THE FLORIDA

ENGINEER

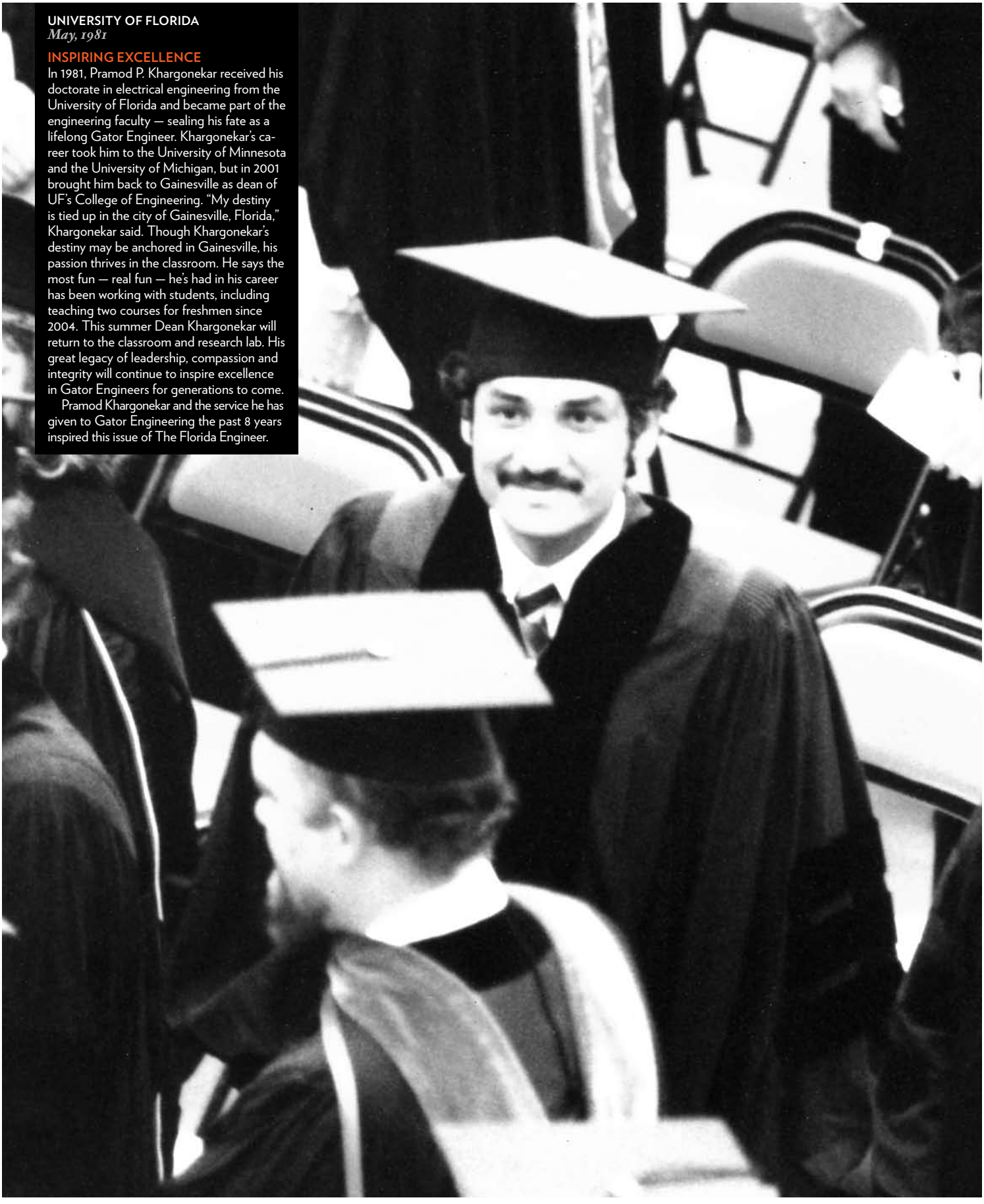
SUMMER 2009

VOLUME 95

FEAST ON THIS

Technology is filling more and more of our daily plate, but how much can we *really* consume?

UF | UNIVERSITY of FLORIDA



UNIVERSITY OF FLORIDA
May, 1981

INSPIRING EXCELLENCE

In 1981, Pramod P. Khargonekar received his doctorate in electrical engineering from the University of Florida and became part of the engineering faculty — sealing his fate as a lifelong Gator Engineer. Khargonekar's career took him to the University of Minnesota and the University of Michigan, but in 2001 brought him back to Gainesville as dean of UF's College of Engineering. "My destiny is tied up in the city of Gainesville, Florida," Khargonekar said. Though Khargonekar's destiny may be anchored in Gainesville, his passion thrives in the classroom. He says the most fun — real fun — he's had in his career has been working with students, including teaching two courses for freshmen since 2004. This summer Dean Khargonekar will return to the classroom and research lab. His great legacy of leadership, compassion and integrity will continue to inspire excellence in Gator Engineers for generations to come.

Pramod Khargonekar and the service he has given to Gator Engineering the past 8 years inspired this issue of The Florida Engineer.

COURTESY OF SEEMA KHARGONEKAR

THE FLORIDA ENGINEER

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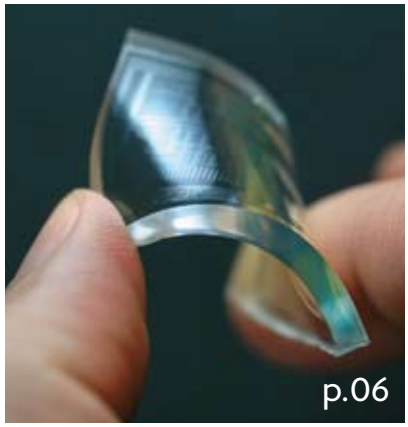
THE AUTHOR IS IN Best-selling author and social critic Tom Wolfe shares his views about our technology-obsessed society and offers shrewd observations, of course.



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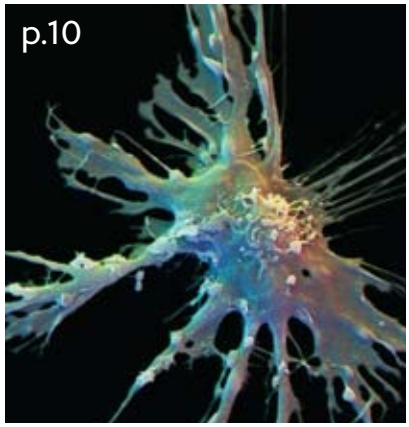

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NEWS WORTHY AND COMPLICATED Learn about how graphene has the potential to give silicon some competition in technology production. Dendritic cells may not be something you've ever heard of, but these cells are making a big impact in the cancer battle.

DEPARTMENTS

To learn more about how **DEAN KHARGONEKAR** influenced each of this issue's pages go to: thefloridaengineer.eng.ufl.edu

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from 300 Weil Hall

How does one sum up eight years of leading the College of Engineering at the University of Florida?

It seems like yesterday when I wrote excitedly on this page about our return to Gainesville after 17 years in the Midwest and being amazed by all the changes that had taken place, such as the demise of our favorite restaurant Brown Derby. (We learned later it had burned down.) Sadly, Alachua General Hospital will close down later this year. Our first child was born at AGH. Change is the only constant.

Serving as Dean has been an immensely rewarding experience. I was welcomed and warmly accepted by the students, faculty, staff, alumni and friends of the College. As an alum myself, I was equally enthusiastic and eager to embrace my alma mater and lead it toward being a world-class institution of engineering education, research, and outreach devoted to serving the people of the State of Florida, the nation, and the world. While only history can be the judge, I hope we made major strides toward this goal.

There were many challenges: fierce worldwide competition for talented faculty and students, budgets, rapid changes in engineering, and economic globalization — to name just a few. Among all these, our central focus was on attracting and retaining the most talented faculty and students and providing them with an exciting environment for research and education, state-of-the-art infrastructure, and support to excel. I hope we did this well as it is the single most important determinant of our future.

The University of Florida, one of the largest public research universities in the world, is the best exemplar of the challenges and opportunities in higher education. I aimed to balance competing missions of undergraduate education, graduate education, advanced research, and public service. In a cross weave, I strove to align the long-term interests of students, with ambitious aspirations of faculty and stiff demands placed on staff. These exercises in striking the right balance, finding deep interconnections, and fostering the synergies between education and research taught me a lot about how to lead in a major public research university. I hope the College community will continue to explore these synergies and interconnections so we continue to improve all aspects of engineering education and research for serving humanity.

During this exhilarating journey, my wife, Seema, and I made many friends. We will cherish these relationships and bonds. We are so grateful for the affection and love we received during these last eight years. While I will no longer be the Dean of Gator Engineering, we will remain the biggest boosters for successes of our students, faculty, staff, alumni and friends.

Go Gator Engineers,

Pramod Khargonekar

Pramod P. Khargonekar
Dean
ppk@eng.ufl.edu

LAB NOTES:

The College has benefited from an explosion of progress since Khargonekar arrived in 2001

2001
›Gator Engineer alum Pramod P. Khargonekar becomes dean in July

2002
›Merged two departments to create the Department of Mechanical & Aerospace Engineering

›Established the Department of Biomedical Engineering

2003
›Intellectual property agreement with Harris Corp., So faculty can collaborate more freely on research

2004
›Partnered with the College of Liberal Arts & Sciences and the Health Science Center to create A Nanoscience Institute (SEE PG 14)

2005
›Partnered with Florida HighTech Corridor, advancing the technological and economic base of Florida

›Overhauled the College's distance education programs and launched UF EDGE

›Secured a $10 million gift to name the J. Crayton Pruitt Family Department of Biomedical Engineering, matching funds created a $20 million endowment

2006
›Awarded more bachelor's degrees to Hispanic students than any other U.S. university

2007
›ABET accredited and received a six-year accreditation for the College

2008
›The Nanoscale Research Facility opened (SEE PG. 14)

2009
›The $85 million Biomedical Sciences Building opens (SEE PG. 13)

›The College has raised $48 million for Florida Tomorrow: UF's Capital Campaign. That's more than 60 percent of the College's $80 million goal

GATOR ENGINEERING STATS

- The College's USNWR rankings soared. The graduate program ranks 25th among public and private universities and 15th among public universitie, in 2001 it was ranked 35th and 20th, respectively.
- The College's endowment has tripled; starting at $24 million and is just shy of $75 million today.
- Annual College research expenditures grew from $65 million to more than $108 million.
- In 2001, the College awarded 95 Ph.D.s. In 2007, it awarded 186 Ph.D.s. and ranks in the Top-10 of public and private universities for number of Ph.D.s graduated.
- In 2007, Hispanic Business Magazine ranked the College third in its list of the best engineering schools for Hispanics.
- Since 2001 the number of female faculty has grown by 50 percent. The number of Hispanic faculty members has increased by 150 percent.

Watch the tribute video to DEAN KHARGONEKAR at thefloridaengineer.eng.ufl.edu

ENgAGE

GET IN THE NEWS: read about all the exciting things happening in the College go to thefloridaengineer.eng.ufl.edu

DOUBLE COOL Dachong, or big bug, created by Bo Liu, avoids obstacles, senses the ambient light intensity and moves to the brightest spot in the room. It will also level itself on a tilted surface. Its three pairs of legs are connected to and driven with two actuators. Jonathon Jeske, a first-year mechanical engineering and robotics graduate student, created Coin Frog (top right).

ROBOT INVASION

Students from the Machine Intelligence Laboratory showed off their creative sides while strutting their engineering prowess during this year's robot demo day.

BY ANDREA ASUAJE

Coin Frog, the coin-collecting robot that works underwater and collects treasure at the bottom of money-infested fountains, along with 21 other student-produced robots, was presented to the media and guests at the annual robot demonstration this spring.

Eric Schwartz, associate director of the UF Machine Intelligence Laboratory and a master lecturer in the Department of Electrical & Computer Engineering, said he started the demonstration day in order for people to see all the hard work his students had done throughout the semester.

The class, called "Intelligent Machines Design Laboratory," is made up of half graduate students and half undergraduates. It includes mechanical, electrical and computer engineers, Schwartz said.

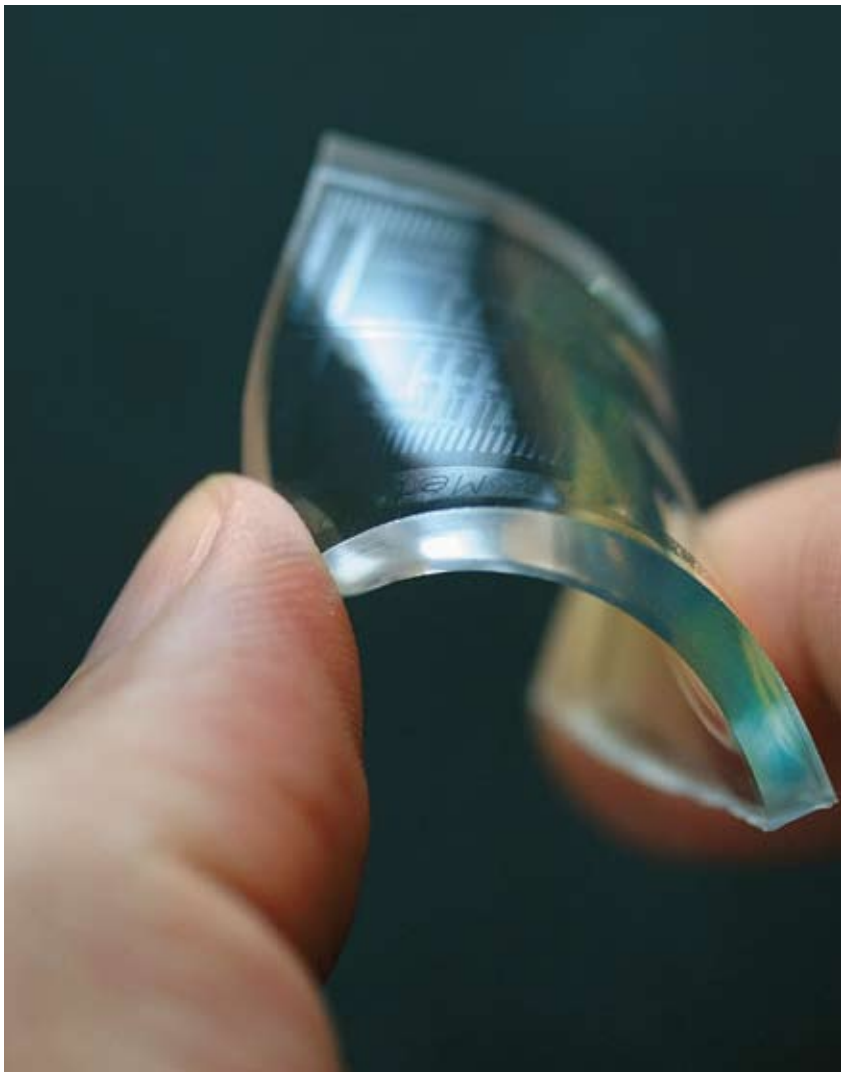
He said a class like this allows students to apply the theory they've learned in other classes in a hands-on, practical way, and allows students to see the results of their education.

"This is real engineering," he said. "This is real stuff."

He also said creating a robot takes a lot of dedication to not only building the machine but also researching and finding the least expensive parts to build the robot, which could appeal to future employers.

"This is a class that gets people jobs," he said. "[Employers] are going to ask you about your robot."

He said some of the most impressive robots this year included John Kurien's Tim TeBOT, a robot that could play paper football; Timothy Martin's Woody, which uses a Nintendo Wii remote to detect fire and then extinguishes it while playing music; and the Gator Aider Parking Attendant, created by Jared Bevis. □



CHIP FUTURE UF engineer Jing Guo and former Ph.D. student Youngki Yoon, now at U.C. Berkeley, were part of a research group working to create basic semiconductors from graphene.

IN THE NEWS | 05.09

GRAPHENE SHOWS PROMISE AS POSSIBLE NEW COMPUTER CHIP

New research findings could lead to faster, smaller and more versatile computer chips. BY AARON HOOVER

First isolated in 2004, graphene — a 1-atom-thick material — has spurred great excitement in the chip research community because of its promising electrical properties and bare-minimum atomic size.

Scientists and engineers believe after decades of development, silicon is fast reaching the upper limits of its physical performance. If the rapid evolution of ever-shrinking, ever-more-powerful, ever-cheaper semiconductors is to continue, they say, new materials must be found to complement or even replace silicon. Graphene is among the leading candidates for these nanoelectronics of the future.

A team of scientists and engineers from Stanford, the University of Florida and Lawrence Livermore National Laboratory is the first to create one of two basic types of semiconductors using graphene, the exotic new material. The findings could help open the door to computer chips that are not only smaller and hold more memory — but are also more adept at uploading large files, downloading movies, and other data- and communication-intensive tasks.

A paper about the findings, co-authored by eight researchers, was published this May in the journal Science.

"There are still enormous challenges to really put it into products, but I think this really could play an important role," said Jing Guo, a UF assistant professor of electrical and computer engineering and one of two UF authors who contributed.

The team made, modeled and tested what is known in the industry as an "n-type" transistor out of graphene nanoribbon. Graphene is a form of carbon that has been called "atomic chicken wire," thanks to its honeycomb-like structure of interconnected hexagons. A graphene nanoribbon is a nanometer-wide strip cut from a graphene layer.

The team's feat is significant because basic transistors come in only two forms — "p-type" and n-type — referring to the presence of holes and electrons, respectively. P-type graphene semiconductors had already been achieved, so the manufacture of an n-type graphene semiconductor completes the fundamental building blocks.

"This work is essentially finding a new way to modify a graphene nanoribbon to make it able to conduct electrons," Guo said. "This addresses a very fundamental requirement for graphene to be useful in the production of electronics."

Researchers at a number of institutions have reported using graphene to create a variety of simple transistor devices recently, with the Massachusetts Institute of Technology reporting in March the successful test of a graphene chip that can multiply electrical signals.

Guo said the team built and modeled the first-ever graphene nanoribbon n-type "field-effect transistor" using a new and novel method that involves affixing nitrogen atoms to the edge of the nanoribbon. The method also has the potential to make the edges of the nanometer-wide ribbon smoother, which is a key factor to make the transistor faster.

"This uses chemistry to really address the major challenges of electrical engineering when you get into such these small nanoscale dimensionalities," he said. "It is very unusual for electrical engineers, who are used to dealing with bulk structures of at least millions of atoms." □

Want more GATOR ENGINEERING news? We thought so, go to: thefloridaengineer.eng.ufl.edu

PREVIOUS SPREAD: ANDREW STANFILL; THIS PAGE: JI HYE HONG

THE SAVVY ENGINEER

Building a Career in Academia

BY MEGAN E. GALES

The most independent animal on earth is the tenured professor. There's no time card to punch, no priorities imposed and the freedom to explore. Even if the post-college career path led far away from noble gothic walls and lovely vine-clad halls, with a little strategic planning in three primary areas the Savvy Engineer can make the jump back into academia.

RESEARCH: Will you add to the knowledge base?

At research institutions, research will determine your success or failure. You'll do a lot of research through your students. They'll need help. They'll break stuff. But they'll learn, and that can be extremely rewarding. Entrepreneurial talent will serve you well, because leading a research group is a lot like running a small business. You'll fund most of your expenses — equipment, supplies, Ph.D. students, and even your summer paychecks — from grants.

"Fundamental research is no longer done in companies. If you want to do true research, it has to be done at a university."
– **SCOTT THOMPSON**
Professor of Electrical & Computer Engineering who came to UF after 12 years at Intel.

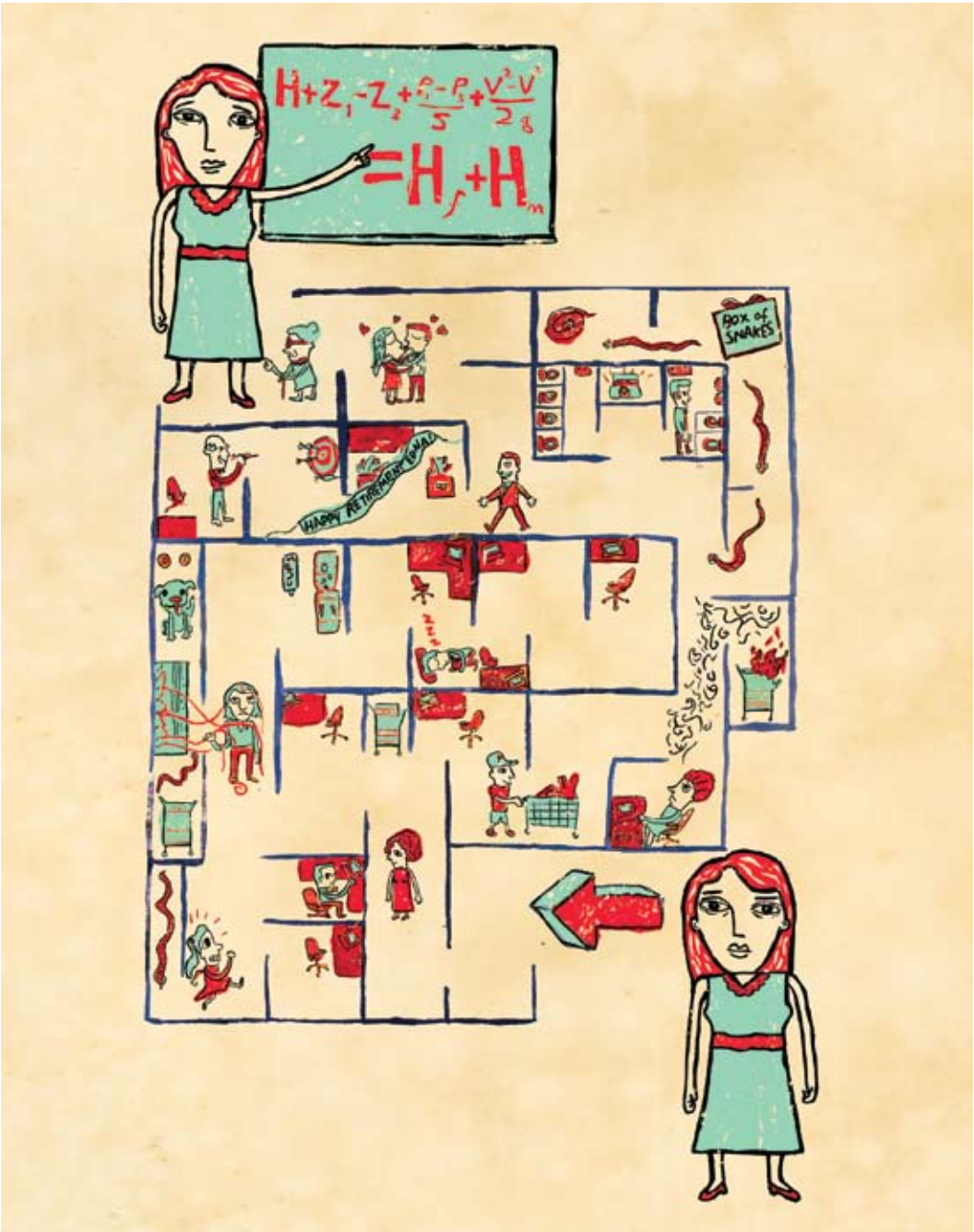


ILLUSTRATION BY JOHN DUNNE

DON'T WAIT. Build a strong publication record now. You won't land the job without one. Get to know funding agents, too. Network through technical conferences.

TEACHING: Do you like students?

Students bring college campuses to life. At a major research university, like UF, you'll teach one or two classes each semester and mentor Ph.D. students. At a small teaching college, you'll teach a diverse array of about four classes each semester.

"If I explain something to the students and they don't understand, it's my fault. I haven't explained it well enough. So I continuously evaluate my delivery. I try to get them excited about the topic. The more students ask questions, the happier I am."
– **DAVE BLOOMQUIST**
Byron D. Spangler Professor of Civil & Coastal Engineering and Director of the University Center for Excellence in Teaching

PRACTICE NOW. Volunteer to mentor interns who spend the summer with your company. Serve as an adjunct instructor or mentor at a university. Offer to give a seminar at a local college — or even your alma mater.

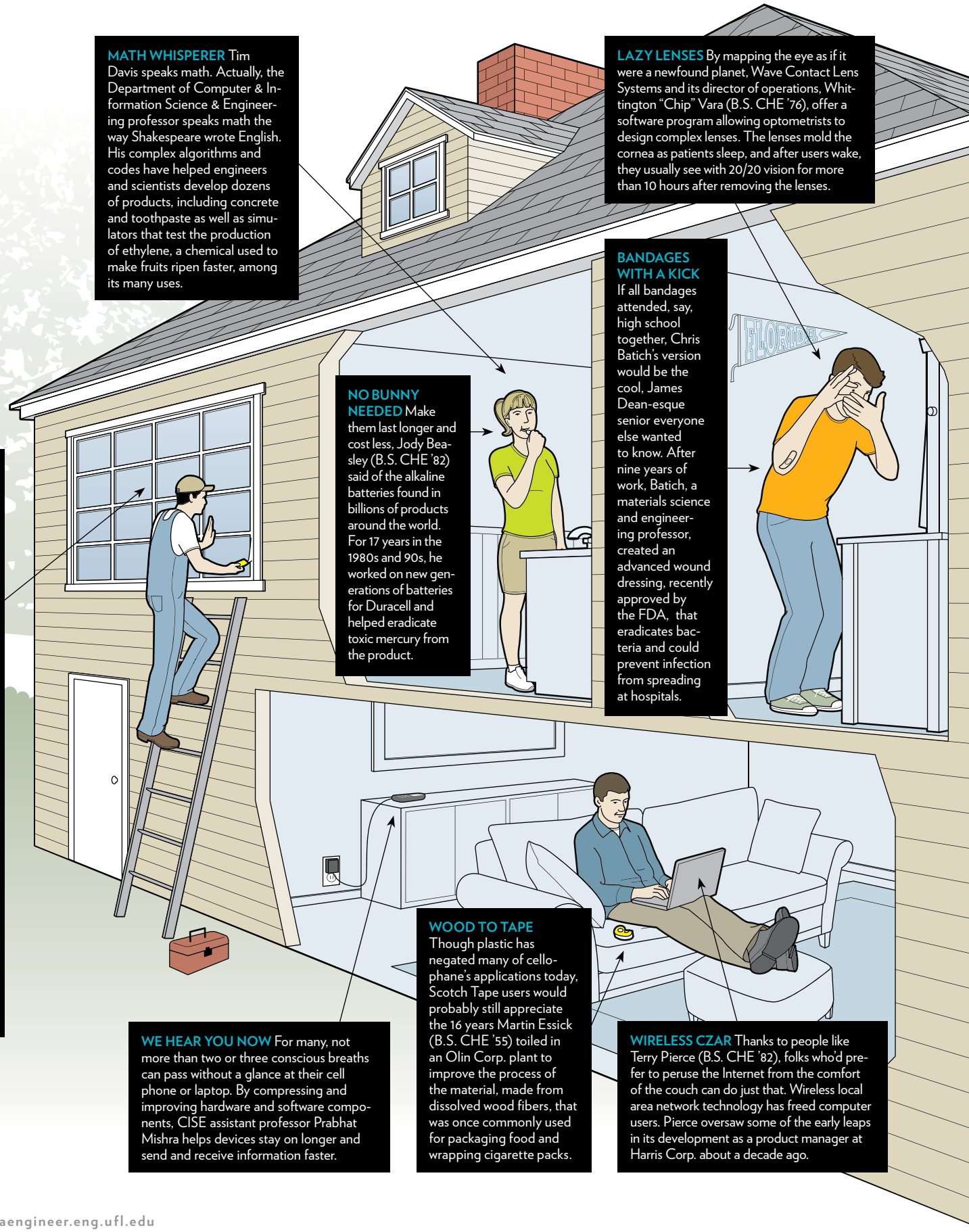
SERVICE: Are you willing to help your colleagues?

It takes more time to run academia than many people realize. You'll be expected to serve on various committees, mentor junior colleagues, and generally share in the governance of your institution. There's also an obligation to maintain and nurture your discipline. External service will help you build a reputation within your field, which you'll need when it comes time for tenure.

"It's critical to keep your eye on future directions. Make sure that you identify and seize new opportunities."
– **PAUL HOLLOWAY**
Distinguished Professor of Materials Science & Engineering and 2008-2009 UF Teacher/Scholar of the Year

START TODAY. Involve yourself in professional societies. When you apply for a job, you'll already have a record of service to reference. □

Want an ACADEMIC CAREER but don't have a Ph.D.? Learn more here: thefloridaengineer.eng.ufl.edu



MATH WHISPERER Tim Davis speaks math. Actually, the Department of Computer & Information Science & Engineering professor speaks math the way Shakespeare wrote English. His complex algorithms and codes have helped engineers and scientists develop dozens of products, including concrete and toothpaste as well as simulators that test the production of ethylene, a chemical used to make fruits ripen faster, among its many uses.

LAZY LENSES By mapping the eye as if it were a newfound planet, Wave Contact Lens Systems and its director of operations, Whittington "Chip" Vara (B.S. CHE '76), offer a software program allowing optometrists to design complex lenses. The lenses mold the cornea as patients sleep, and after users wake, they usually see with 20/20 vision for more than 10 hours after removing the lenses.

BANDAGES WITH A KICK If all bandages attended, say, high school together, Chris Batich's version would be the cool, James Dean-esque senior everyone else wanted to know. After nine years of work, Batich, a materials science and engineering professor, created an advanced wound dressing, recently approved by the FDA, that eradicates bacteria and could prevent infection from spreading at hospitals.

NO BUNNY NEEDED Make them last longer and cost less, Jody Beasley (B.S. CHE '82) said of the alkaline batteries found in billions of products around the world. For 17 years in the 1980s and 90s, he worked on new generations of batteries for Duracell and helped eradicate toxic mercury from the product.

CAULK THIS! Buy a 10-ounce tube of caulk and a caulk gun. Seal the half-inch crack in the wall, and then wander through the rest of the house searching for another fault to fix. Three months later, toss the dried tube of caulk in a trash can. Thanks to an innovation created by a group of Integrated Product & Process Design program engineering students, squander thy caulk no more. General Electric now offers a version of their conception – Caulk Singles, 1.25-ounce single-use bags that employ the tag line, "Tear. Squeeze. Toss."

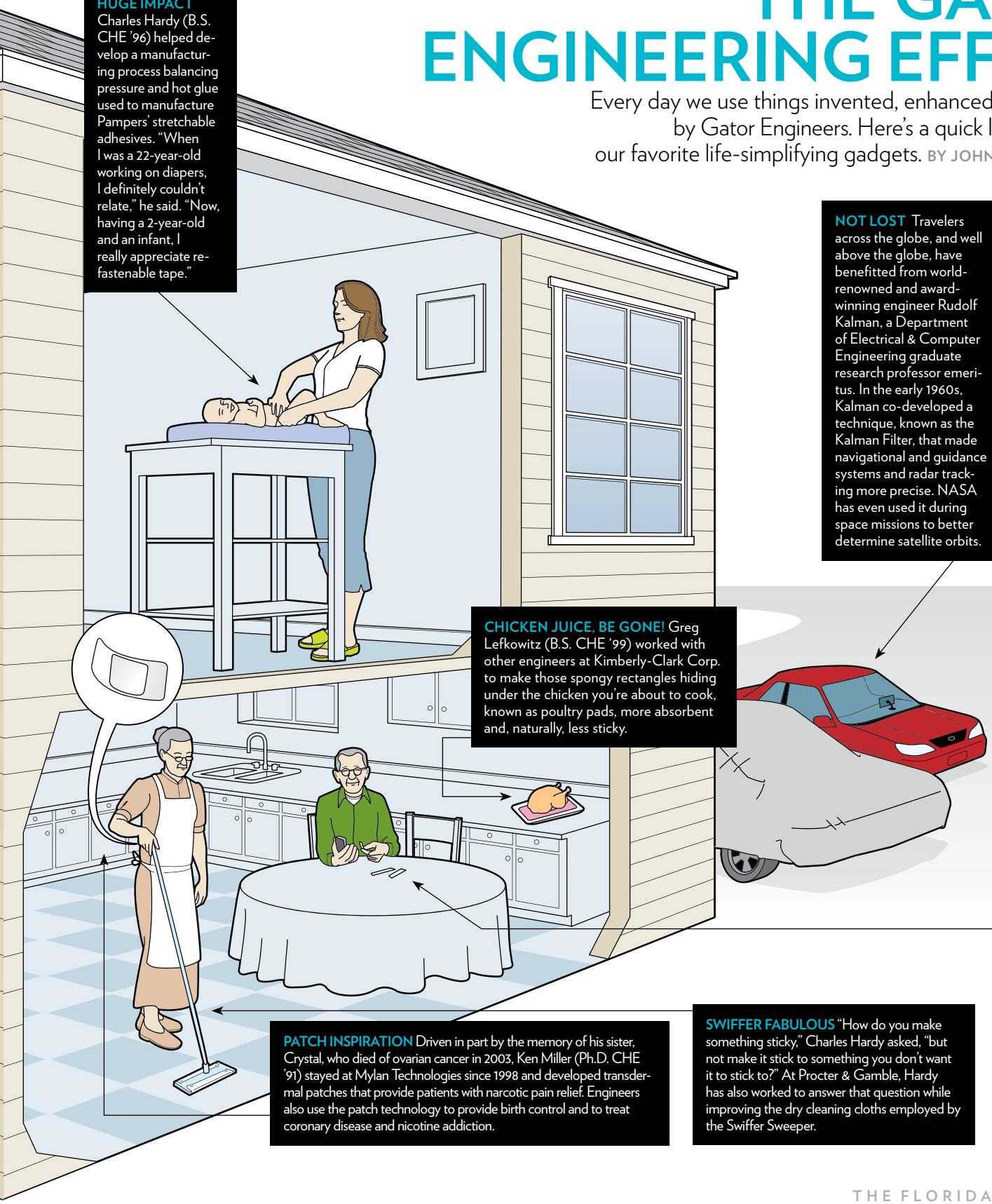
WE HEAR YOU NOW For many, not more than two or three conscious breaths can pass without a glance at their cell phone or laptop. By compressing and improving hardware and software components, CISE assistant professor Prabhat Mishra helps devices stay on longer and send and receive information faster.

WOOD TO TAPE Though plastic has negated many of cellophane's applications today, Scotch Tape users would probably still appreciate the 16 years Martin Essick (B.S. CHE '55) toiled in an Olin Corp. plant to improve the process of the material, made from dissolved wood fibers, that was once commonly used for packaging food and wrapping cigarette packs.

WIRELESS CZAR Thanks to people like Terry Pierce (B.S. CHE '82), folks who'd prefer to peruse the Internet from the comfort of the couch can do just that. Wireless local area network technology has freed computer users. Pierce oversaw some of the early leaps in its development as a product manager at Harris Corp. about a decade ago.

THE GATOR ENGINEERING EFFECT

Every day we use things invented, enhanced and produced by Gator Engineers. Here's a quick look at a few of our favorite life-simplifying gadgets. BY JOHN WOODROW COX



LITTLE THING, HUGE IMPACT Charles Hardy (B.S. CHE '96) helped develop a manufacturing process balancing pressure and hot glue used to manufacture Pampers' stretchable adhesives. "When I was a 22-year-old working on diapers, I definitely couldn't relate," he said. "Now, having a 2-year-old and an infant, I really appreciate re-fastenable tape."

NOT LOST Travelers across the globe, and well above the globe, have benefitted from world-renowned and award-winning engineer Rudolf Kalman, a Department of Electrical & Computer Engineering graduate research professor emeritus. In the early 1960s, Kalman co-developed a technique, known as the Kalman Filter, that made navigational and guidance systems and radar tracking more precise. NASA has even used it during space missions to better determine satellite orbits.

CHICKEN JUICE, BE GONE! Greg Lefkowitz (B.S. CHE '99) worked with other engineers at Kimberly-Clark Corp. to make those spongy rectangles hiding under the chicken you're about to cook, known as poultry pads, more absorbent and, naturally, less sticky.

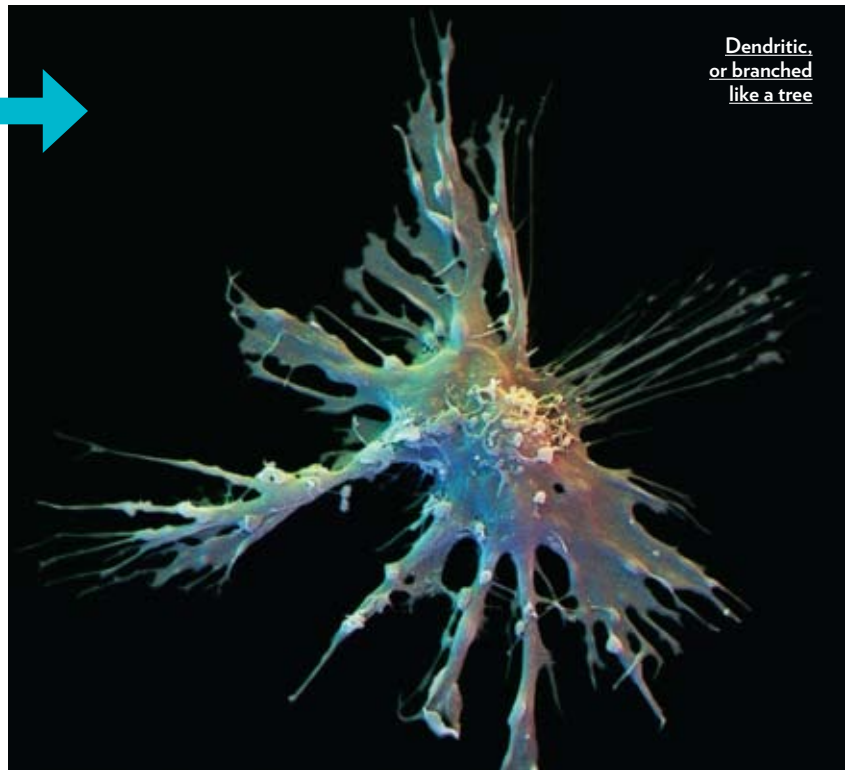
PAINLESS POKING Keith Harvey (B.S. CHE '03) has labored at Ft. Lauderdale-based Home Diagnostics since 2005 to make blood glucose test strips and meters more accurate and less painful.

PATCH INSPIRATION Driven in part by the memory of his sister, Crystal, who died of ovarian cancer in 2003, Ken Miller (Ph.D. CHE '91) stayed at Mylan Technologies since 1998 and developed transdermal patches that provide patients with narcotic pain relief. Engineers also use the patch technology to provide birth control and to treat coronary disease and nicotine addiction.

SWIFFER FABULOUS "How do you make something sticky," Charles Hardy asked, "but not make it stick to something you don't want it to stick to?" At Procter & Gamble, Hardy has also worked to answer that question while improving the dry cleaning cloths employed by the Swiffer Sweeper.

IT'S COMPLICATED

The research featured here, besides being complicated, is produced by the most recent additions to the Gator Engineering faculty — all hired in the last eight years. And the research runs the gamut from cancer treatment to tracking ingested medication to curbing traffic congestion. BY DEBORAH SWERDLOW



Dendritic, or branched like a tree

Vaccines with a Kick

Biomedical engineer Ben Keselowsky is collaborating with UF's pathology and urology departments to develop vaccines for Type 1 diabetes and prostate cancer.

He is working on a high-throughput approach to create, test and optimize vaccine combinations that include biomaterial particles. "These diseases have disrupted immune responses, so you basically want to design a vaccine that will tune to the body's immune responses," he said.

Keselowsky is working on designing the best biomaterials for these vaccines. The biomaterials are targeted at dendritic cells. These are ideal targets because they process foreign invaders and other materials in the body and present them to the other immune cells as a way of telling those cells what materials to look out for and respond to.

"They're the key orchestrator of immune response, balancing immune response to foreign invaders and promoting tolerance to self-antigens," Keselowsky said.

The prostate cancer vaccine's goal is to cause the dendritic cells to stimulate immunogenic responses, causing the other immune cells to attack and destroy tumor cells. The goal for the diabetes vaccine is to stimulate a tolerogenic response, which will cause the immune cells to stop attacking insulin-producing pancreatic cells. Both vaccines are biomaterial particle-based, so they can provide a biodegradable, time-released depot of antigen and immuno-modulatory molecules. These particles can also incorporate dendritic cell-targeting molecules as well as chemoattractants and differentiation factors.

Keselowsky said his team developed a novel microarray platform consisting of arrayed islands of dendritic cells co-localized with adsorbed particles.

"This allows us to probe dendritic cell responses to a thousand different vaccine-particle formulations simultaneously on a single chip, enabling the discovery of unforeseen interactions between vaccine components," he said.

Radiation Detection

Glenn Sjoden's research on detecting special nuclear materials enables him to analyze and optimize neutron and gamma ray transport for detection, nuclear power or forensics in almost any scenario. Most of his research deals with three-dimensional transport theory, which uses parallel codes and high-performance parallel computers to estimate the levels of radiation and its effects as it transports and scatters in a system.

"Knowing where the radiation goes is priceless," said Sjoden, UF associate professor of nuclear engineering.

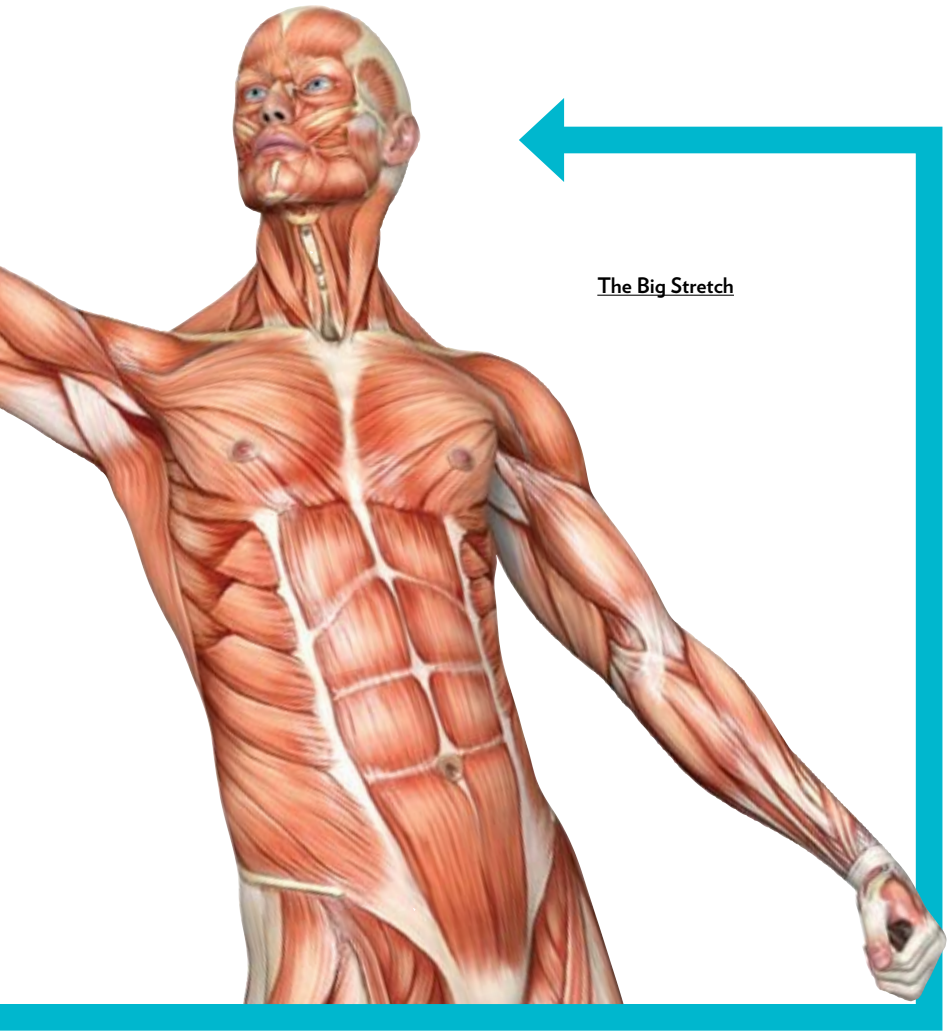
With co-author and nuclear engineering chair Alireza Haghighat, he has written some of the codes used in transport theory applications, including one code called PENTRAN recently shown to solve a system of 5 billion unknowns on thousands of processors.

"Right now, it's the only code in the world tested to that level," he said.

Sjoden and the UF Transport Theory Group worked with IBM and Tanguy Courau, a visiting scientist from Electricite' de France the past year to analyze a whole reactor core with PENTRAN.

Sjoden said he and his graduate assistants at the time — Kevin Manalo, Tom Plower and Mireille Rowe — adapted PENTRAN to analyze fuel burn-up in a nuclear reactor with a post processing code called PENBURN. They used PENTRAN with PENBURN because the code solves unknowns in angle, energy and space over a three-dimensional mesh.

PREVIOUS SPREAD: ILLUSTRATION BY CHRIS PHILPOT; THIS PAGE: © DAVID SCHARF/SCIENCE FACTION/CORBIS



The Big Stretch

Robots, Satellites, Muscles, Oh My!

Warren Dixon could help stroke patients gain more precise control of their muscles and motion during rehabilitation while experiencing less fatigue. He's also using the same technology to improve satellite and robot function.

Dixon, an associate professor of mechanical and aerospace engineering, is developing new mathematical formulas to predict the behavior of nonlinear systems, which can lead to better control. Since nonlinear systems include anything from robots to satellites to the human body, Dixon's research has numerous applications, all falling under the same mathematical umbrella. "We have this philosophy that the more information you have about the way a system is going to behave, the more sense you have to be able to do what you want to do," he said.

The common theme all of these applications is Lyapunov theory, which is based on "if a function is lower bounded and always decreasing, then the function will remain bounded and converge to the lower limit," Dixon explained. He said his research group is building on Lyapunov methods to construct new control designs and stability analyses.

One of Dixon's most intriguing projects deals with muscle stimulation and could help stroke patients in rehabilitation.

Muscle activity is one of the most nonlinear and uncertain systems because it varies depending on the person and the circumstance, Dixon said. Nonetheless, his group tries to develop a Lyapunov-based mathematical formula that takes into account factors such as muscle fatigue, muscle fiber type and pH levels and tries to predict the best level of stimulation required to move the muscle a certain amount.

ISTOCKPHOTO (ALL PHOTOS)

Making it Flow

Using a vehicle that records data such as how a driver changes lanes and how much distance a person keeps between him and other cars, allows researchers to categorize drivers as aggressive or conservative, explained civil and coastal engineering professor Lily Elefteriadou.

The researchers then incorporate driver behavior into the algorithms at the core of traffic simulation software. So if a city knows which types of drivers are most common in its population, then it can create a more realistic simulation to figure out the optimal highway design.

"The presence of very aggressive or very conservative drivers has an impact," said Elefteriadou, director of the Center for Multimodal Solutions for Congestion Mitigation. For example, cities might want to adjust the number of lanes on a highway because aggressive drivers tend to quickly move over to the left lane after entering the freeway, thus causing all of the surrounding cars to accelerate, she said.

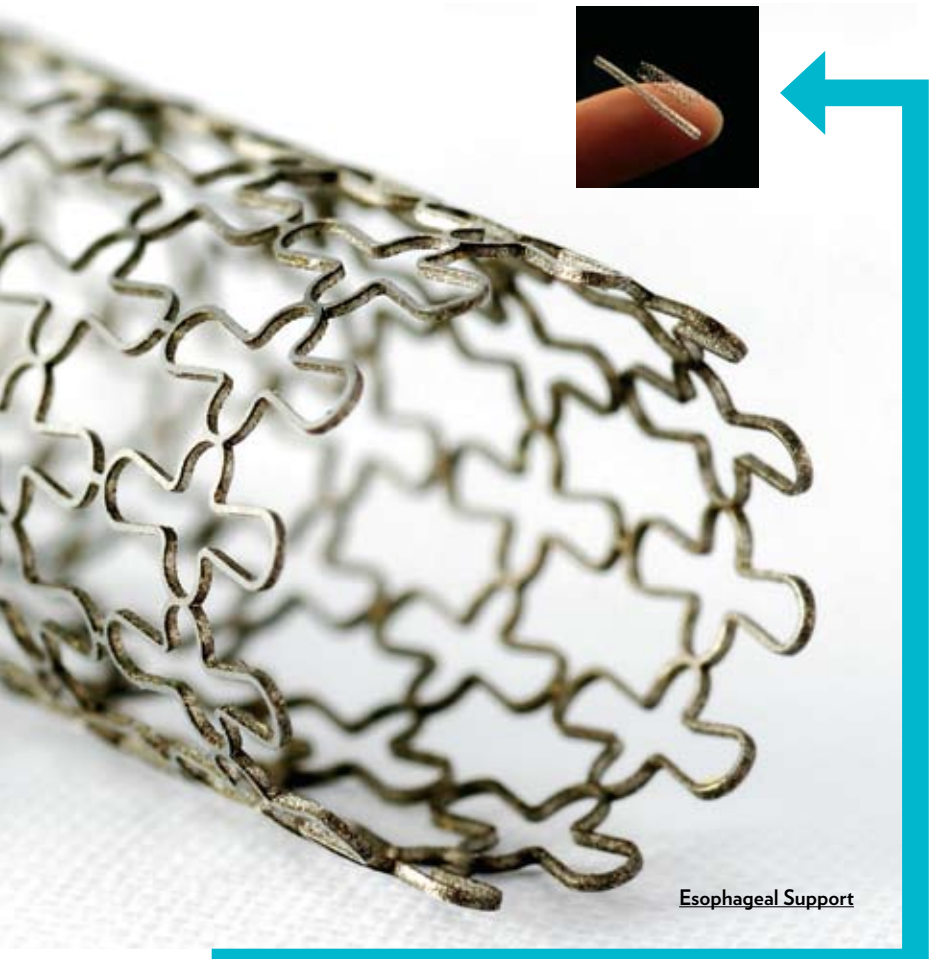
The CMS was established in May 2007 and is federally funded. It is one of only a handful of such centers in the U.S. and is affiliated with the Transportation Research Center, which has been at UF since 1972. Elefteriadou is also the director of the TRC.

The traffic simulation software developed at the CMS is distributed through McTrans, another affiliate of the TRC.

Elefteriadou said that although several universities develop and use their own simulation software,

UF's software is the most widely distributed for commercial purposes.

Zoom, zoom



Esophageal Support

Disrupting Cancer

After a tumor is removed from a cancer patient's esophagus, the patient would likely receive a stent to keep the now-weakened esophagus walls from collapsing. But a common problem with an esophagus stent is cancer cells adhere to the stent surface and then multiply on it, causing more blockages, said chemical engineer Tanmay Lele.

This process requires the generation of intracellular mechanical forces that are exerted on the stent surface. To keep the cells from adhering to the stents, Lele tries to stop the cells from exerting those forces in the first place by creating nanostructures that disrupt the molecular-level processes happening on the cell's surface.

The nanostructures specifically disrupt the clustering of transmembrane receptors called integrins, which recognize and bind to adsorbed proteins on the stents. The integrins need to cluster to transmit force from the intracellular actomyosin cytoskeleton to the stent surface.

Lele hopes to disrupt tumor-cell attachment to the stent surface by spacing out the nanostructures to prevent integrin clustering. Initial experiments show strong potential for this approach, he said.

The American Heart Association has funded a great deal of Lele's research because altered mechanical forces are also responsible for artery blockages, so understanding how cells respond to mechanical forces is key to understanding heart disease, he said.

Size Does Matter

An integrated circuits design group is developing low-power microsystems to sense and process brain signals using various steps of algorithms. The microsystems then wirelessly transmit those processed signals to an external device that controls movement, explained electrical and computer engineering assistant professor Rizwan Bashirullah.

Since these microsystems would be implantable electronic devices, they must be small and low-power but highly functional; they have to be able to sense the low-noise and highly parallel brain signals while using a minimum amount of power so the device does not overheat, said Bashirullah, an assistant professor of electrical and computer engineering.

As a self-described "hardware guy," Bashirullah said he focuses on developing algorithms that can work within these constraints.

"Not every algorithm is hardware- or energy-efficient, so one of the things that we're trying to do is basically create algorithms that are very hardware-efficient in terms of the amount of space [and] the amount of computational energy required," he said.

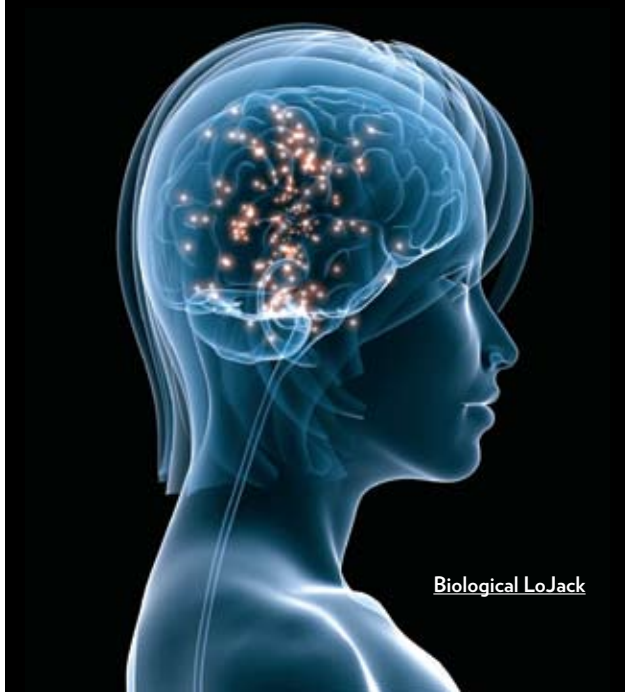
He's also working on a separate low-power microsystem that could save the pharmaceutical industry billions of dollars each year, which could translate into lower health care and drug costs.

Bashirullah is developing a biocompatible electronic microchip that can be placed on a pill capsule and monitored from outside the body to track the pill's trajectory.

"It's an electronic tag or time stamp associated with the patient ingesting the pill," he said.

As of now, it's difficult to track whether patients in a clinical trial are actually taking the prescribed drug, which makes it hard to infer the accuracy of the results, he said.

Like the microsystems that process brain signals, this device is small, wireless and low-power, he said.



Biological LoJack

ISTOCKPHOTO (ALL PHOTOS)

BY THE NUMBERS
The Biomedical Sciences Building is 160,000 square feet and seven floors of geeky technology, including 40 security cameras and 60 access-controlled doors.

IN THE NEWS | 05.09

BUILDING CONNECTIONS

An idea that began more than five years ago to construct a building to encourage interdisciplinary research between engineering and medicine will open its doors late this summer. BY STEVE MILLER

It's not a coffee shop or a lounge, although the tables, chairs, multi-level layout and floor-to-ceiling windows may imply such.

Instead, it's the atrium of the UF Biomedical Sciences Building, which will open for business in August.

The idea of the airy setting is to encourage socializing, which can sometimes be an awkward gesture in the intense world of biotech, medicine and engineering, all of which will be holding hands in the new building.

The multidisciplinary function of the $85 million, seven-floor structure hopes to create an interactive intersection for ideas from students, scientists and teachers.

The 3,400-square-foot atrium, with wood paneling and metal detailing befitting a modern loft, is a mingling incentive hatched in part by Ann Bussel, a member of the UF advisory board for biomedical engineering.

The idea of a gaggle of biology, medical and engineering folks all chatting about projects in leisure "is even better with this welcoming feeling," Bussel said. She liked the idea enough that the Shepard Broad Foundation, her family's benefactor organization where she is a trustee, granted $850,000 to enlarge the atrium from an originally-planned 1,000 square feet.

"It was the atrium that attracted [the foundation]," Bussel said. "We are interested in that warmth that it will have, and it will encourage that merger, that collaboration between the disciplines. Which is often where great ideas come from."

The atrium, which is slated to be named the Broad-Bussel Atrium, is part of an overall building design aimed at collaboration.

"The best of science comes from interacting, so we created interactive spaces throughout the building," said Jennifer Melton, project manager with Orlando-based HuntonBrady Architects.

> "The best of science comes from interacting, so we created interactive spaces throughout the building."

"Having a clear connection to the other buildings — as well as also having a common sun terrace in the middle — creates more opportunities to run into people," Melton said.

Among the departments represented in the building will be the J. Crayton Pruitt Family Department of Biomedical Engineering founded in 2002 under the direction of Dean Pramod Khargonekar. □

RENDERINGS COURTESY OF UF FACILITIES PLANNING & CONSTRUCTION

OFF THE WALL

Rarely do concrete slabs, fiberglass beams and hyper-active air-filtration systems become necessary research tools, yet these are integral to the success UF's Nanoscale Research Facility. BY KIM WILMATH

WELCOME TO THE NANO UNIVERSE

It's tough to see what goes on behind the wide-windows of UF's Nanoscience Institute for Medical and Engineering Technology. It's not that the scientists who work there are secretive about their work. Heck, they'll even let you zip on a protective suit and wander around the facility's clean room. It's just the stuff they tinker with is smaller than the diameter of a human hair, smaller than single cells or bacteria.

The facility was built about a year ago with $35 million in state funding, said center director Bill Appleton. Reasearchers and students in the Colleges of Engineering, Medicine and Liberal Arts and Sciences get access to the complex tools needed for nano-scale research, in addition to other universities, industries and national labs being welcome to use the facilty.

ENTRYWAY MOSAIC

Walk through the front doors of the NRF building and look down. In the middle of an expansive blue-and-green mosaic is a tiny piece of gold, about the size of a dime. Artist Robert Stout created the work to illustrate the relative size of a nanometer, which is a billion times smaller than a meter stick. Appleton explained if a nanometer was blown up to the size of a dime, a meter stick would be the size of the earth's diameter in comparison.

THE CLEAN ROOM

When it comes to working with nanometer-sized objects, even the smallest particles can cause a big disruption. NIMET's state-of-the-art clean room helps cut down on such interference. Anyone who enters must wear a hairnet, shoe booties, a thick white suit, a hood, another pair of boots and rubber gloves. The actual laboratories are separated from the rest of the building by two chambers and a long hallway. The air inside is completely filtered five times every minute to remove particles, and all equipment is cleaned at least twice before it's placed inside. Scientists can't even bring in regular paper. "It's like an operating room in a sense," Appleton said.

ADVANCED IMAGING SUITES

The building's design also cuts down on the shock from the earth's natural movement and changes in its electromagnetic field. Fluctuations, caused by things like busses driving by or metal elevators, could make it impossible to accurately look at nanometer-sized objects with atomic-resolution microscopes. A thick, extraordinarily wide concrete slab was built underneath the first floor's imaging suites, separate from the rest of the building's foundations and big enough to temper outside vibrations. To avoid electro-magnetic interference metal is not used in the room's construction, and even the slab's interior supports are made of fiberglass. In addition, the lab closest to an elevator is shielded with metal to divert away any additional magnetic interference.

MULTI-ION-BEAM LITHOGRAPHY SYSTEM

NIMET research involves using ion beams to pattern nanoscale devices, like airbag sensors, semiconductor circuits, or cell phone components. The UF lab is the first in the U.S. to have this particular ion-beam lithography tool. Most labs use electron-beams, which are effective, but not as efficient. The ion technology can create intricate circuit components onto silicon by exposing resists or sputtering patterns directly into the sample and can be more versatile than electron beams, Appleton said.

CENTER FOR NANO-BIO SENSORS

Upstairs interactive workstations and labs house the Center for Nano-Bio Sensors where scientists from UF's medical and engineering colleges are developing breath-sensors to detect human diseases or drugs. Similar to an alcohol breathalyzer, a hand-held sensor with nanoscale materials and components detect proteins or molecules in human breath that point to various conditions, such as low blood-sugar, internal trauma or anthrax-poisoning. At least 15 different industries are involved in the project, Appleton said. The Center is a $4 million Center of Excellence funded by the State of Florida.

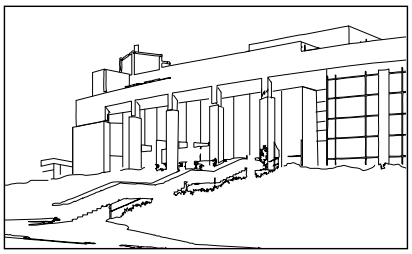
ALL PHOTOS: JEREMIAH STANLEY

CHEMICAL SENSORS FOR BIOLOGICAL SCREENING

With use of the NIMET facilities, chemical engineering distinguished professor Fan Ren helped create an extra-sensitive, more accurate chemical sensor. It's used for things like early detection of cancer and diabetes patients' glucose monitoring. The sensor has a highly specialized electron transistor on its surface, yielding faster, more reliable medical test results. For instance, instead of women undergoing mammograms and waiting weeks for results, a simple saliva test on one of Ren's sensors could provide results almost instantly. The device can also be used to detect kidney failure, prostate cancer, pH levels in the blood and toxins in the body with saliva or breath tests. Ren said a few companies have approached UF with an interest in marketing the technology.

FLOOR PLAN

NANOSCALE RESEARCH FACILITY



FRONT VIEW

photograph by **HUGH KRETSCHMER**

REALITY BYTES

Tweeting, Googling, texting and Facebooking have redefined not only our vernacular, but also our concept of socialization. With women over 50 as Facebook's fastest-growing group of users, and kids getting their first cell phones at an average of 8 years old, is technology taking a bite out of our reality?

by **WILLIAM McKEEN**

IT'S TOO LATE TO STOP NOW.

Six centuries ago — a mere eyebrow twitch in the grand scheme of history — information existed in hand-copied books owned only by the wealthy and the clergy. Today, a buffet of information is a couple clicks away from a 6-year-old with his mother's laptop.

It's all happened so fast, in that figurative twitch. A century ago, people still had to go to libraries or bookstores to find out stuff. Today's students have advantages even their parents didn't have 20 years ago. Unlike mom and pop, these kids can copy-and-paste from a Web site and commit plagiarism without cracking a book. And they don't need to go to Barnes & Noble to actually buy a book. They're set up for one-click shopping on Amazon.

Nobody (least of all an engineer) wants to turn back this Tsunami of advancing information. With its focus on improving the world and making life better, engineering has made this truly incredible information technology possible.

But that doesn't mean there's anything wrong with raising a hand, asking a few questions, and suggesting maybe we should pause and consider what's going on.

The hand belongs to Pramod Khargonekar, outgoing dean of the University of Florida College of Engineering. As he contemplates life post-deanship, he'll be returning to the classroom. He sees himself standing in front of 18- and 19-year-olds, helping them deal with the growing information overload this generation faces. It's a problem their parents and grandparents didn't have.

"IS TECHNOLOGY REALLY MAKING US WISER PEOPLE AND TRULY PRODUCTIVE PEOPLE? THE WHOLE NOTION OF INFORMATION OVERLOAD AND CONNECTIVITY ARE SIGNIFICANT ISSUES." —PRAMOD KHARGONEKAR

"It's clear that of all the technological developments in the last half century, information technology has truly revolutionized the way we live," Khargonekar says. "And I don't use the word 'revolutionized' casually."

The information explosion changed the world on a scale equal to the transformations wrought by automobiles and air travel, he says, because all of them profoundly affected the way people live.

In 2006, Khargonekar taught a freshman course called Information Technology and Society, and that class might serve as the dress rehearsal for what he does in his post-dean years. Talking to young people about this technology he watched develop — which was as integral to the students' childhoods as SpongeBob SquarePants — was eye-opening.

"I wanted to tell students that technology doesn't live by itself," Khargonekar says. "Technology creates change and change creates new societal issues. I wanted us to look at the interplay between technological developments and societal developments. I wanted students to see technology and not view it as magical, as this thing that just happens."

But what is still new and magical for the professor is old stuff to the students. Information overload is a way of life to them. Today's college freshmen were born in the early 1990s and they can't remember a world without the Internet.

To this generation, technology is life. It has, among other things, redefined the basic human concept of friendship. With the online social-networking site Facebook, students can friend (note verb) people they don't really know, and they become Facebook Friends, something very different, with different responsibilities and obligations, from real friendship. A Facebook Friend, for example, doesn't have to help you move out of your apartment. A real friend doesn't get off the hook so easy.

Facebook, of course, is *so 2008*. The new social-network kid on the block is Twitter, which demands brevity (140 characters per post) and reduces life to a series of trivialized updates called "Tweets" by participants: "In line at the grocery and I forgot the pantyhose!" "I am so over this lecture." "Running late — no coffee for me." (If you have second thoughts and want to erase your post, the program asks, "Delete this Tweet?" — a sentence that would have meant nothing outside a birdcage mere months ago.)

Khargonekar does not have a Twitter account, though he muses about the possibility. Still, he sees it as a tool with great potential, both for transmitting information and also for the trivialization of human life.

LIKE, REALLY? OMG! With four out of five teens (17 million) carrying a wireless device, 47 percent of teens saying their social life would end without their cell phone and 57 percent believing their mobile devices have improved their lives, it really makes one want to stop and smell those roses.

STUART FRANKLIN/MAGNUM PHOTOS

The plethora of technological devices developed to save time also ends up consuming much of it and, as Ernest Hemingway said, "Time is the thing we have the least of."

Novelist and social critic Tom Wolfe is among those who arch eyebrows over the time and labor-saving devices granted us by technology. Such things as iPhones and Twitter "waste more time than anything else in American life," he says. "The computer and the Internet are the contemporary versions of knitting and badminton in the backyard, except that they have nothing to show for it afterward, the way knitting does, and lead to atrocious sedentary posture and sloth, unlike badminton."

Wolfe's social criticism has marked his journalism and his fiction, most notably in his satirical novel *The Bonfire of the Vanities*. As the man responsible for tagging those who achieved adulthood in the 1970s as "the Me Generation," Wolfe's antennae are alert to any new examples of silliness and narcissism. Tweeting one's most mundane activities is high goofiness indeed.

Khargonekar agrees with Wolfe. What's most important, he says, is how we use technology. It's easy to fall in love with each new device and development. "There is euphoria with any new technology," he says. "Of course, there are excesses that happen, but in time these things will take their place in the scheme of things."

But critics such as Wolfe worry "these things" that are supposed to make life better could make things worse. He uses Thomas Jefferson as an example. He had at least eight careers in addition to his job of creating American democracy. "Today," Wolfe laments, "two-thirds of his life would be consumed answering inane e-mails." If Jefferson had a Twitter account, we might all still be foreigners.

By all accounts, Jefferson answered every letter he ever received and, Wolfe points out, he used the "outmoded technology" of pen and ink. Wolfe's favorite writers — and here he ticks off Dickens, Balzac, Zola — also wrote in longhand. Wolfe himself logs onto a computer only at gunpoint and still writes in a flourishing script that looks remarkably like John Hancock's signature.

Again Khargonekar finds himself agreeing with Wolfe, especially in noting that technology gives us the freedom to trivialize our precious time on Earth.

"I hope thoughtful people will consider Wolfe's criticism and find ways of using technology in a responsible manner, instead of being less wise and less productive," he says.

Khargonekar recognizes that anyone who suggests a pause in the overwhelming advance of information technology risks being cast aside as a Luddite, even for the most warm-milk criticism. (In 19th century England, a group of artisans known in history as the Luddites protested the industrial revolution by destroying machines. Today, anyone who whispers any qualms about technology is immediately spat upon as a Luddite.)

Wolfe has built his half-century writing career on a foundation of infuriating the status quo and so he doesn't mind the occasional "Luddite" or "mossback" tossed his way. "The Luddites showed their ignorance by destroying the new machines," Wolfe says. "Modern man, in his wisdom, has only to increase his production and speed up his life by ignoring them."

As an engineer, not a social critic in a vanilla ice-cream suit, it's not Khargonekar's nature to ignore technology, but he does nod at the concerns voiced by Wolfe and others.

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"What Wolfe is saying is deeper than that," Khargonekar says. "Is technology really making us wiser people and truly productive people? The whole notion of information overload and connectivity are significant issues. Technologies are neither good nor evil. It depends on how we use them. Consider nuclear technology. We bombed Japan, but France is getting 80 percent of its energy from nuclear power. Automobiles come with a cost to the environment, but they made people free. It all depends on how we use it."

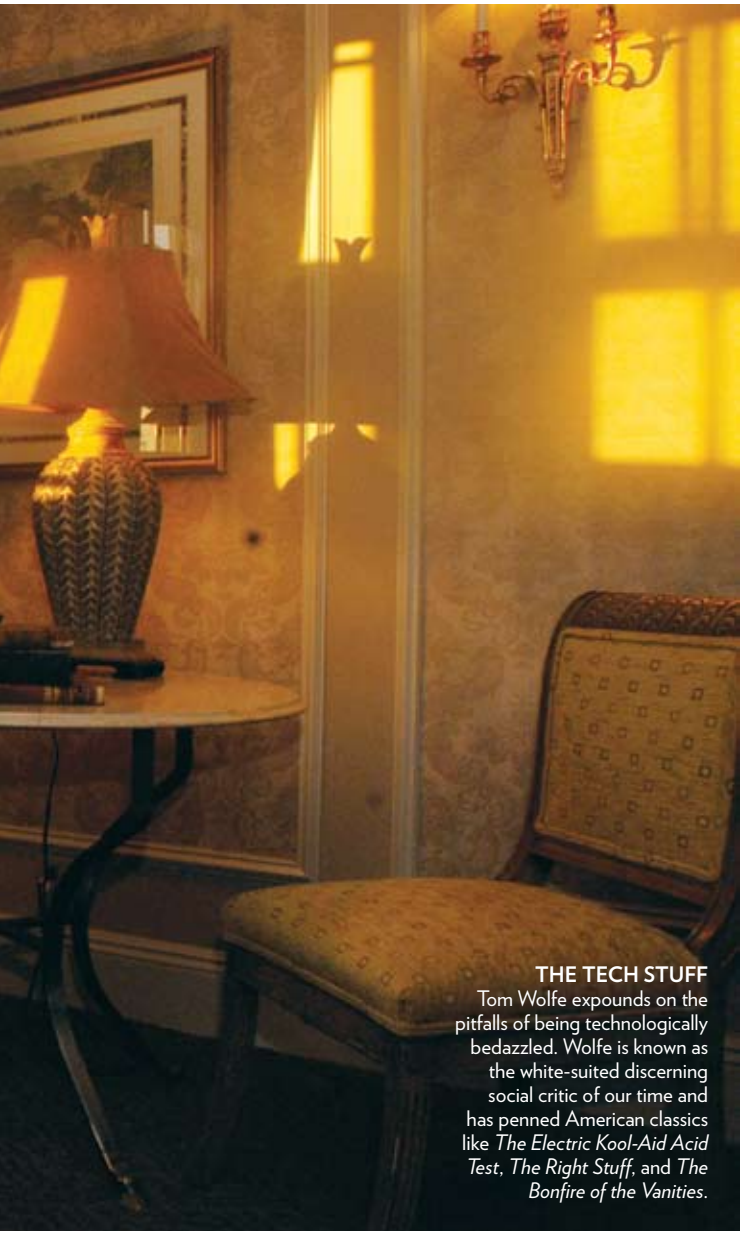
In a world in which a few keystrokes and a search engine can help us find exactly what we are looking for, we may miss finding the things we didn't know we were looking for. The serendipity of turning a newspaper page and falling into a fascinating abyss of information might be lost in the new world order.

As the newspaper goes the way of the dodo and the Edsel, readers construct facsimiles by plugging a list of interests into a search engine. They then get all the news they want of celebrity sightings and the victories of their favorite sports teams. Few people put "starvation," "injustice" and "bigotry" into their search engines, and so this technology that can bring us closer together can also end up distancing us from one another. It will be possible for someone to consider themselves well informed — after all, they "read a lot" — and go through life without ever encountering anything to upset or outrage them. One of the functions of journalism is to "comfort the afflicted and afflict the comforted." If the comforted choose to cocoon themselves only in comfort, will there ever be change or outrage or cries for social justice?

And this is one of the things that most worries Khargonekar about the next generation, which is suckling at the bosom of new and overwhelming information technology. Will the next generation become a society that bows before technology, allowing it to lead? Or will it take the lead?

Technology can be used to help construct productive and useful lives. Beyond that, there might be ways to unlock technology's potential to make us more human, to help us become more compassionate and social. Technology can help us embrace the flesh and blood rather than celebrate and perpetuate the synthetic humanity online.

"I do see an optimistic side of the coin," Khargonekar says. "When you enter a search term and get a thousand results, you will see things that you never expected. There is still the



THE TECH STUFF
Tom Wolfe expounds on the pitfalls of being technologically bedazzled. Wolfe is known as the white-suited discerning social critic of our time and has penned American classics like *The Electric Kool-Aid Acid Test*, *The Right Stuff*, and *The Bonfire of the Vanities*.

"THE COMPUTER AND THE INTERNET ARE THE CONTEMPORARY VERSIONS OF KNITTING AND BADMINTON IN THE BACK YARD, EXCEPT THAT THEY HAVE NOTHING TO SHOW FOR IT AFTERWARD, THE WAY KNITTING DOES, AND LEAD TO ATROCIOUS SEDENTARY POSTURE AND SLOTH, UNLIKE BADMINTON." —TOM WOLFE

possibility of serendipity there." The link structure of the Internet also allows readers — scientists and engineers, in particular — to find citations instantly, instead of trolling library stacks, looking for orphaned, dusty volumes.

But the pessimistic side of the coin has to do with trust. "The concern that I have is that young people have lost the ability to tell good information from bad," Khargonekar says. "I ask librarians, 'How are you going to teach students what's reliable and what's not?' The great thing about books is that what you are reading is most likely true. But in the age of the Internet, everybody's a publisher."

Indeed. The Internet has democratized the media to a large extent, allowing all sorts of geniuses-with-ideas to have a forum. Not since the days of the colonial press has there been such an even playing field. To stand up to media monopolies a decade ago was a futile mission on par with tilting at windmills. Today, a Web address and an idea are all you need to become a publisher.

But of course there is a downside. Even a moron can till 40 acres of cyberspace and fill readers' heads with lies and ignorance. Yet to many students, a blog carries the weight of a major news organization's Web site. "When the New York Times publishes something, I know that great thought has gone into that article before I saw it," he says. "A blogger can do and say whatever he wants and some students may believe him."

Time, that thing we have the least of, will help us sort it all out. "There is real balance over time between the wisdom of crowds and wisdom that arises from long, deep expertise," Khargonekar says. "Eventually I anticipate we will achieve some sort of balance. The wisdom of crowds will never replace Einstein. The wisdom of crowds has something to tell us about total human experience and the total human view. And that brings these questions into sharper focus."

Of course there's no one "right answer" because there are so many questions. We haven't even thought of all the questions yet.

And that's what invigorates Khargonekar as he prepares for re-entry into his teaching orbit. "I want students to be deeply aware of this connection between technology and society," he says.

When he walks into the classroom that first day, the sky will be full of questions. □

illustration by **DAVID PLUNKERT**

ENGINEERING'S ROLE IN REPAIRING **THE BIG FIX** AMERICA'S BROKEN HEALTH CARE SYSTEM

by **DONYA CURRIE**

HEALTH CARE MIGHT BE THE MOST DIFFICULT SYSTEM IN THE UNIVERSE, CONSIDERING ALL THE THINGS THAT CAN GO WRONG.

2.2 TRILLION
dollars spent on health care in 2008

90%
hospitals without computer programs for physician order-entry

4.8 DAYS
average length of a hospital stay

39%
increase in spending on healthcare from 2000 to 2005

119.2 MILLION
number of visits to an ER each year

(ALL THE FACTS ARE BASED ON U.S. HEALTHCARE)

It's unpredictable. No two patients are guaranteed the same quality of care on any given day. A clinic waiting room can become packed at any moment, overwhelming an already stressed-out health care staff. A seemingly minor error can be deadly.

As U.S. lawmakers grapple with how to overhaul the nation's unwieldy and costly health care system, they would do well to consider systems engineering's long track record of streamlining industries to eliminate fraud, waste and errors. Medical mistakes are linked to 98,000 yearly deaths and 1 million injuries.

"If you look at the health care system it's just, to put it bluntly, a big ugly system," said Joseph Hartman, professor and chair of the UF College of Engineering's Department of Industrial & Systems Engineering. "You've got people and services needing to be moved around quickly and efficiently."

And then there's that "uncertainty" factor. As in, how do you know exactly how long a doctor will need to spend with a particular patient? In an emergency department, how can you predict the number of people who'll be packed into the waiting room on any given hour of the day or night?

Kids these days, or anyone younger than 35, might not remember a time when doctors couldn't simply order an MRI and moments later hold a picture of a patient's brain in their hands, said Bruce Wheeler, interim chair of UF's Pruitt Family Department of Biomedical Engineering. Thanks to that "spectacular bioengineering triumph," as Wheeler called it, there's no need to saw through a patient's skull for a look at the brain.

Wheeler's father-in-law checks his blood pressure at home daily and phones the results into a computer that automatically uploads the information for his doctor, saving him a trip to a clinic. Pacemakers, cochlear implants, artificial skin — the contributions engineering has made and continues to make to the field of medicine save and improve countless lives.

That engineering/medicine relationship needs to go a step further, though, especially in light of a health care system where 30 cents to 40 cents of every dollar is spent on costs linked to "overuse, underuse, misuse, duplication, system failures, unnecessary repetition, poor communication, and inefficiency," according to a landmark 2005 report, *Building a Better Delivery System: A New Engineering/Health Care Partnership*.

Enter engineering, the epitome of efficiency.

The report, the result of an alliance of the National Academy of Engineering and the Institute of Medicine, grew out of the idea that systems engineering tools — the same practices that keep Wal-Mart, Boeing and the rest of corporate America going — could transform the way health care is delivered. Those tools include simulation, supply-chain management, game theory, value-at-risk, optimization and data mining. For the patient, this translates into a better experience and a smaller bill.

Systems engineering can help in the design of operating rooms, management of human resources (how many nurses should be on the night shift, anyway?), scheduling of patients and staff and more. The marriage of health care and engineering can, and should, result in not only more efficient health care, but also better quality and fewer deadly mistakes.

"If you look at what has to happen in a hospital, you've got really difficult problems because of the uncertainty," Hartman said, pointing again to the need for a systems engineering approach to grease the gears of the health care industry.

And that's exactly where engineering can help health care.

"There really is great opportunity for improving the quality, safety and productivity of health care delivery by bringing these fields and disciplines together," said Proctor Reid, director of programs for the National Academy of Engineering and study director for the committee that authored the *Building a Better Delivery System* report.

Reid can list countless areas where engineering approaches could improve health care. For example, hospitals might be making strides in adopting information technology for things like electronic patient records, but how about using IT and systems techniques to improve clinical operations?

"Progress has been very slow, and, I think it's fair to say, disappointing," Reid said. Yet he pointed to "islands of progress" like Vanderbilt University's health system.

During a 2008 workshop on using systems engineering to improve traumatic brain injury care in the military health system, Vanderbilt professor Dr. William W. Stead, who also is the Vanderbilt University Medical Center associate vice chancellor for strategy and transformation, presented a case study that should have hospital administrators taking notice.

Stead proposed hospitals shift from "expert-based practice" to "system-supported practice," which, of course, uses engineering to improve patient care. In this case, patients on ventilators need complex, specialized care and are prone to many life-threatening complications. A systems approach, Stead theorized, could tackle the problem.

> "SYSTEMS THINKING ALLOWS US TO AT LEAST PONDER HOW WE CAN DO THINGS BETTER"

"The idea behind system-supported practice focuses on the system's performance; teams of people, a well-defined process, and information technology tools work in concert to produce desired results consistently," Stead wrote in his case study. The experiment focused on intensive care units and was based on a design that could be implemented in 45 days or less.

Stead said a major breakthrough in the development of the system-supported practice was the "process-control dashboard." This shows a patient's status as a set of red, yellow or green lights, using a line for each patient and a column for each element of the standardized practice. A green light means everything is as expected, a yellow light means action must be taken but there is still time to do so, and a red light means take immediate action.

One reason the Vanderbilt system ended up working well, Stead said, was that it operated as a "closed-loop control," meaning the output of the system feeds back directly to change the inputs.

He likened the system to the interaction between a thermostat and a furnace. When the thermostat senses room temperature is falling below the set limit, it calls for heat, the temperature rises, and the thermostat approaches the upper control limit and turns off the heat. If someone opens a window and changes the inputs to the system, the thermostat adapts to that change without reprogramming.

"The desired performance is achieved without programming complex interactions among inputs or modifying the program as inputs change," Stead wrote. "This is what is needed in health care."

For that to happen, though, hospitals and clinics need to agree on an end-to-end plan of action and have real-time measurement to show what is happening and display a patient's status and how that fits into the plan.

Because, as the report cautions, a run-of-the-mill application of engineering just won't do. Hospitals are more complicated than giant retail super-centers, and the human body is more complex than an airplane.

UF engineers and medical researchers are constantly looking at creative ways to improve health care. The contributions they are making are patient game-changers that will build on the work programs like Vanderbilt have done to make the internal workings flow more efficiently.

Dr. Paul Carney, director of the UF Epilepsy Research Laboratory, is himself both a neurologist and biomedical engineer and teaches in the medical school and College of Engineering. He sees endless opportunities to meld engineering with medicine to improve health care.

Epilepsy is a seizure disorder that affects 50 million people worldwide. An estimated 25 percent of people with the disease aren't helped by drug therapy. In five to 10 years, Carney hopes to be able to offer them a tiny device that will be implanted in their brain and deliver signals to prevent seizures. In working on that neural prosthetic idea, Carney recognized it needed a specialized, engineering/medical approach.

"I realized we were really doing systems biology," Carney said. "We do strive to combine experimentation with computation around the system, in this case the epilepsy system. We constantly bump into having to understand the brain as a system."

"Systems thinking allows us to at least ponder how we can do things better," said Hartman of the Industrial & Systems Engineering Department. "I think the more people you bring into this arena to ask these questions is a healthy thing."

Or consider associate professor Benjamin Lok's Virtual Patients Project. In a twist on video game technology, it allows medical students to examine and relate to life-size patients and learn everything from bedside manner to better diagnostic techniques. Aside from appearing a little wild-eyed, the virtual patients are surprisingly realistic, and they can actually be more effective than human actors when it comes to stimulating patient/doctor interaction. A virtual patient, for example, could show symptoms an actor couldn't fake, such as different pupil sizes.

Carney said UF is particularly well-positioned to foster the engineering/health care partnership because the College of Engineering and medical school are physically close, and faculty are willing to work across disciplines. One course, BME 6010, links engineering students with a preceptor in the medical school, and the student comes up with a solution to a problem. That course has spawned real-life medical innovations such as a device that could detect air in a premature baby's abdomen before deadly infection set in. Another student came up with a hand-held brain monitoring system for intensive care patients that could tell a nurse whether a patient was asleep, awake or having a seizure.

"There are a lot of problems out there, and I think the solutions are within reach," Carney said. "A systems approach is great because it forces people to interact. We have to meet in the middle and try to leverage each other's expertise."

National Academy of Engineering member William Pierskalla said a systems approach is most useful on the operations side, helping countries like the United Kingdom deliver effective and efficient dialysis treatment.

"Basically, what systems engineering is pretty good at is handling waste or inefficiency," said Pierskalla, a retired engineering professor from the University of California Los Angeles and Wharton School at the University of Pennsylvania who's still active in engineering research. "But health care has been slow to adopt it, as well as a lot of IT in general."

With a 2009 economic stimulus package that earmarked $19 billion for health information technology and a spirited national health reform debate brewing, timing could be perfect for more systems engineering to be woven into the health care fabric.

"We just have been disappointed that we haven't been able to move this further along," Reid of the National Academy of Engineering said about incorporating more of a systems approach to health care. "But I'm optimistic." □

PREVENTION, THE BEST PRESCRIPTION

Gator Engineers are creatively applying many facets of their craft to patient care — making it safer, cheaper and more efficient.

Helping Babies With Brain Injuries

Dr. Michael Weiss, a UF associate professor of pediatrics, is working with computer engineering professor Paul Gader to understand what cells are left in the brain after injury and what becomes of stem cells after they are transplanted into the brain. Gader is helping with pattern recognition to use MRI signals and images from MRIs to eventually "colorize the brain" to decode brain injury and treatment. The idea is to develop an objective algorithm to understand the proportion of different types of cells.

Understanding The Brain

UF engineering professor Baba Vemuri, director of the school's Center for Vision, Graphics and Medical Imaging, is trying to pin down the changes that happen in an epileptic brain before and after the onset of a seizure to eventually predict when a seizure will strike. Another of Vemuri's projects is also working to correlate spinal cord injury with functional recovery.

Better Hospital Planning

Elif Akçali, associate professor of industrial and systems engineering, developed a network flow model that incorporates facility performance such as average waiting times and budget constraints to determine optimal hospital bed capacity.

Predicting Cesarean Births

Stan Uryasev, professor in UF's Risk Management and Financial Engineering Laboratory, and his team developed a decision support tool for obstetricians to help predict who was more likely to need a C-section.

Shortening Wait Times

A UF engineering student project at North Florida Regional Medical Center last summer used a simulation model to show how to cut patient wait times by 30 percent. A spring semester project at Shands Hospital examined ways to help a radiation oncology group do a better job of scheduling patients over the course of a week so new patients and those needing more time wouldn't be clustered together and result in overstuffed waiting rooms.

Improving Medication Effectiveness

Malisa Sarntinoranont, an associate professor in the Department of Mechanical & Aerospace Engineering, is working on a system that could deliver precise doses of potentially toxic medication to the brain using nanoparticles. This could have huge implications for patients with epilepsy who can't tolerate the side effects such as extreme dizziness of medications given the traditional way.

6 MINUTES
frequency with which preventable infections are acquired in hospitals, costing

$4.5 BILLION
each year and contributing to more than

88,000 DEATHS

2.6 HOURS
average time spent in emergency department

7,000
average number of deaths from medication errors each year

1/3
patients reporting a medical, medication or laboratory error in the past two years

A Different Point of View

Behind great engineering innovations, there are amazing women. But the struggle to get there has been real and unrelenting.

by **ALISSON CLARK**

On the first day of classes at Texas A&M University in 1983, Angela Lindner settled into her desk to begin her master's program in chemical engineering. When her professor entered the room, however, he demanded to know what she was doing there.

LOOKING IN FROM THE OUTSIDE Maryly Van Leer Peck (M.S. CHE '55, Ph.D. CHE '63) was the first woman to earn a Gator Engineering graduate degree. In 1962, Life magazine featured her as one of the promising young women of her generation. Peck went on to a successful career in both industry and academia. Today she serves on the UF Department of Chemical Engineering advisory board.

"He said, 'I don't understand why you want to put yourself through this. You could just marry an engineer and not have to work a day in your life,'" she recalled.

That was just the beginning: When Lindner, now the College of Engineering's associate dean for student affairs, compared her tests with those of male students, she saw that she had received lower marks for the same answers. But she didn't give up, and just before graduation the professor called her into his office.

"I've learned something from you," he told her. "You've proved that women do have the right to get engineering degrees. And I've realized that's a good thing, in case you wind up getting a divorce and you have to support yourself."

"Little steps," Lindner sighed. "Little steps."

Women in engineering today don't face such blatant discrimination, but the numbers show they haven't made the same inroads into the field as in medicine or law. (Would you expect to see a story on female doctors in the College of Medicine's magazine?) The National Academy of Engineering estimates just 9 percent of working engineers are women, and female students make up about 17 percent of engineering college students. (UF follows suit, with 1,507 female students representing 21 percent of the College.)

Women's salaries lag behind, as well. The National Science Foundation placed the median annual salaries of female scientists and engineers at about 22 percent less than males.

Theories abound on why the gap persists, from women's family and career goals to their learning styles, inclinations and innate aptitudes (re: Harvard president Larry Summers' resignation after he spoke on the topic at an engineering diversity conference in 2005).

Whatever the contributing factors, it's clear the industry needs women: not just to foster diversity, but to also fill jobs, says Cammy Abernathy, the College's associate dean for academic affairs.

"For the past few decades, we've been supplying our engineering work force by importing talent from overseas, and that's not going to be that easy anymore — there's more competition for those engineers," Abernathy said. "Our largest untapped pools to fill those jobs are women and minorities."

Another reason to recruit female engineers lies in the synergy diversity creates, says former NASA engineer Donna Shirley, who became the first female engineer at the Jet Propulsion Lab in 1966 and went on to lead NASA's Mars Exploration Program.

Shirley, who now owns a management consulting company, says diverse engineering teams get better results, and research supports her experience.

"When the white males who had been at NASA for 20 years would be really stuck, and I'd bring an idea in they hadn't thought of. It was just the result of having a different point of view," she said.

WHERE WE'VE BEEN

Ask middle-aged female engineers about the double standards or outright harassment they endured in years past, and many are loath to dwell on the negative. But to understand where we need to go, it helps to look at how far we've come.

In the 1960s, discrimination was overt. Donna Shirley arrived at the University of Oklahoma intent on majoring in aeronautical engineering, and her academic adviser told her that "girls couldn't be engineers."

Other women, such as UF agricultural engineering associate professor Carol Lehtola, were not-so-subtly nudged toward engineering disciplines deemed more acceptable for women. In 1970, Lehtola wrote to South Dakota State University and the University of Minnesota about agricultural engineering. Both responded that they'd be glad to have her as the first female student in the program, but Minnesota's department went on to suggest that, as a woman, it might be more appropriate for her to study food processing. She chose SDSU.

The difficulties didn't stop when these women entered the workforce. Abernathy graduated from MIT in 1980. Since then, "I never got a job in my life that someone didn't say, you only got that job because you're a woman — even the one I have now," said Abernathy, who came to UF in 1993 as a professor of materials science and engineering and became the College's first female associate dean in 2004.

"Now, when someone makes a comment like that, I agree with them," she said. "In my generation, women were taught to work to make everyone around them successful, rather than just focusing on their own success. And in the interdisciplinary environment of engineering today, that's a tremendous skill."

> "In my generation, women were taught to work to make everyone around them successful, rather than just focusing on their own success. And in the interdisciplinary environment of engineering today, that's a tremendous skill."

Abernathy cites the teamwork that helped her develop a semiconductor device at Bell Labs, where she worked from 1985 to 1993, that is now used in millions of cell phones.

"I'm a very competitive person, but in my generation, women were raised and socialized with emphasis on being a team player. If I had focused on being the queen of my own empire, working in isolation, I never would have achieved that. So I embrace it. I tell people, 'You think I got this job because I'm a woman? You're right.'"

ENGINEERS OF TOMORROW

When Mallory Peterson came to UF three years ago as an environmental engineering major, no one ridiculed her or told her she didn't belong. She knows those things happened — she's heard about it at conferences of the Society of Women Engineers. She's not concerned she'll face that kind of discrimination, but she's heard tales from young alumni who say their co-workers, many of whom are their fathers'

PREVIOUS SPREAD: ALLAN GRANT//TIME LIFE PICTURES/GETTY IMAGES

STRENGTH IN NUMBERS
Angela Lindner, left, associate dean for student affairs and environmental engineering associate professor; Mallory Peterson, UF Society of Women Engineers president and environmental engineering student; and Cammy Abernathy, associate dean for academic affairs and materials science and engineering professor

JEREMIAH STANLEY

age, sometimes treat them more like daughters than equals.

"I'm just going to take it head-on," Peterson said. "Part of the reason I wanted to be an engineer is because it's a challenge."

Peterson came to UF with a scholarship from SWE, a national organization founded in 1950, when women had to fight for a seat in all-male engineering colleges. She's now president of UF's chapter, founded in 1959 and revived when UF began a concerted effort to recruit women to engineering in 1972.

Former associate dean Gene Hemp directed the push to enroll more women.

"We just felt it was the right thing to do," Hemp said. "I started by getting all of the female students together in a conference room to talk about what could be done. The bad news was, we all fit in a very small conference room."

One of the first problems Hemp identified was that women were being discouraged from careers in engineering — not by their parents, boyfriends or male professors, but by female teachers.

"We had many women who said their female chemistry or math teachers told them engineering was a man's field," said Hemp, who is also UF vice provost emeritus.

He encouraged those students to reach out to female high school students, telling them not to be dissuaded from their goals. Hemp also recruited female undergraduates majoring in math and chemistry.

The success of the College's effort was demonstrable: In two years, the number of female students in the College rose from 26 to 87. By 1980, 13 percent of undergraduate engineering students were female. The first female faculty member came onboard in 1967, followed by the first female tenure-track professor in 1975. In 2004, 94 years after the College was established, Dean Pramod Khargonekar appointed Cammy Abernathy as associate dean for academic affairs, the first woman to hold any type of dean position within the College. He then appointed Jennifer Curtis as chair of the Department of Chemical Engineering in 2005 and Angela Lindner as associate dean of student affairs in 2008.

Female enrollment, however, hasn't skyrocketed: With students in most disciplines ranging from 13 to 35 percent female nationally, engineering is a long way from parity.

"When I was at MIT, we had 17 or 18 percent women students. It's not much better nationally now," Abernathy said. "The numbers across the country have hit a plateau."

A FORMULA FOR SUCCESS

To explain the plateau, experts point to a variety of factors, from the structure of high school science and math classes to the low number of tenured female professors. Among the theories:

1. MIDDLE AND HIGH SCHOOL SCIENCE and math classes don't always suit girls' learning styles, which may cause girls to lose interest. "Bad teaching drives a lot of high school girls away from careers in science and engineering," said Barbara Hughey, an MIT alumna who is now associate director of the Institute's Women's Technology Program. The program brings high school girls to MIT over the summer for an intensive introduction to engineering.

National solutions: "In middle school and high school, we

SOCIETY OF WOMEN ENGINEERS TURNS 50!

When UF's Society of Women Engineers celebrates its 50-year jubilee on Oct. 2-4, it will honor the women who paved the way for the 1,507 female engineering students at UF today.

Founded in 1959 as the ninth chapter in the country, it initially represented seven women in engineering, according to a 2003 history by Vice Provost Emeritus Gene Hemp.

The first female engineering graduate earned a bachelor's degree in 1948. The first woman to receive an engineering graduate degree at UF, Maryly Van Leer Peck, earned a master's in 1955 and a Ph.D. in 1963. She gave birth to four children during the course of her studies, and she was featured in Life magazine in 1962 as one of the promising young women of her generation. Peck worked as a senior research engineer for Rocketdyne before working in academia in Guam, Arizona, Maryland and Florida.

In 1972, SWE was revived as part of a concerted effort to recruit more women to UF's program. The organization now offers mentoring, social activities and networking to women, along with a few male members.

At the jubilee, SWE members will have a chance to meet the alumnae who started it all.

"We want everybody to know about the women who went before them," Hemp says. "They should understand they are standing on the shoulders of giants."

For SWE Jubilee information go to: www.eng.ufl.edu/swejubilee

need to grab their attention so they see the relevance of science and math to what they want to do," said Hughey, whose daughter is a high school sophomore. Programs like WTP help by giving girls the hands-on experience their high school curriculum may lack.

Gator Engineering solutions: SWE reaches out to middle school and high school girls with two annual programs. In the first, engineering students visit local schools to give girls a better picture of the dynamic, collaborative nature of engineering careers. In the second, high school girls come to campus for hands-on lab experience.

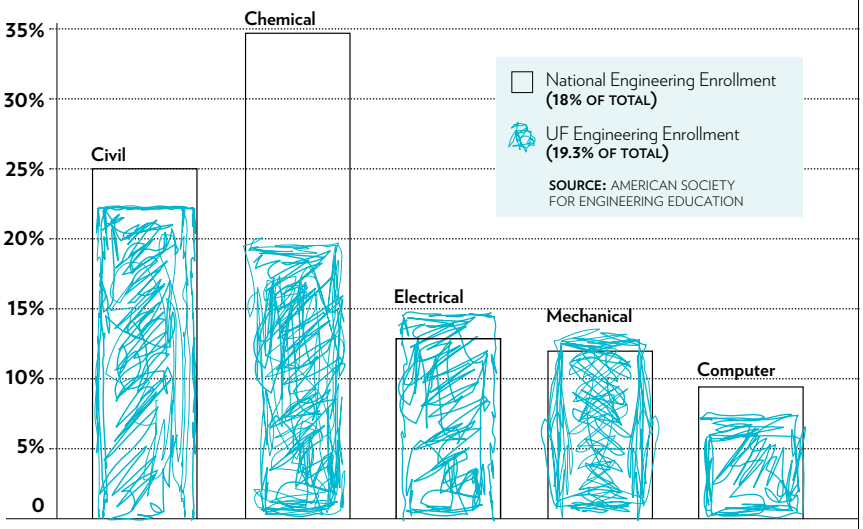
2. A LACK OF FEMALE PROFESSORS as mentors and role models may discourage female students. In 2008, just 12.3 percent of engineering faculty were female, according to the American Society for Engineering Education. The shortage of female mentors might make a young woman's college experience more difficult, and it may discourage those women from pursuing careers in academia. Abernathy says her experiences at Stanford and MIT made her doubtful she would ever teach.

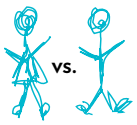
"When I looked at the faculty, it didn't look like an environment where I could fit in very well," she said.

National solutions: Hemp suggests the economic downturn may also come to the rescue: When job offers for engineers with bachelor's degrees aren't as plentiful or lucrative, more students opt to further their education with master's degrees and Ph.D.s. It's possible this could lead to more talented female students going into academia.

Gator Engineering solutions: Since 2001, Khargonekar has increased the number of female faculty in the College by 50 percent. And the Florida Institute for the Development of Engineering Faculty prepares graduate students for careers in academia by giving them an inside look. Students learn about academic job searches, create resumes and craft research and teaching statements.

Engineering Bachelor's Degrees Awarded to Women in 2008





In 2008, UF awarded bachelor's degrees in environmental engineering sciences to **14 WOMEN** and **13 MEN**

3. WOMEN WHO HAD BAD EXPERIENCES in the field may try to protect bright young students from the same experience. That's what happened to Sabrina Parra, a civil engineering senior from Miami, whose high school teacher tried — unsuccessfully — to steer her away from engineering.

"She said it was probably not going to be a good field for me," Parra said. "I found out later she had been in engineering and had switched to teaching."

National solutions: Outreach programs such as the Web site EngineerGirl.org, launched by The National Academy of Engineers in 2000, lets teenage girls explore career options and connect with women in the field.

Gator Engineering solutions: When female engineering students arrive at UF, SWE matches each of them with an upper-division mentor in her field. The mentors coach new students through the program with study groups, test review sessions, social support and networking.

4. ENGINEERING MAY SUFFER from an image problem. A 2003 study from the University of Michigan showed that girls who excelled in science tended to choose careers in biological sciences because of their perception that engineering and math-based sciences were "less people-oriented." Girls in the 17-year study cited wanting to help people as a reason for choosing the so-called "soft sciences" over engineering.

National solutions: From biomedical to environmental engineering and everything in between, the perception that engineers don't help people just doesn't stand up to scrutiny. But engineers need to do a better job spreading the word, Abernathy says.

"A young person's perception of what we do doesn't take into account the collaborative nature of engineering today," she said. "You're not working in a lab all by yourself trying to figure out how to make widgets. A lot of engineering is about making people's lives better."

The Gator Engineering solution: The awed expressions of the kids at UF's annual Engineering Fair offer ample proof of UF's contribution. When elementary and middle schoolers see the submarines, satellites, robots and electronic games that UF students create, engineering's reputation as a cold, theoretical discipline is dealt a death blow.

MEASURING PROGRESS

How will we know when we've succeeded in paving the way for women in engineering?

"The only way to tell if our job is done is if the percentage of women in the student body goes up, when we get to something that looks like parity," Hemp said.

The good news, says Abernathy, is that diversity in one area, be it race or gender, helps diversity in all areas. As one of a few female students in her department at Stanford, an experience she likens to "being in a men's locker room or a fraternity house," Abernathy found camaraderie with a male African-American professor who could relate to feeling like an outsider.

"If he hadn't been there, I don't know how I would have made it through," she said.

While the female students of today are highly unlikely to be singled out for ridicule as Lindner was, the associate dean still hears tales of internships punctuated by daily catcalls from male co-workers. When young women do encounter sexism, however, they have a wider support network than in years past. And that network isn't exclusively made up of women. It's important to remember, Lindner says, that for every male engineer or professor who makes a female engineer's life harder, there are more who have a genuine commitment to diversity in the field.

"I could have walked out of college with the message that white males were my enemy, but that's not fair. We can't stereotype them back," she said. "You have to give everyone the opportunity to do the right thing." □

To see what happened behind the scenes at MARYLY VAN LEER PECK's *Life* magazine shoot go to thefloridaengineer.eng.ufl.edu

JOHN CARRICO, ALIAS IMAGING

2007

PRISCILA SILVA

Geeky confessions, milk cartons and a corporate dream

BY ANDI MILLER

Priscila Silva is a memory girl.

Even now, with a little hindsight and maturity in her personal rearview, she laughs at her own precocious coed moxie — an audacious proclamation to the Dean of the College that he tells her he has not yet forgotten.

"I told him I wanted to be CEO of Procter & Gamble," laughs Silva, 25, a native of Brazil and a 2007 industrial and systems engineering graduate. "He tells me he still remembers that. I'm going to work hard so I don't let him down."

Today, through the power of her own determination and some forceful goal-setting, Silva is well on her way to making that dream a reality, even as she says she's backed off a tad on her own definition of success. Now in her second year at the Cincinnati-based corporate giant, she's traveled as far away as China and Japan where she's conducted market research interviews with foreign mothers on the right kind of Pampers-brand diapers best suited for their babies and their culture.

It's not engineering, says the perpetually upbeat Silva, but she's using concrete skills she learned in the College — the problem-solving, critical thinking and analysis — to put her own imprint on marketing P&G products.

"It's the little things," she says with a believable sass. "If the flavor of your toothpaste changes, that sucks. It's very personal. At P&G we put a lot of thought in you getting the best quality. I get to touch the lives of millions of people.

"Some people like to do community service, some people like to join civic groups. Props to them, I think that's great work," she adds. "To me this is one way I find to help others — by giving them products that help. P&G was the first company to ever put fluoride in toothpaste... and it improves smiles and lives in small but meaningful ways. I thought 'That's amazing.'"

Silva also became a cheerleader in her own right of the P&G brand, ticking through a litany of well-known grooming and household tools like a spokeswoman badly in need of some airtime.

"I'm Hispanic and we love scents," she confides, noting at age 15, the family moved to Miami. "Like the way I measure clean is through smell. Other people look for more visual cues — the brighter the white. It's very dorky."

She is loyal to Crest toothpaste and her Olay face cream — "I use the low end stuff because I'm not that old. I don't need wrinkle protection — yet. "

And don't forget the Febreeze candle, the Swiffer and her yummy Olay Ribbons (body wash). "It's a little pricey but it's totally worth it. I'm lazy and I forget to put on moisturizer, so this really helps with that."

Spoken like a true girly girl but one who is driven enough to have already crafted her own glamorous bucket list that takes her to the far corners of the continents and back — she's crossed off "climb Great Wall of China" but still hopes to "sled down the Olympic luge track in Lake Placid, N.Y. at 90 mph." Then there's "pet a kangaroo," and stroll the Taj Mahal barefoot, along with attending the Cannes Film Festival and a real masked ball.

She lives her life surrounded by small motivational tools keeping her focused as she crafts some creativity into her consumerism. She dreams in practicality.

Driving to work, Silva favors silence over music so she can ponder the day ahead. The background screen on her cell phone reads "Push Yourself" and she's an avid reader of both Psychology Today and Scientific American. Every Sunday, she reads postsecret.com, and honors her homeland with indulgences

of Haagen-Dazs' Passion Fruit and Rum Raisin ice creams "because they remind me of Brazil."

At her 100-year-old apartment, her bathroom holds a cheeky secret: "I have three plastic bracelets I hang from my shower head I wore at a nudist resort. I keep them to remind me of how free spirited I felt. It's not something I had ever done or will do again, but they remind me I need to always push myself outside of my day today comfort zone."

But it's her family and a road trip with the Silva crew to a Parmalat milk factory in Paraguay when she was 11 that seeded her fascination for product packaging. It's a geeked-out confession, her wonderment at something so benign as a manufacturing assembly line for milk that leads her to spill the details of her career path.

"I was just fascinated by all those little boxes getting folded by robot machines, all put into packages and trucked without humans ever touching it," she recalls. "That's what makes me so excited by consumer goods. You look at a tube of toothpaste and you never think about what goes into making that. At Parmalat, I realized there is a lot of magic that happens behind everyday products and that to me is so beautiful, so seamless to the end user."

She's been accused of drinking the P&G Kool-aid, but says the company's management philosophy of investing in people, cultivating their potential and promoting from within is in line with her own social consciousness view of the world.

"I love what it stands for, what it does, the people — leadership, ownership, passion for wining, integrity. Their values and my values are very much in line," she says, adding that adjustment to life in the Midwest has been easy, even for someone who grew up in South America.

She allows she's a long way from home, but she's finding comfort in creating things that are used across the globe.

"I want to have an impact there," she says of her goals at P&G, which include making good on what she told the Dean, though she sees herself a little wiser now.

"It's not about being CEO," Silva says. "I look at this like dropping a pebble in a lake — you get ripples. The higher you drop the pebble the farther away the ripples are going to go. The higher up I go in a company, the more ripples I can make every day." □

Watch **PRISCILLA SILVA** tell you why emailing with strangers prepared her for P&G: thefloridaengineer.eng.ufl.edu

ALUMNI BY YEAR

1961

Bobby Ott Hardin, Ph.D. CCE

a native of Lexington, earned his bachelor's degree in civil engineering in 1956 and his master's in civil engineering in 1958, both at University of Kentucky. He became an assistant professor at UK upon completing his master's, having served as an instructor during his graduate studies. Hardin received a National Science Foundation Graduate Fellowship. He taught at UK and in 2006 completed 50 years of service to the university, having become UK's longest-serving faculty member at the time of his retirement. His research into the constitutive behavior of soils led to six national awards, including the Thomas A. Middlebrooks Award and the Walter Huber Research Prize. He invented a resonant column oscillator for determining the shear modulus of soil at various confining pressures.

1983

David Bruce Martin, B.S. ISE

has been at IBM for 22 years. Currently he is Manager of Procurement Metrics, Processes & Controls for Lenovo Global Procurement (Lenovo purchased IBM's Personal Compter Division). He is married to a Gator (Physical Therapy), and many Gators in the family (father - education, brothers: accounting, building construction and computer-science). He also has three children 9, 11, and 13.

1986

Martin Jay Schwartz, B.S. MAE

has been vice president of engineering for Revere Supply Co., Inc. in Jacksonville, Fla. for the past four years. Revere is a major supplier of safety and survival equipment to the commercial and recreational marine industries.

1990

Warren Vincent (Casey) Carrigan III, PE, B.S. CCE

is an honors graduate and former owner of Apex Technology, a Jacksonville based structural engineering firm. While on a medical mission trip in Mexico he says he got the urge to go to medical school. He graduated in May from FSU College of Medicine with his MD and began a neurology residency at the Mayo Clinic Jacksonville in June.

1997

Peter Moore, P.E., B.S. CCE M.E. CCE '04

was awarded the 2009 UF Foundation Outstanding Young Alumni Award. He is president and CEO of Chen and Assoc. where he developed a program of employee led committees supporting the firm's leadership through grassroots efforts. He is assistant city engineer for Coral Springs

1966

Thomas O. Hunter, B.S. ME, Gator Engineering Alum Honors Dean

Hunter, president and laboratories director of Sandia National Laboratories, and a longtime Dean's Advisory Board member, has worked closely with Dean Khargonekar and gave $20,000 to start a college endowment in Khargonekar's honor. The Dean's Excellence Fund will give unrestricted money to future deans for research, equipment, travel, facility renovations and teaching. The goal is to raise $100,000 more within a year and $1 million in about five years. The fund may be eligible for $50,000 in state matching funds. "The future of this college is dependent on a substance of quality," Hunter said. "The foundation he (Khargonekar) has laid is that this is going to be a nationally recognized university." Another new endowment, the Pramod P. Khargonekar Junior Faculty Award for Excellence, will be used to support junior faculty. That fund has a goal of $50,000.

—KIM WILMATH

For more info contact Meg Hendryx: mhendryx @ufl.edu

FACULTY UPDATES

Gator Engineering professors are nationally recognized by their peers for outstanding research and commitment to engineering.

EES
Paul Chadik

was named chair for the Department of Environmental Engineering Sciences. He received his B.E. in chemical engineering from Manhattan College and his M.S. and Ph.D. from the University of Arizona. For the past 25 he performed research and teaching at the graduate and undergraduate level focusing in water chemistry and water treatment systems design. He is co-author of the text, Water Supply and Pollution Control, 8th Ed. He served as the associate chairman, undergraduate coordinator, and ABET coordinator in the department.

CHE
Richard Dickinson

was named chair of the Department of Chemical Engineering. He joined the Department in 1994 after receiving his Ph.D. in chemical engineering from the University of Minnesota, followed by a postdoctoral appointment at the University of Wisconsin and a NATO Postdoctoral Fellowship in Germany. His cellular and molecular bioengineering research was recognized with an NSF Career Award and a UF Research Foundation Professorship. Dickinson has also been recognized as the College of Engineering Teacher-of-the-Year as well as the University-wide Teacher-of-the-Year Award.

MSE
Paul Holloway

he was selected to be the 2008-2009 Teacher/Scholar of the Year by the University of Florida. This is the highest award of this type bestowed by the University.

MSE
Franky So

was selected to become a Fellow of SPIE, an international society

advancing light-based research, becasue he is a pioneer in the field of organic light emitting diode (OLED) technology. Under his leadership, his team demonstrated the world's first 320x240 video displays. He also invented the mixed host device architecture and was able to increase device lifetime by more than 10 times.

MSE
Steve Pearton

was selected as a Fellow of the Materials Research Society for the development of processing techniques for compound semiconductor electronic and photonic devices.

Student Affairs
Jeff Citty

is an academic adviser in the College's Student Affairs Office. He was selected as an Outstanding Advising Certificate of Merit recipient in the from the National Academic Advising Association as part of the 2009 Annual Awards Program for Academic Advising.

and spokesperson for the city engineering division. He is a leader in ASCE Young Member association at the state and national level and is past president of the Broward County branch and serves on the state, regional and national levels.

1999

Andrea R. Brown, P.E., B.S., CCE, M.E. EES '08

began an engineering practice in Orlando, Fl. with colleague, Jamie T. Poulos. After working together at both the South Florida Water Management District and a local planning and engineering firm, the two became LEED Accredited Professionals and started Poulos Brown, LLC to provide civil engineering and land development services in the area. Prior to this, she spent six months volunteering in Esparta, Atlantida, Honduras designing a sanitary sewer collection and treatment system for the community. Poulos Brown was established as a woman-owned business with a strong emphasis on community service and involvement on local boards, including the provision of pro bono services to the City of Orlando for small scale projects.

2001

Lisa Armbruster, M.S. CCE

was awarded the 2009 UF Foundation Outstanding Young Alumni Award. She is assistant director of governmental affairs for the Florida Shore and Beach Preservation Assoc. She worked on a year long beach renourishment project for the coastline of Panama City Beach. After Hurricane Ivan and other storms, Panama City beach lost about 4 million cubic yards of sand. The project required dredging offshore sand to restore the beach. This provided a barrier between the damaging waves and properties on the shore. Maintenance on the renourishment of the coastline will continue to provide protection from future hurricanes and storms.

2002

Domenico Anthony Ruggiero, B.S. MAE

following graduation, he began full-time employment at the NASA Kennedy Space Center working with the Orbiter Structures Engineering department of United Space Alliance, a NASA contractor responsible for the processing of NASA's fleet of space shuttles. In addition to participating in the Orbiter Major Modification (OMM) of OV-103 Discovery, his experience in the group was utilized during the STS-107 Columbia Reconstruction Effort in a hangar at the Kennedy Space Center following the unfortunate loss of Columbia's crew on February 1, 2003.

Most of his regular duties within structures engineering were directed toward the processing of OV-103 Discovery, including the efforts leading up to STS-114 "Return to Flight" in 2005. He also played a part in the resolution of a an in-flight anomaly for OV-103 during STS-121 which involved an over-pressurization of the Forward Reaction Control System (FRCS) during ascent to orbit. After the mission was complete,He led the borescope inspection efforts which found Thermal Control System (TCS) blankets out of configuration and capable of blocking the FRCS vent ports.

Finding the cause for the over-pressurization event prevented the need to remove the FRCS to perform a more invasive investigation. With the FRCS still in place, the TCS blankets were capable of being correctly re-installed. If the FRCS had been removed from Discovery, USA would have missed the vehicle rollout milestone from the Orbiter Processing Facility (OPF) to the Vehicle Assembly Building (VAB) and possibly delay the scheduled launch date.

Currently he is performing Systems Engineering work for NASA at the Kennedy Space Center for the NASA Constellation Program.

His second son, Gabriel, was born on July 4th, 2008. Michael, his first, son was born in 2006.

DISTINGUISHED GATOR ENGINEERS HONORED AT GRADUATION

The University of Florida Distinguished Alumnus Awards are awarded to an alumnus of the University that has excelled in his/her chosen field or performed outstanding service for the university. Dean Pramod Khargonekar bestowed three Distinguished Alumnus Awards during the College of Engineering's 2009 Spring Commencement Ceremony. The recipients were: Dr. Leonard S. Bernstein, B. CHE, '62; Hjalma E. Johnson, B. IE, '58; and Dr. Herbert A. Wertheim, who attended the College of Engineering's electrical engineering department.

1989
Richard Simonian, M.S. CISE
Perfect Partnership

As the president of Maritime Communication Services, a subsidiary of the Harris Corp., and the chairman of the Dean's Advisory Board, he is helping to build a connection between the UF College of Engineering and Harris. The partnership allows engineering students and Harris engineers to work together on research projects. Simonian is also on the search committee for the new engineering college dean, though he said it's a position he almost wishes he didn't have. "There's this gold standard," Simonian said of Dean Pramod Khargonekar's legacy. "He's left tough shoes to fill." Simonian, along with the other Advisory Board members, has volunteered to give up his spot in deference to the new dean, though he said he's more than willing to continue to serve the college.

—KIM WILMATH

2003
Elizabeth A. DeStephens, B.S. MSE
is a petroleum engineer with Ryder Scott Consultants in Houston, Texas.

Kyle D. Grandusky, P.E., B.S. CCE
is an engineering department project manager at Engenuity Group Inc. He was appointed to Palm Beach County Water Resources Task Force. The PBCWRTF was enacted by the Palm Beach County Board of County Commissioners under Resolution No. R-2008-1810, adopted on October 7, 2008, with the mission of tackling regional water resource issues such as future water supply, conservation, wastewater treatment, and water reuse.

2007
Marlin Scott Clark, B.S. MAE
graduated high school early at the end of his junior year. He attended Hillsborough Community College for two years to attain his associate in arts degree. He says he's always had an affinity for creating things and understanding how everything worked and how he could make it work better. When he was six, his parents bought an above ground pool and the family was leveling sand to assemble the pool on. He says he knew there was an easier way to get the job done so he went to the shed and built a drag by him self using a hammer and nails with short 2x4's, cut plywood and rope.

Gerard O'Sullivan, M.S. MAE,
is director of engineering at ECS, Energy Curtailment Specialists, in Buffalo, NY.

100 YEARS OF GATOR ENGINEERING

It's almost here. In a few months, we'll kick off the College of Engineering's year-long centennial celebration and recognize major anniversaries for some of our departments. Enjoy the first installment of *Gator Engineering Remembers*. Stay tuned for more:

REMEMBER IN...

1910 when the College of Engineering was founded. John R. Benton was named dean. There were 48 students, 5 faculty members, and the Civil, Electrical and Mechanical departments.

1911 when faculty discussed how athletics was interfering with academics.

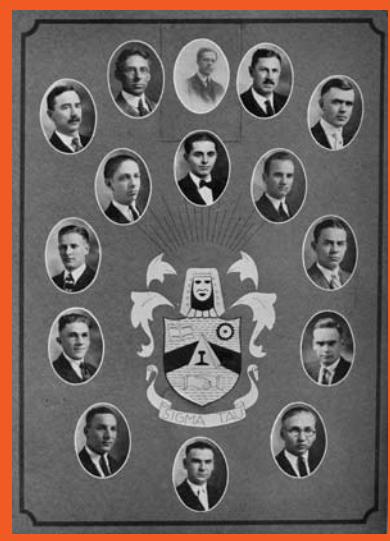
1914 when the Benton Engineering Society was formed.

1917 when the College decided to grant degrees to all seniors who left to fight in WWI as long as their schoolwork was satisfactory.

1921 when a rule barring any class absences due to football games was adopted because of the game's interference.

1923 when the Upsilon Chapter of Sigma Tau honorary engineering fraternity was established.

1928 when master's programs were established in civil, electrical and mechanical engineering.



1930 when Dean Percy Reed instructed faculty to ask students to stop smoking during tests.

*We've accomplished truly remarkable things the last 10 decades, but we're most proud of you. Come celebrate with your Gator Engineering family. See pg. 36 & visit our Web site. Tell us what **YOU** remember: 100years.eng.ufl.edu*

COURTESY OF THE MATHESON MUSEUM

ADVANCEMENT THROUGH LEADERSHIP

As Dean Khargonekar steps down, he leaves a legacy of dedication, passsion and excellence

In this issue of *The Florida Engineer*, we pay tribute to the many contributions Dean Pramod Khargonekar made in his tenure as dean. The support and partnerships formed mirror the vision set forth by Dean Khargonekar beginning with the establishment of the J. Crayton Pruitt Family Department of Biomedical Engineering. The endowed department provided by Dr. Pruitt and his family provided a spring board for a number professorships and chairs to be provided by alumni and industry partners such as Bellsouth and Intel Corp. We are fortunate to have a leader with a firm vision for the College's future. Friends and alumni have responded with numerous scholarships, fellowships and research support, making his vision a reality. Increased graduate student enrollment, stellar faculty hires, centers and institutes and innovative research are the result trust and belief in Dean Khargonekar's mission. Jumping 10 spots in the *U.S. News and World Report* rankings from 35th to 25th overall is just one illustration of his dedication and hard work.

The College has established two funds to honor Dean Khargonekar's leadership and passion for excellence. Through the generosity of alumni, faculty and students the College has established the Khargonekar Junior Faculty Award and the Dean's Excellence Fund. The Khargonekar

Junior Faculty Award reflects his belief that investing in faculty will enhance the College's ability to respond to greater educational and research opportunities. The Dean's Excellence Fund is an endowment that will generate resources in perpetuity allowing future deans the ability to respond to the many emergent needs and opportunities sure to arise. We hope you will take a moment to look online at the Khargonekar award and Dean's Excellence Fund brochure at www.development.ufl.edu and make a gift honoring his many accomplishments.

We are grateful for Dean Khargonkear's vision and leadership and to the many who have already invested so we can pay tribute to his passion and desire to succeed. We look forward to reaping the rewards of his leadership for many generations to come. □

To find out how you can help the College contact:
MEG HENDRYX
Senior Director of Development
mhendryx@ufl.edu

COURTESY OF ENGINEERING COMMUNICATIONS AND MARKETING

FRIENDS WE'LL MISS

1933 David C. Barrow Jr. B.S. EE MESA, ARIZ., AUG. 20, 1995 1934 William R. Perry B.S. ME MAITLAND, FLA., JUNE 22, 2007 1935 Jay W. Brown B.S. IE CE LONGWOOD, FLA., JAN. 13, 2004 | Henry R. Harper WILMETTE, ILL., DEC. 1, 1987 | Woodrow L. Lynn B.S. CE PENSACOLA, FLA., DEC. 20, 2008 1936 George W. Campbell B.S. ME BETHESDA, MD., FEB. 25, 2009 | Lee M. Humphrys B.S. CHE MINNEAPOLIS, MINN., FEB. 14, 2007 | Colonel Charles W. Matheny Jr. B.S. CE ZOLFO SPRINGS, FLA., APRIL 30, 2007 1937 Walter C. Simms B.S. EE HOLLYWOOD, FLA., OCT. 7, 2003 1938 Colonel Walter R. George B.S. ME MAITLAND, FLA., APRIL 1, 2009 | David W. Newell Jr. B.S. CHE HOUSTON, TEXAS, FEB. 26, 2006 1939 John N. Adams Jr. B.S. EE SARASOTA, FLA., FEB. 7, 2001 | Alvis G. Green JACKSONVILLE, FLA., MARCH 20, 2009 | Colonel Bert W. Humphries B.S. ME OCEANSIDE, CALIF., FEB. 20, 2006 | Adrian H. Whitcomb B.S. OCALA, FLA., SEPT. 14, 2000 1940 Harold H. Stevenson B. ME SPANISH FORT, ALA., NOV. 14, 1996 1941 Donald M. Hinkley B.S. CE OCALA, FLA., JAN. 24, 2005 | Walter F. Taylor B.S. CE ATHENS, GA., DEC. 2, 2002 1948 Seymour Spears B. ME SYOSSET, N.Y., JUNE 12, 2006 1949 Charles H. Asche B. IE MIAMI, FLA., MARCH 7, 2009 | John H. Lundy B. SE EDGEWOOD, N.M., JUNE 24, 2007 | Joel T. Rodgers B.S. ME SAINT PETERSBURG, FLA., NOV. 14, 2008 1950 Timothy Goodrow B. CE TALLAHASSEE, FLA., FEB. 18, 2009 1951 John N. Darby B.S. CE JACKSONVILLE, FLA., FEB. 28, 2007 | Laurence A. Hofma B.S. CE ORLANDO, FLA., OCT. 22, 2008 | Jerald P. Simons B. EE PLANO, TEXAS, MARCH 5, 2009 1952 John W. Hock B.S. CE GAINESVILLE, FLA., DEC. 24, 2003 | Jefferson R. Kirkpatrick B. CE WEST PALM BEACH, FLA., MARCH 28, 2009 1953 Frank S. Boardman B.S. CE HUNTSVILLE, ALA., FEB. 24, 2009 | Luis Galnares B.S. CHE MIAMI, FLA., JAN. 25, 2008 | Robert C. Watkins Jr. B. CHE BORGER, TEXAS, JAN. 27, 2009 1956 John Ridout B. IE BRISTOL, TENN., JUNE 26, 2007 1957 Rhett A. Miller Jr. B. CE TALLAHASSEE, FLA., MARCH 3, 2009 | Walter H. Skinner B. CE LAKE CITY, FLA., APRIL 9, 2009 | Robert C. Smythe MSE CANTON, GA., APRIL 13, 2004 1958 O. Frank Bennett B.S. ME VALRICO, FLA., FEB. 16, 2009 | Doyle D. Garner B. ANE VENICE, FLA., APRIL 8, 2009 | Robert F. Hendee B. IE OKLAHOMA CITY, OKLA., JUNE 18, 2007 | Cmdr. Thomas M. Maroldy B. ANE HOLLYWOOD, MD., MAY 20, 2007 1959 Frank W. Bloechl B. IE SARASOTA, FLA., FEB. 15, 2009 | Bobby J. Kerley B.S. CE GREENSBORO, N.C., APRIL 6, 2009 | Lloyd H. Pope B. EE CHILDERSBURG, ALA., FEB. 11, 2009 | Ronald T. Schlosser Sr. B. EE BROOKSVILLE, FLA., OCT. 18, 2007 1960 Dr. Howard A. Davies PH.D. CHE FLORENCE, S.C., MARCH 13, 2009 | David G. Dickson Sr. B.S. EAG PITTSBORO, N.C., FEB. 25, 2009 | Robert E. Lewis B. EE TAMPA, FLA., NOV. 19, 2005 | George H. Perry B. EE BURNSVILLE, N.C., MARCH 12, 2007 1961 Alva K. Gillis Jr. MSE MELBOURNE, FLA., DEC. 10, 2008 | Paul G. Suchoski B. EE CHEVERLY, MD., MARCH 2, 2009 1963 Walter D. Patton B. ME ORANGE SPRINGS, FLA., MARCH 26, 2009 1964 Lloyd N. Wilson Jr. B. IE TAMPA, FLA., DEC. 15, 2008 1966 Randolph E. Lee Jr. MSE KEY BISCAYNE, FLA., FEB. 15, 2009 1968 Arthur K. Hargrove B.S. EE IRVINE, CALIF., AUG. 7, 2002 1969 Ms. Virginia W. Perry ME LENOX, MASS., MARCH 6, 2009 1971 Dennis W. Renner MSE FORREST, VA., AUG. 30, 2004 1975 Justo I. Corripio B.S. IE ALLEN, TEXAS, JAN. 12, 2007 | Harold W. Humerickhouse B. ET LONDON, ARK., APRIL 11, 2009 1979 Robert L. Bunn B.S. EE CLEARWATER, FLA., DEC. 18, 2006 | Stephen P. Joca B.S. CE ORANGE PARK, FLA., JUNE 1, 2007 1981 Donald E. Maurer B.S. EEN JACKSONVILLE, FLA., MARCH 20, 2009 1982 Bradly A. Aerts B.S. CHE COLLIERVILLE, TENN., SEPT. 1, 2008 | Ernest G. Weeks B.S. ISE SPRINGFIELD, VA., DEC. 11, 2008 1985 Robert S. Baker B.S. ENE JACKSONVILLE, FLA., AUG. 12, 2007 1987 Glenn E. Storm Jr. M.E. CHE MIAMI, FLA., OCT. 29, 2007 1995 Gordon K. Skau B.S. EE PLANT CITY, FLA., JAN. 15, 2006 1999 Manisha Kratochvil B.S. CHE ANTIOCH, TENN., MARCH 2, 2009 2003 Anthony M. Stell M.S. NES CLYDE, N.Y., FEB. 27, 2007 2005 Dr. Min-Ho Park PH.D. CEN NACOGDOCHES, TEXAS, SEPT. 15, 2008

SAVE THE DATES....

AUG. 6, 2009
College of Engineering Dean's Reception at the Florida Engineering Society Annual Meeting.
The Breakers in Palm Beach at 5:30 p.m.
dwade@eng.ufl.edu
352-392-6795

OCT. 2-4
UF's SWE 50-year jubilee

OCT 2-3, 2009
Department of Materials Science & Engineering 50th Anniversary Celebration
Includes department tours, presentations and a celebration banquet.alumni.mse.ufl.edu
352-846-3300

NOV. 6-7, 2009
College of Engineering Centennial Kickoff

FRIDAY
Benton Hall Historical Marker Dedication & Reception
Marking the site of the original Benton Hall, UF's first engineering building

SATURDAY
Gator Engineering Tailgate Reunion
Three hours before kickoff of the UF vs Vanderbilt football game.

NOV. 6-7, 2009
Milestone Anniversary Celebrations for CCE, ECE, ISE, MAE and NRE
Department tours, presentations and celebration banquets.

NOV. 19-21, 2009
Grand Guard Reunion
Weekend of events honoring the Class of 1959 and all prior years, hosted by the UF Alumni Association.
ufalumni.ufl.edu
352-846-3580

Info on registering for these events will be available later this summer.

For **CENTENNIAL CELEBRATION** and **DEPARTMENT ANNIVERSARIES** info go to: 100years.eng.ufl.edu

ILLUSTRATION BY JOHN DUNNE

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