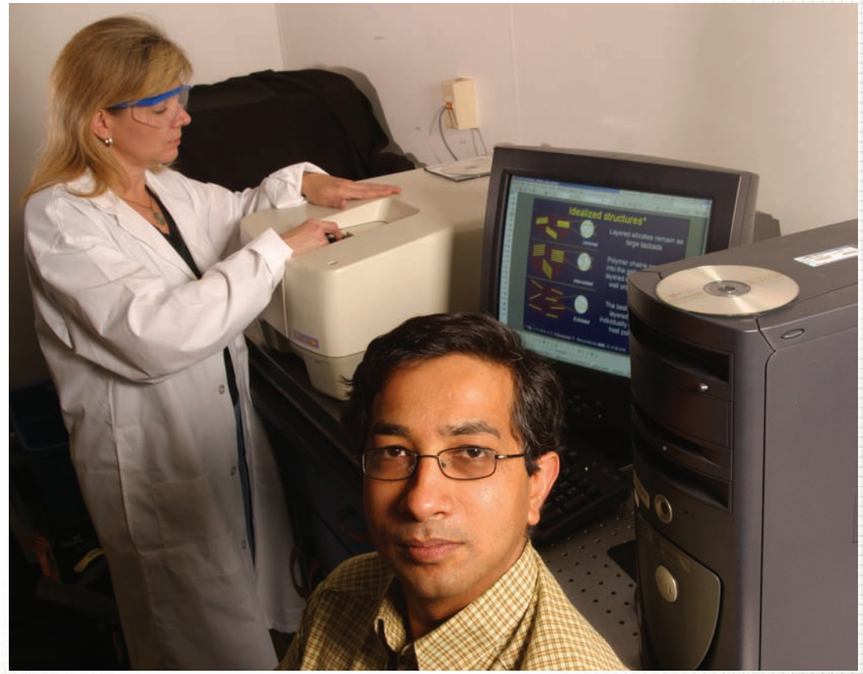
"We're trying to move into commodity materials—like polyolefins," Krishnamoorti says. "The other thing that we're working on is high-temperature polymers. We're just starting a collaborative process with the Air Force."

Krishnamoorti says the lowest hanging fruit in his research is the area of reinforcing elastomers, basically rubber-based materials. This has very wide-ranging applications, from down-hole oil well drilling to NASA, which is looking for sealants. Elastomers by nature are rather soft, pliant material. Krishnamoorti's group is finding ways to improve their strength while keeping the most important aspect, their elastic properties.

"We tune the material chemistry to try and tune the materials physics and at the same time, what set our group apart from perhaps most of what people do in the nano business is we try to incorporate processing as an integral step of trying to understand structure-property relations," Krishnamoorti says. "Because in all of these nano-materials, processing is the crucial aspect. You can control structure more by processing than by, even chemistry, for example. As long as you have favorable chemistry, you can get any structure you want and you can trap it in that structure and get the enhanced properties by processing. And that's the most important angle that we bring to bear. It addresses a very important disconnect that happens in academic and industrial research."

What is processing exactly? Examples might include sending plastic through an extruder, an injection molder, a blow molder, or a sheeting apparatus. Processing might also include subjecting the material to high temperature, high pressure and flow, meaning shear or elongation. Many of these steps may also be applied during cooling, which will solidify the material and further effect the final properties of the material.

Krishnamoorti wants to be able to say how each of these processes affects the structure and the properties of the material. For traditional polymer materials, the governing principles are quite well established, both at the scientific level and at the industrial level. But the area where much less is known is the area of nanocomposites. The idea is to try to come up with governing principles so that new products with remarkable new properties can be developed. ■



Cynthia Mitchell (2005 PhD ChE) works on an ultraviolet-visible-near infra red absorption spectrometer in professor Ramanan Krishnamoorti's lab.

::::: 1970's :::::

KERRY KIRKLAND (1970 BSME) was recently named vice president and general manager of Stress Subsea, Inc. Previously, he was the vice president at Technip. He can be reached at kerry.kirkland@stress.com.

LANE ALEXANDER (1971 BSME) was recently named pipeline manager for Stress Subsea, Inc. Previously, he was the pipeline manager for Technip. He can be reached at lane.alexander@stress.com.

DAVID KELSOE (1973 BSChE) is founder and owner of Automated Turnaround Solutions in Kingwood. He can be reached at kelsoe@kingwoodcable.com.

::::: 1980's :::::

MARK L. LOETHEN (1981 BSCE, 2004 MBA) is managing engineer for the Street and Bridge Engineering Section in the Engineering and Construction Division for the City of Houston. He can be reached at mark.loethen@cityofhouston.net.

RAFAEL ORTEGA (1981 BSCE, 1985 MBA) was appointed by the Harris County Commissioners Court to the board of directors for the Metropolitan Transit Authority of Harris County. He is president of the Houston-based engineering firm Lockwood, Andrews & Newnam Inc., which was selected as a member of the program management support team for Metro's 7.5-mile light rail transit system. The company handled systems, architectural engineering and technical support for the project.

ARIJEET (ART) SENGUPTA (1984 MSPE, 1988 MBA) is working as the lead engineer and geologist in the design and operation on the Everglades Restoration in Florida, the world's largest environmental project. He can be reached at artsengupt@aol.com.

ALAN LEUNG (1987 BSEE) is head of research for Boto Co., one of the world's largest manufacturers of artificial Christmas trees. The fake tree, a mainstay of China's booming, low-cost Christmas merchandise industry, is going high-tech. Over the past few years, China has been producing increasingly real-looking, easier-to-assemble artificial trees. Some drip with lights that can last a decade. Others shoot out fake snow, play Christmas jingles or even count down to the New Year.

::::: 1990's :::::

YAMILE CENDALES JACKSON (1991 BSIE, 1994 MSIE, 2000 PhD IE) was elected to the board of directors of the Project Management Institute, the world's leading not-for-profit advocacy association for project management professions. As founder, president and CEO of Ringstones Consulting International Inc., she has provided project management consulting and training throughout the world and sponsored project management research concentrated on project risk management. She is an adjunct professor of engineering management at UH and in the MBA program at the Voralberg University of Applied Sciences in Austria.

MARTY CRISTOFARO (1996 BSCE) is the manager of the design team for Houston's Storm Water Management Program. He is an engineer with JF Thompson, Inc. He is a registered professional engineer and professional land surveyor.

BRYAN P. KENNEDY (1996 BSCE) has been named partner of Jones & Carter, Inc.. He is a land development department manager and can be reached at bkennedy@jonescarter.com.

::::: Births :::::

JULIO RIOS (1997 BSIE) and **JENNIFER (WHITE) RIOS** (1999 BSEE) welcomed home their first child, Daniel Adrian Rios, on Nov. 30, 2004. He weighed six pounds, 14 ounces and measured 19.25 inches long. Julio, who also has a

master's degree in management information systems from UH Clear Lake, is a product architect for Fuelquest. He can be reached at email@juliorios.com. Jennifer is a firmware engineer for Hewlett Packard and can be reached at jennifer.rios@hp.com.

::::: Deaths :::::

DAN C. TINDALL (1949 BSME) died Aug. 19, 2004 at the age of 79 after a 15-year battle with cancer. He flew PV-1 Twin Engine Bombers during World War II and was a registered professional engineer and owner of Tindall Homes, building custom homes in the Greater Houston area. He served on the board of directors and was chair of the ethics committee for the Greater Houston Home Builders Association, member of the Houston Apartments Association, past president of Bayview MUD, member of Kemah Kronies, Kemah Police Academy Alumni, usher at St. Mary's Church and the first to enter the Gene Therapy Program for Prostate Cancer. He is survived by his wife of 57 years, Phyllis; two sons; five grandchildren and four great-grandchildren.

MARCUS CANTRELL (1951 BSME) died Aug. 23, 2004 at the age of 80. He served in the Army during World War II and was in Germany at the Battle of the Bulge. He worked for Ingersoll-Rand, Pacific Pumps and Crane Packing Company and retired in 1968 to pursue a lifelong dream of becoming a grass farmer. He was a pioneer in the field of agriculture and took delivery of the first Vermeer big round hay baler ever shipped to a farmer anywhere in the world. He raised cattle and became an expert at growing Tifton 85 grass. He is survived by his wife of 40 years, Barbara; his dog, Buddy; godchild and a host of friends and relatives.

ROBERT THEODORE MOSHER (1951 BSME) died Sept. 18, 2004 at the age of 80. He served in the Navy Air Corps during World War II as a navigator aboard PSYs and PBNs. After his discharge, he worked for Humble Oil & Refining Co. He was owner and president of Esch and Associates from 1955–87 and the developer of Lexington Estates subdivision in Decker Prairie, Montgomery County. He is survived by his wife of 56 years, Mary Frances Duffy; two daughters; three sons and six grandchildren.

HAROLD VERNON THEISS (1951 BSME) died Oct. 6, 2004 at the age of 78. He served in the Navy during World War II. He retired after 30 years of service from Anderson, Clayton and Co. He enjoyed bowling, history and genealogy, traveling and working at the family farms raising cattle and pecans. He was an elder, congregation secretary and choir member at Trinity Lutheran Church. He was preceded in death by his wife of 29 years, Marie, in 1984. He is survived by long time friend and companion, Jackie Bushman; a daughter; two sons; seven grandchildren and two step-grandchildren.

WILLIAM E. GWALTNEY (1952 BSME) died Aug. 30, 2004 at the age of 77. While at UH, he met and married Jo Ann Langley. He was co-owner and founder of Tex-A-Mation Engineering Co. in La Porte. He was a director for Bayshore National Bank and on the board of the Bayshore Municipal Utility District and the Bayside Terrace Civic Club. He was an avid outdoorsman; boating was a way of life. He is survived by his wife of 52 years, Jo Ann; two daughters; three grandchildren and a great-granddaughter.

LEON VERNON (TINK) MANRY JR. (1954 MSPE) died Nov. 6, 2004 at the age of 80. He served in the Navy during World War II, after which he returned to continue his studies, earning a bachelor's degree in electrical engineering from Rice University and specialized geology studies at Texas A&M University. During his 50-year career in the energy industry, he served as manager of exploration and chief engineer for Slick Oil Corporation and Geotek Oil Corporation. He was

UH ENGINEERING ALUMNUS

Lends Expertise to Small Entrepreneurial Businesses

By Portia-Elaine Gant

After earning three degrees in chemical engineering from UH, Michael A. Ervin (1966 BSChE, 1969 MSChE, 1970 PhD ChE) began a 21-year tenure at DuPont in positions ranging from research engineer to vice president of research and development, and his journey took him to Europe and all across the United States. Now, Ervin, eager for a change of pace, has settled down in Austin, to get involved in a small company.

"Late in my DuPont career, we went on an acquisition binge," Ervin said. "I started meeting and working with people in these small companies we acquired. I became intrigued by the culture of start-ups; I was intrigued by the opportunity to work in a small entrepreneurial company. Once I got into it, I decided I really liked that culture."

Michael A. Ervin served as the first chair of the Industrial Advisory Board for the UH Department of Chemical Engineering.

Ervin began his entrepreneurial career at DTM Corporation in Austin, which was founded to commercialize selective laser sintering (SLS).

"SLS is a technology used for rapidly building prototypes and parts out of powders with a laser beam," Ervin said. "I became familiar with it at DuPont because we looked at acquiring that technology from The University of Texas before DTM licensed it."

Both companies provided Ervin with the opportunity to use his chemical engineering background in different ways, and he said he enjoyed positions within both organizations.

"I enjoyed very much being the vice president of research at DuPont in that it gave me an overview of the whole corporation and the work going on around the world. I enjoyed the strategic part of serving different businesses," Ervin said.

The environment at DTM, however, is what furthered Ervin's interest in smaller businesses.

"I enjoyed helping the small companies put a lot of good processes in place," Ervin said. "DTM had only a small number of people with corporate experience, so the processes that other corporations already have in place were not there. Helping to teach those processes was very enjoyable to me."

After his five-year stint with DTM, Ervin left to begin a private consulting practice, M.A. Ervin & Associates, a company that works in intellectual property management and technology transfer.

"I worked a great deal at DTM with patents and technology transfers, and I've been doing that ever since," Ervin said. "Late in 1999, I studied for and passed the bar for the U.S. Patent Office and became a U.S. patent agent, and now both consult in patent strategy and write patents for people in small companies. I have currently six clients; several are very small companies with less than 10 people. Even my two larger clients today are only 400 and 75 people respectively."

president and chair of The Ocean Corporation, and also founder, president and chair of Mid-Gulf Exploration Company and Midland Production Corporation. His memberships included nine years on the National Petroleum Council in the U.S. Department of the Interior, Aspen Pacific Rim Conference, Sea-Space Symposium, American Association of Petroleum Geologists, Society of Petroleum Engineers, Tau Beta Pi and Sigma Gamma Epsilon. He was a registered professional engineer in Texas, a charter member of the Society of Professional Well Log Analysts, a 50-year member of The Masons, Houston and Blanco Lodges, director of the Texas Independent Producers and Royalty Owners Association, and president of the Friends of Guadalupe River Honey Creek. He is survived by his wife, Jeanne; six children, nine grandchildren and his beloved dog, Hunda.

WALTER WORTH POWELL (1954 MSME) died Oct. 11, 2004 at the age of 77. He graduated from Texas A&M University with a degree in aeronautical engineering. He was a registered professional engineer and retired as president of Anderson Greenwood International after 30 years of service. He is survived by his wife of 54 years, Lucille Kathryn, two sons and two grandchildren.

GENE PAUL HACKNEY (1955 BSCE, 1961 MSCE) died Jan. 23, 2005 at the age of 80 after a five-year battle with cancer. He enlisted in the Army Air Corps where he became a B17 navigator who successfully completed 35 bombing missions over Europe during World War II. In 1946, he married Phyllis Jean Amrine. In his retirement, he was very active as a Boy Scout leader at the local and district levels. He is survived by a daughter and four grandchildren.

TIMOTHY VON STERNBERG (1972 BSEE) died July 30, 2004 at the age of 60 after a two-year battle with cancer. He enlisted in the Air Force and was honorably discharged with the rank of sergeant. He was an avid camper, outdoorsman, hiker, cyclist and bowler. He is survived by a daughter and a life partner, Cathy Norton.

FRANK R. MCMANN (1973 BSIE) died Oct. 14, 2004 at the age of 59. He was employed by TOSC, Inc. He was an avid golfer and is survived by his wife of 35 years, Nancy Dunlap, and two sons.

DENNIS ANDREW ALKIRE (1976 BSEE) died Sept. 5, 2004 at the age of 54. He worked for HL&P, then NASA for five years prior to becoming a project engineer specializing in power distribution for the petrochemical industry. He enjoyed the outdoors and was also an accomplished target pistol marksman. He backpacked in the Rocky Mountains, worked with his sons' Scout troops, bowled and remodeled his childhood home. He enjoyed reading science fiction and was a history buff. He is survived by three children.

JOHN GALLOWAY (1978 BSCE) died Aug. 19, 2004 at the age of 56. He was a senior project manager for Turner, Collie and Braden. He was an avid golfer, hunter and dog lover. He was a member of St. Martin's Episcopal Church and several engineering associations and social clubs.

MICHAEL ANDERSON ROBERTS JR. (1978 MSPE) died Aug. 12, 2004 at the age of 57. He earned a B.S. in geology from Duke University, M.S. in geology from the University of South Carolina, M.B.A. from Houston Baptist University and J.D. from South Texas College of Law. He was licensed to practice law in Texas. He was a lieutenant in the U.S. Air Force Strategic Air Command during the Vietnam War. He is survived by his wife, Mary Jo, four sons and two daughters.

JAMES PAUL MALIGAS (1998 BSIE) died March 24, 2005 at the age of 33. He graduated from UH cum laude and was recognized as an outstanding student by the Texas Society of Professional Engineers. He received his master's degree in industrial engineering from Purdue University, where he specialized in Operational Research and provided technical consulting services to Indiana manufacturers along with assisting 130 students with economics. He began his career at IBM in San Jose, Calif., in the hard drive division where he developed methodology for forecasting demand based on product life cycle. His career progressed to Entergy in Houston where he was the business lead for development, implementation, operation and maintenance of a simulation engine used for forecasting energy loads and later to his current job at Halliburton where he was senior forecast modeler in Energy Services.

Key:

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BioE — Biomedical Engineering
ChE — Chemical Engineering
CE — Civil Engineering
ComE — Computer Engineering
EE — Electrical Engineering
EnvE — Environmental Engineering
IE — Industrial Engineering
ME — Mechanical Engineering
MatE — Materials Engineering
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News _____

Fred Gentile (1961 BSEE) now enjoys retirement by spending time sailing around the world.

UH Engineering Alumnus Networked First ATMs, Developed Automated Fuel Dispensing System

By Portia-Elaine Gant

In engineering, many discoveries that improve the quality of life do so in unseen ways, but UH electrical engineering alumnus Fred Gentile's (1961 BSEE) development is in everyday use across the world—the Automated Teller Machine.

"I was the development manager for Docutel Corporation, where a friend of mine developed the first basic ATM," Gentile said. "I developed the networks that tie the ATMs together. My goal was to put the number of things tellers do online."

Gentile has a patent in networked automatic banking systems with networks. His interest in ATMs grew from a personal desire for expediency.

"I hated writing checks at a grocery store to get some cash if the bank wasn't open," Gentile said. "It's a convenience that started a revolution. We have a lot of things now that are similar. You can get your boarding pass for a flight without talking to anyone. You can get your money out of the bank using these automatic terminals when you're in a hurry, and no one has to help you."

Though the development work was both creative and technical, Gentile said that his engineering degree was invaluable. "Engineering gives you your background and the ideas to build on," Gentile said. "You're learning from what you were taught in science, and you're applying it to real day-to-day applications. Engineering makes all the difference in the world."

In addition to his work with ATMs, Gentile created Automated Fuel Dispensing Systems that are seen at gas stations everywhere and has a co-patent for that design.

"It was the same group of us that had worked on the ATMs, and it was working so well that we looked for other places to apply similar technology," Gentile said. "We were investigating the possibilities, and a large oil company asked if we were interested in building systems for them. They supplied the pumps, we supplied the computers and electronics, and we did it in 115 days. After that, they gave us a contract to build 75 systems."

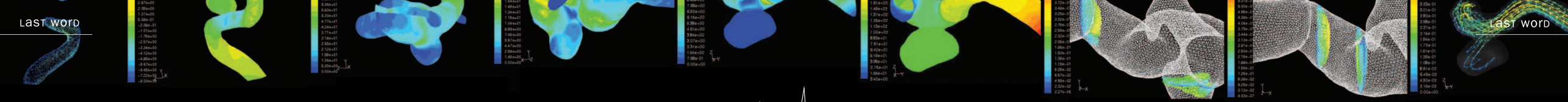
Though they completed the ATM networking system within a year and the Fuel Dispensing System even faster, with today's technology the turnaround would be much faster.

"In those days you didn't have a CompUSA where you could buy a computer ready to go," Gentile said. "You had to put your computer together, and there were a lot of obstacles in getting the software written and selecting the right equipment. We spent long hours working on these things. It took individuals 60 to 80 hours a week to develop them."

Almost three decades after these initial developments, Gentile can see the progress that other engineers have made with the groundwork his team laid down. "This is the age of self-service machines," Gentile said. "The systems seem to be more sophisticated now although they have the same functions. They have better displays available today, and they build a lot more of them. When I was at Docutel, we built 4,000 to 5,000 ATMs and 75 fuel stations. Now there are hundreds of thousands, so you can see how the business has matured."

After working for NASA, Honeywell and American Airlines in engineering communications and development, Gentile retired, which led him to a new hobby. "About 10 years ago, I decided I wanted a sailboat, and I've been sailing more since I retired," Gentile said. "I sailed some of the Greek Islands, and we went to Tortola in the British Virgin Islands. I also went to the French Island Martinique. You have to know a little bit about the wind and the configuration of the sail so it's a bit of an art, but I don't think it's very difficult to get highly proficient."

Though retired, Gentile is still a member of IEEE. He has been involved in the organization for 43 years.



NEW MEDICAL TECHNOLOGY MAY IMPROVE TREATMENT FOR PATIENTS WITH Cerebral Aneurysms

BY BRIAN ALLEN

Mechanical engineering professor Ralph Metcalfe and his research students at UH are working with doctors at Baylor College of Medicine/The Methodist Hospital on new medical technology to identify brain aneurysms before they create strokes. As many as 15 million Americans are estimated to have unruptured cerebral aneurysms, which are ballooning weak spots in the wall of a blood vessel in the brain.

Most of the aneurysms are benign, meaning they don't lead to stroke. But roughly 25,000 people in the U.S. suffer hemorrhage each year. "So the question is, you have maybe 15 million people who have these things, but only 25,000 die from them… but which 25,000?" asks Metcalfe, who is working primarily with Dr. Charles Strother's research group. "How do we predict who is most at risk?"

The challenge is even greater because the surgery to repair the aneurysm is somewhat risky. The other problem Metcalfe and his colleagues are investigating is developing a better method of identifying who has aneurysms and where they are. "They have 3-D CT (computerized tomography) scans and MRIs (magnetic resonance images), but they're very expensive," says Metcalfe. "You can't screen everybody. So the question is, how do we identify them and then what do we do at that point?"

Metcalfe's research may help doctors answer those questions, and more, with his group's three-dimensional computational simulations of blood flow.

"One of the key points is that aneurysms don't seem to form randomly," explains Metcalfe. "They do seem to form at locations that are associated with the fluctuations in the flow of blood. So the question was, what is it about the flow of blood that tends to correlate with the formation of aneurysms?"

Metcalfe and Strother began working together when Strother invited Metcalfe to give a talk at the national convention of the American Society of Neuroradiology discussing the use of computers simulating blood flow in the brain. From there, they identified some critical problems they were both interested in, such as, what causes an aneurysm to form?

Also of interest is, when do aneurysms start to form? How rapidly do they grow? What causes them to burst? Will blood clots form in them?

"It turns out that in some cases you want the blood clot to form in the aneurysm," explains Metcalfe, "because then that can stabilize it. It can greatly minimize the chance of the aneurysm bursting, which of course would be catastrophic."

But there is a down side to an aneurysm filled in with a blood clot because the clot could partially dissolve and may come loose and enter the blood stream. In that case, a blood clot is going through the brain, and it's eventually going to flow to an artery that is too small, at which point the clot blocks the flow of blood. That blockage prevents the oxygen-rich blood from reaching its destination and ultimately kills many of the brain cells that are downstream of that point. That event is known as an ischemic stroke.

There are two major kinds of stroke: ischemic, which accounts for more than two thirds of all strokes and is caused by blood clots that clog blood vessels in the brain; and hemorrhagic, which tends to be more serious and occurs when the wall of a blood vessel becomes weak and begins to leak blood into the brain. Smaller attacks that create stroke-like symptoms that go away, are typically caused by smaller blockages and are called transient ischemic attacks.

Once detected, how are aneurysms treated? One method is to surgically place a stent in the vessel to support the artery walls and prevent the clot from coming out. That strategy can solve both problems, keeping the clot in place and sealing the weak area of the blood vessel wall.

"But it doesn't always solve the problem, and that's one of the issues," Metcalfe says. "Doctors want to know how a stent alters the flow of blood in and near the aneurysm? What is the optimum design in order to make a stent more effective so that the chances of future strokes are minimized?"

Metcalfe's work in blood flow dynamics plays two major roles. The first is as a research tool.

"We perform simulations of more idealized cases," he says. "We try to figure out what happens to the flow in, for example, the carotid arteries, the main arteries that carry blood to the brain. How does the blood behave as it flows through there? Can we correlate a certain type of behavior of the blood with potential sites where aneurysms form? We do very accurate simulations and when you have an accurate simulation, you have a complete description of the flow fields and can study in great detail all the fluid dynamic variables such as the wall shear stresses, the pressures, the velocity."

The second application is as a clinical tool.

"Once we have a reasonable idea of the fluid dynamic variables needed to study and identify a potential problem, we then use a program that provides a detailed, three-dimensional description of the actual arteries of real patients from Strother."

Strother introduces a dye, the contrast agent, and they then get images of the artery and the aneurysm using 3-D Digital Subtraction Angiography (DSA). Metcalfe's group, led by UH graduate student Aishwarya Mantha, then imports the images into a computer program, removes some geometric glitches and then generates a computational mesh, a mapping of hundreds of thousands of tiny elements that represent the area being studied. That mesh is then introduced into a program that actually solves the fluid dynamic equations of motion.

"It's a three-dimensional calculation." says Metcalfe. "There are several hundred thousand elements, which are discrete zones within a geometric mesh, and then there are 700 steps representing intervals of time over the cycle of each heart beat. It takes a lot of computer time to perform these simulations."

And really, really fast computers. "We use the Beowolf cluster for that," he says.

Metcalfe is also working with the graphics group at UH's Texas Learning and Computation Center to significantly improve the visualizations created by his simulations.

"The critical step here is to make these complicated flows much more accessible to people like medical researchers and physicians," Metcalfe says. "We're developing three-dimensional visualizations so doctors can go inside the virtual artery and actually see what's happening as the blood cells flow through."

Metcalfe believes that the day is not far off when a fully integrated computational-medical tool will be commonly used in diagnostics and prevention as well as remedial treatment of this serious medical problem.

The University of Houston System and The Methodist Hospital formally signed an agreement of understanding in February, making The Methodist Hospital the UH System's preferred affiliate in the Texas Medical Center. ■

Above: UH professor Ralph Metcalfe (center) reviews data on a patient with Dr. Charles Strother (second from left) and UH graduate students Maheep Jain and Aishwarya Mantha.

Aaron Richie (2002 BSME) holds an innovative load-responsive hydrodynamic thrust bearing designed by Kalsi Engineering. Learn more about Manmohan Kalsi (1970 MSME, 1975 PhD ME) and his business on pages 18–23.

2005 UH Cullen College of Engineering Alumni Events

September 1

Engineering Alumni Association Tailgate
UH vs. Oregon
4 p.m. Tailgate, 6 p.m. Kickoff
Reliant Stadium
**Purchase football season tickets through E-Block and sit with fellow engineering alumni. E-Block deadline is June 30. For details, contact Janice Quiroz at jquiroz@uh.edu or call 713-743-4215.*

September 10 & 24, October 15

Engineering Alumni Association Tailgates
Sept. 10: UH vs. Sam Houston State
Sept. 24: UH vs. Southern Mississippi
Oct. 15: UH vs. Memphis
4 p.m. Tailgate, 6 p.m. Kickoff
West side of Robertson Stadium, UH campus

November 12

Homecoming Brunch & Tailgate
UH vs. SMU
3 p.m. Tailgate, 6 p.m. Kickoff
West side of Robertson Stadium, UH campus

November 26

Engineering Alumni Association Tailgate
UH vs. Rice
12 p.m. Tailgate, 2 p.m. Kickoff
West side of Robertson Stadium, UH campus

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