THE END OF AN ERA
AND THE BEGINNING OF ANOTHER

It is certainly not usual that an "annual" report would cover a period of eighteen months, but there has been little that is usual about the past year for Tulane Engineering. Had it not been for the events of fall 2005, this report would have covered the activities of the School of Engineering during calendar year 2005. Instead it covers the period of January 1, 2005, through June 30, 2006, the date that the School of Engineering ceased to exist as a separate entity.

In June 2005, we concluded our 2004/2005 fiscal year, and it was a very successful year for the School. During 2004/2005, accreditation of the Computer Science program was renewed and Computer Engineering was accredited for the first time, bringing to nine the total number of degree programs accredited by the Accreditation Board for Engineering and Technology (ABET).

In spring 2005, 30% of the BS degrees awarded by the School were awarded to women, placing it #15 in the country, and 45% of the MS degrees and 40% of the PhD degrees awarded by the School were awarded to women, placing it #2 and #1 in the country, respectively. It was also an excellent year in research funding, which increased by 6%; Annual Fund giving, up 14%; and overall fundraising, up 38% (discounting the $30M Filo gift of the prior years). And at the conclusion of the fourth year of our ten-year plan to overcome the School's annual budget deficit, we appeared to be on track.

Then, on August 28, Hurricane Katrina struck the Gulf Coast, the city of New Orleans was flooded, and Tulane students, faculty and staff were dispersed around the country and, in a great many cases, beyond. The University suffered severe financial losses due to the storm and its aftermath and was forced to develop the Tulane University Plan for Renewal, aimed at ensuring its financial stability while strengthening it as a world-class educational and research university. As a result of this plan, a new School of Science and Engineering was formed, bringing together the sciences and two engineering programs: biomedical engineering and chemical and biomolecular engineering. The remaining engineering programs were targeted to be phased out by June 2007. As dean of the new school, I was charged with the opportunity to lead "a planning process...to define a new vision for engineering within the context of the School of Science and Engineering and to also build a strong foundation from which Tulane can strategically grow its science and engineering presence in the future."

Classes resumed at Tulane on January 17, 2006, a remarkable accomplishment given the state of the University less than five months earlier. And on May 13, the University celebrated an extraordinary commencement weekend that was a testimony to Tulane's resilience and the important role that it will play in the revitalization of the city of New Orleans. But the spring of 2006 was bittersweet for Tulane engineering as we witnessed the end of an era (The School of Engineering) and made preparations for the beginning of another (The School of Science and Engineering). Since its inception in 1894 as the College of Technology, engineering at Tulane has undergone many changes over the years, but none as extensive as this. Yet engineering is still very much alive at Tulane University and it will be a vital component of the School of Science and Engineering. This year's annual report chronicles some of the achievements of the Tulane engineering faculty and students in 2005/2006.

And there will be many more in the years to come.

Nicholas J. Altiero
First Day Of The Semester Was Also The Last

On a sunny August afternoon, anxious freshmen gathered for orientation — their first such gathering at Tulane University. The setting was McAlister Auditorium. The time was 1:00 pm and the weather forecast was sunny and hot with an increasing chance of showers through the weekend.

When they arrived, “the message President Cowen gave them was: Moms and dads, take your students and leave,” said Missie McGuire, assistant vice president of campus recreation and student centers. Most students arrived on move-in weekend only to drop their bags and be told within hours to leave — go home or evacuate with the university to Jackson, Mississippi.

The simple act of entering the city became a sensory overload as a military escort blazed across the Lake Pontchartrain Causeway with our rescue team. As they drew closer, the sights and smells of a devastated city came into sharp focus.

Brian Mitchell, Vijay John, W.T. Godbey and John Prindle were among a handful of faculty and staff cleared for regular entry into the engineering building. They returned to secure the facility and the equipment and to collect innumerable hours of research. Many biological samples had been left in un-replenished liquid nitrogen (LN\textsubscript{2}) dewars for two sweltering weeks. When they arrived, the team was thrilled to find that the dewars remained cold as they quickly refilled the LN\textsubscript{2}. Unfortunately, some frozen samples had begun to decompose. Our team also attended to the liquid nitrogen and helium needs of the Chemistry Department and Tulane’s Coordinated Instrumentation Facility, whose Nuclear Magnetic Resonance Spectrometers required the recharging of their reservoirs as well. Dean Nick Altiero also returned and sifted through a live, darkened campus for payroll records to ensure that his graduate students continued to receive their stipends.

Following the storm, tension was high as security and health risks in the area were of major concern. But soon cleanup and repair operations started on campus. Electrical and computer services began to return. Reconnecting with colleagues was a priority. The importance of family and friends as well as the frailty of the human condition were on the minds of everyone affected. And so was a new spirit of brotherhood.

The outpouring of support from other universities was astounding. The diaspora was taken in by families in Texas and Mississippi. Students and faculty were allowed to continue their research at LSU, Rice, Baylor, University of Houston, Columbia, Rensselaer and many others. Assistant Professor Anthony Lamana lead a group of researchers in Omaha, Nebraska. “It’s sort of like a bad TV show: all of us living in the same house,” says Lamana. He rented the house for all of them while he worked a half-time visiting professorship at the Peter Kiewit Institute. Professor Yunfeng Lu piled a group of students into his car and drove north to Shreveport, Louisiana. They eventually made their way to Albuquerque and settled down to work at the University of New Mexico.

Continued on page 4
Renewal Plan Brings About Change

Many of our students continued to study and do research on their own while spread around the world, dedicated to their studies, to the university and to the rebuilding of New Orleans. That dedication to rebuilding continues today.

Flash forward to January 2006, when students from around the country arrive at Tulane to resume classes. "When I came back in early January, the campus was already back to normal," says Research Assistant Mickaël Gay. Thanks to a herculean effort by Tulane's facilities management, life (and classes and research) goes on.

SINCE KATRINA WE HAVE HAD ALL THESE STUDENTS WHO ARE ANXIOUS TO HELP NEW ORLEANS REBUILD.

But the city is still in need of much restoration. Over the summer, fourteen students took part in Semester in NOLA, a six-week program coordinated through the university's Center for Public Service that combines both academic and hands-on internship experiences. The purpose is to offer students an intensive introduction to the history and culture of New Orleans and to explore the relationship between knowledge and civic engagement, says Amy Koritz, associate professor of English and one of four members of Tulane's faculty to team-teach the academic portion of Semester in NOLA.

I AM EXCITED TO FIND THE LIGHT AT THE END OF THIS TUNNEL.

Professors Laura Steinberg and Anthony Lamana from the Department of Civil and Environmental Engineering have worked on long-term project to assess the environmental impact of Hurricane Katrina. Their project is funded by the National Science Foundation. Right after the storm "we went down to New Orleans, looked at the damage, catalogued it," says Lamana. "This will provide an opportunity for students in environmental engineering, civil engineering and public health." He adds, "We are going to have a lot of work to do." Projects like Koritz's and Steinberg's are a glimpse into the future of the university – a future that includes many changes. The same Renewal Plan that created the Semester in NOLA also changed the structure of the century-old School of Engineering.

The new School of Science and Engineering will include the Department of Biomedical Engineering, the Department of Chemical and Biomolecular Engineering as well as Physics, Chemistry, Cell and Molecular Biology, Psychology and other sciences. The restructuring of the school will also mean the elimination of several key departments: Civil and Environmental Engineering, Mechanical Engineering and Electrical Engineering and Computer Science. Students who started in these departments will graduate with their degrees in 2007, and research will continue.

This is an opportunity to strengthen the ties between the new School of Science and Engineering, Tulane's Medical School, School of Public Health and Tulane's National Primate Research Center. The potential in stem-cell culture, gene delivery to cancer cells and vaccine development and delivery are quite impressive. The family of Tulane Engineers will continue to grow. Gifted students continue to enroll in our new programs. "We have a commitment to the students to continue to educate them and to create a new generation of problem solvers," explains Nick Altiero.

"We have lost a lot over the last year," says Altiero. "Many people lost their lives to the storm, including emeritus professor Karlen "Ducky" Riesz. Riesz, 92, who was rescued from rising water with his sister from their Audubon Street home, had been ill and was in a particularly fragile state, said Martha Sullivan, former Tulane vice president of student affairs. He died in transit to an evacuation center in Shreveport, Louisiana. The Dean continues, "It is in his memory and the memory of School of Engineering Board members Joe Krebs and Waldemar Nelson that we must continue to educate, to research and survive in the wake of this storm of change."
The Beat Goes On In Biomedical Engineering

The Department of Biomedical Engineering is excited about the future. Besides being included in the university's new School of Science and Engineering, the department is pleased to welcome its newest faculty member, Bum-Rak Choi.

Dr. Choi earned his BS in Molecular Biology from Seoul National University in South Korea and PhD in Cell Biology and Physiology from University of Pittsburgh. Before joining Tulane, he was a research assistant professor at the University of Pittsburgh.

Working with top research groups in the field of cardiac arrhythmia, Bum-Rak is at the forefront of cardiac arrhythmia research in his development of new optical mapping techniques. Research like that of Dr. Choi is an excellent example of the future of Tulane Engineering.

According to Dean Attiero, “Our relationship with the medical scientists downtown at the Tulane Medical Sciences center will allow an ease of collaboration that was previously not available to engineering researchers” including molecular biologists for development of genetic probes, chemists for development of organic probes and redox chemistry in ischemia, and clinicians for application.

Professor Choi’s current research is on two major topics in the current cardiovascular electrophysiology research:
1) how single ion channel or gap junction kinetic features influence/modulate overall cardiac conduction and electro-mechanical/mechano-electrical couplings, which will lead us to therapeutic targets of cardiac arrhythmias; and
2) how complex 3D structure of heart such as Purkinje networks and heterogeneous cell types trigger/maintain reentrant arrhythmias.

Dr. Choi’s research is funded by ongoing grants from the National Institute of Health and the American Heart Association, with the goal of developing innovative technology to record cardiac action potentials and to provide electrophysiological information for novel heart stimulation protocols.

Teaching Assistant Enjoys A Rewarding Return

Having fled to Florida and eventually to City College in New York, PhD candidate Jerina Pillert couldn’t wait to get back. Back to classes. Back to research. Back to her students. Back to Tulane.

According to Pillert, “I chose Tulane Engineering because it felt like home. The Biomedical department was engaged in exciting and meaningful research and at the same time managed to have strong connections between faculty and graduate students. I didn’t see this at other, larger schools. I felt that at Tulane I wouldn’t be just a number or a lab rat that no one knew.”

I CAME TO RESUME MY EDUCATION IN A PLACE THAT I LOVE.

“I came back because I felt New Orleans needed me, or at least people like me. Tulane and the city needed its students to come back.”

She also came back to continue her graduate research. She is finishing up a project that investi- gates the pressures seen at an air-liquid interface undergoing mechanical ventilation in a simple rigid model of an airway. The aim of her study is to provide insight into better mechanical ventilation waveforms in order to help those suffering from Acute Respiratory Distress Syndrome (ARDS) and other diseases where the lung is filled with fluid and where mechanical ventilation becomes a necessity for breathing.

Being a TA has changed Jerina’s perspective on engineering, teaching and herself. She comments, “I never realized how hard teaching is until I was one-on-one with a student trying to answer their questions. They made me think of engineering concepts and mathematics in a whole new light.”

Her enthusiasm is obvious. “I loved being able to communicate a complicated idea in a way I had never thought of before. My reward was to see the light go on inside their heads and to be able to reinforce the idea that engineering wasn’t so hard after all. I think I even managed to convince some of them that engineering could be fun!”

When asked if she will continue to live and work in New Orleans, her answer was, “Yes, absolutely.”

Holiday at Home

Name: Jerina Pillert
Graduate Student, PhD Candidate
Degree: Biomedical Engineering
Advisor: Dr. Donald Gaver III
Hometown: Coral Springs, FL
Plans after graduation: I plan to work in industry.
Awards: Outstanding Graduate Student Teaching Award for the BME department, 2003
Member of Alpha Eta Mu Beta

On returning after Hurricane Katrina: It was difficult to stay in touch with other professors and students. Many had lost their homes and on top of that were trying to figure out their own lab situations. Mostly, we were able to keep in touch with the undergraduates working in our lab. One even came up to Brooklyn to spend Thanksgiving with us.

I was one of the lucky ones. My apartment is located downtown and didn’t suffer much damage. I had a window broken that a friend, actually another graduate student in my lab, patched with plastic wrap for me. Because of her I didn’t have to return right away.

I returned to New Orleans for the first time in late December. My mother and I celebrated Christmas in the city.
Faculty Awards Recognize Excellence

Sergey Drakunov, Associate Professor of Electrical Engineering and Computer Science, was awarded the 2005 Lee H. Johnson Excellence in Teaching Award. This teaching award was established in 1979 by the Society of Tulane Engineers to recognize teaching excellence by a member of the school of engineering faculty.

Dr. Drakunov joined the EECS Department in 2000 after teaching in Moscow for several years. His fields of study include Nonlinear Control, Observers and Filters, as well as recent work on Systems with Sliding Modes. As a graduate and undergraduate advisor, he works closely with students on their thesis projects.

Dr. John H. “Jack” Grubbs, Associate Dean for External Programs, and professor in the civil and environmental engineering department, was the recipient of the 2006 Lee H. Johnson Excellence in Teaching Award.

Grubbs, who joined the Tulane faculty in 1999 after a 34-year military career, was a professor and chair of the Department of Geography and Environmental Engineering at the U.S. Military Academy, where he had taught for 18 years. In his first full year at Tulane, he received the university’s Award for Undergraduate Teaching Excellence.

THE CEE, ME AND EECS DEPARTMENTS HAVE BEEN BLESSED WITH EXTREMELY TALENTED INDIVIDUALS AND WE ARE FORTUNATE THAT THEY HAVE SHARED THIS TALENT WITH THEIR STUDENTS.

After 45 years with Tulane University’s School of Engineering, Dr. Robert Bruce has been inducted into the school’s Hall of Fame. Dr. Bruce is the Catherine and Henry Bol Chair in Civil Engineering and is a member of the International Federation for Structural Concrete. “His contribution to the School of Engineering has been tireless and his teaching first-rate,” says Department Chair Dr. Vijaya Gopu.

The White House announced this year that Yunfeng Lu, a professor of chemical engineering, was among 58 winners of the Presidential Early Career Awards for Scientists and Engineers, the nation’s highest honor for researchers at the start of their careers. Winners receive up to five years of funding to further their research. Lu received his award for his work with ultra-small nanoscale materials that have national security sensing and detection applications.

GRE SCORES

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2005 (ALL ENTERING CLASS SCORES NOT AVAILABLE)
Top EECS Graduate Has "No Regrets"

Co-Valedictorian Alex Fink didn't apply to many colleges. “Tulane was the most distinguished and at the top of my list. I received good offers from other places but not as much as I would have liked to have had from Tulane," says Fink. He wanted a degree from a prominent school. “I decided it was worth spending a monetary cost on Tulane and not having to live with regret.”

Alex certainly has made the most of his time at Tulane, graduating at the top of his class.

Alex credits Tulane with giving him a unique combination of academic coursework, hands-on experiences and teamwork building – all of which will serve him well as he pursues his post-graduate work and research.

He remembers, “in the spring of my junior year, I participated in the Tulane University Robotic Battle Olympiad (TURBO) along with fellow electrical engineer R. Nevins Ryan III and mechanical engineer Robert K. Dolin. Having spent so much of my previous school time in lectures or very basic labs, TURBO gave me my first chance to really design and create something substantial. The entire experience was something new, as we spent countless late nights in labs designing, testing, and building our robot. I even learned the important lesson of when to avoid a problem rather than fix it.”

“While our robot lost both rounds (and didn’t even move until the second!), the process of creating something so fun by applying the knowledge from my classes affirmed my choice to be an engineer.”

I began to see the application of what I was learning to something about which I am truly passionate. From this point forward, I felt totally secure in my choice of electrical engineering, and realized the nearly endless applications of the field.”

Alex continues to pursue his passion for music, the arts and engineering. He is entering an arts, media, and engineering graduate program at ASU. “I will be able expand my knowledge of electrical engineering while working in a field I genuinely enjoy.”

But Fink notes that the most valuable lessons he learned during his four years in the School of Engineering came from the other students. The comradery and fellowship of students in such an intense program creates an unforgettable bond.

“During my freshman year on the last day to apply for the Engineering Student Council (ESC) freshman representative elections, I decided to enter myself as a candidate," Fink remembers. “Besides being new to the school, my total lack of experience in student government led to a slight hesitance to apply, but on the due date of the application, I felt that I would regret not having given the ESC a try. So, even though I barely knew anybody, I went around the Boggs lobby and lounge, collecting sigs.”

I’ll Remember the Welcoming Students

As Alex continued his studies, he found more examples of kismet in Electrical Engineering.

One day during Dr. Huang’s Electrical Circuits I class, he mentioned the word “filter.” Alex notes. “Up until this point, we had mostly learned about basic circuit analysis methods and simple circuits ... however, the mention of frequency selective filters gave me quite a surprise during the 9:00am class.” As a musician, Alex was intimately familiar with musical synthesizers. He had experimented with all kinds of different filters. “This was the first time I began to see the application of what I was learning to something about which I am truly passionate. From this point forward, I felt totally secure in my choice of electrical engineering, and realized the nearly endless applications of the field.”

I came back Labor Day for the first time after the storm but had to go back to LSU to attend classes. I returned to New Orleans at the end of the fall semester in mid-December 2005. It was nice to be back in my bed, at home, after months on my brother’s couch.

My first time back to campus was to participate in a “Save Tulane Engineering” rally that took place outside Gibson Hall.

Co-Valedictorian

Name: Alex Fink
Class of: 2006
Degree: Electrical Engineering
Hometown: New Orleans (Gretna), LA

Plans after graduation: I’m going to Arizona State Univ. to get my PhD in Electrical Engineering under an NSF IGERT fellowship. ASU has a cross disciplinary arts/media and engineering program that I’ll be working in. This is a relatively new program and two thirds of course work will be in standard electrical engineering graduate classes and the remainder, as well as research, will be focused in this special program.

Alex Fink

Awards:
Daniel H. Vilet Award
Jr. Achievement in EE Award
Leon H. Scherk Award
C.W. Ricker Award

On returning after Hurricane Katrina: My parents’ home in Gretna escaped flooding but wind damage occurred.
Outstanding Researcher Assembles Molecules As Well As A Great Research Team

Recognizing the need to honor deserving scholars and to increase the visibility of the school’s research activity, the Outstanding Researcher Award was established in 2001 by the faculty of the School of Engineering upon the recommendation of the School of Engineering Research and Graduate Studies Committee. The Award is given according to the following criteria:

- The quality and quantity of publications, with particular emphasis given to archival publications, research treatises and citations of published work.
- The total amount of research funding.
- The contributions to the mission of the university in graduate education, training and mentoring, including graduate students and post-doctoral scholars.
- National and international recognition as evidenced by honors and awards, journal editorships and participation in editorial boards, national and international scientific committees and boards, and professional patents.

This year’s recipient of the Outstanding Researcher Award is Dr. Vijay T. John, professor and chair of chemical and biomolecular engineering. Dr. John joined the faculty at Tulane in 1982, having received his BS (chemical engineering) from the Indian Institute of Technology in Madras, India; his MS degree (chemical engineering) from the University of Pennsylvania; and his PhD (chemical engineering) from Columbia University. Prior to joining the faculty at Tulane, Dr. John was a research engineer in the Central Research Division of Mobil Research and Development Corporation.

His other research activities included summer work in 1978 at the Institute of Gas Technology. In 1978-79 he was the recipient of a Columbia University Graduate Fellowship.

Dr. John currently works in the highly interdisciplinary areas of lipid self-assembly, drug and vaccine delivery, and the development of nanostructured materials.

The self-organization of amphiphilic molecules (such as biological lipids and synthetic surfactants) is essential in modern science. Biological membranes are ubiquitous examples of lipid self-assembly that impact the entire function of a cell. Technologies as mundane as consumer detergents and as futuristic as the development of structured, responsive nanomaterials all use these self-organizing molecules.

Dr. John’s latest project is in the exploitation of lipid self-assembly to induce transcutaneous vaccine delivery. Vaccine development and needle-free vaccine delivery is a grand challenge problem being addressed by researchers at the Tulane Medical School and at the uptown campus, and he feels privileged to be part of this group. Funding for his research comes from the National Science Foundation, the National Institutes of Health and the Environmental Protection Agency.

Dr. John’s self-assembled research team is made up of graduate and undergraduate students in the School of Engineering.

In a parallel but unrelated study, Dr. John’s team is working on the development of new technologies based on clathrate hydrates. Clathrate hydrates are inclusion compounds of gas and water where the water molecules form cage-like structures to encapsulate gas molecules. The compounds have tremendous implications in natural gas recovery, processing and storage.

Together with colleagues at Tulane University, Hamilton College and Los Alamos National Laboratories, Dr. John is working to exploit novel clathrate systems for use specifically in hydrogen storage.

The impact of more efficient hydrogen storage may be felt closer to home than you think. Many of the next-generation, fuel-efficient vehicles will depend on improved hydrogen storage to compete with conventionally fueled vehicles in the future. This research is funded by the Department of Energy.
Making Inroads Into Artificial Intelligence

It’s not “KITT” from the television series Knight Rider, but it’s close. It’s the Kat-5, a robotic vehicle designed by Tulane Engineering undergraduate students to compete in a driverless cross-country race.

Unlike “KITT” (short for Knight Industries Two Thousand) which was a 1982 Pontiac Trans Am, the Kat-5 is a silver Ford Escort. The hybrid SUV was modified with computers, a GPS receiver and sweep sensors, and features solar panels on the roof to serve as an alternative fuel source. The equipment was purchased by Gray Insurance Co., a Metairie-based business, and the Tulane students worked alongside the company’s IT department to modify the SUV. “It was called ‘Gray Ghost’ but after Katrina it was changed to ‘Kat-5,’” says Crist Koutsougeras, a Team Gray advisor and associate professor at Tulane in the Electrical Engineering and Computer Science Department.

WE WERE ONE OF ONLY FOUR TEAMS TO COMPLETE THE 132-MILE RACE. WE FINISHED THE RACE IN 7 HOURS AND 30 MINUTES...JUST 37 MINUTES BEHIND THE WINNER.

The race, the DARPA Grand Challenge, sponsored by the Department of Defense, invites academic types, industry researchers, backyard inventors and automotive enthusiasts to create the best autonomous ground vehicle, an auto-piloted vehicle that can navigate itself through an obstacle course. 23 vehicles in all arrived to compete.

Tulane engineering students Matthew Dooner, Ross Kaplan, Powell Kinney, Aaron Lee and Jorge Nagel were part of Team Gray.

Once the parts were in place, the most difficult task was how to build programs that would interpret the sensory information and produce the controlling signals. “Our students were instrumental in this task,” says Koutsougeras. “[They] were mostly focused on the artificial intelligence part that would make the computer coordinate the steering, acceleration, braking, etc.”

In the middle of modifications came hurricanes Katrina and Rita. While evacuated from New Orleans, Powell Kinney and other students took classes at Louisiana State University and continued to work with Team Gray up to the competition.

But Kat-5’s “gray matter,” as they called its artificial intelligence, handled the challenges admirably. “We went against teams with previous experience and more time and resources. We thought it was all gone in the winds of two hurricanes, and we are fourth at the finish line!” exclaims Koutsougeras.

The winning vehicle, “Stanley,” entered by Stanford University, finished the race in 6 hours and 53 minutes. Next came two vehicles entered by Carnegie-Mellon University. Team Gray’s Kat-5 came in fourth with an average speed of 17.5 mph. The first four finishers are the first ground vehicle robots to travel a great distance at a relatively high speed. “These vehicles haven’t just achieved world records,” says DARPA Director Tony Tether, “they’ve made history.”

So he’s not David Hasselhoff. But Powell Kinney continues to impress as he moves towards his next challenge — medical school. Meanwhile, Gray and Company has started a new company in order to develop, market, and sell the technologies created for the Grand Challenge. Powell Kinney is currently working on miniaturizing and standardizing hardware used in the race.
A Week Of House-Busting, Robot-Busting

From a visit from "house-busters" and a blood drive to a war between robots, Tulane engineers put a lot of spirit into their celebration of E-Week.

"In a post-Katrina world, we are celebrating not only engineering but also the return of the city of New Orleans," said sophomore Reanna Poppus, Engineering Week (E-Week) chair. The Boggs Center for Energy and Biotechnology served as the backdrop for the annual celebration, March 13-18.

On display this year was the "house-buster trailer" used by a group of volunteers to clean out homes in devastated areas of New Orleans. Gordon Dyer, technology transfer officer with Lockheed Martin Michoud Assembly Facility in eastern New Orleans, heads up the house-buster project for his company. He was full of praise for a group of more than two dozen Tulane engineering students who have spent weekends gutting out the homes of Lockheed employees along with Lockheed volunteers, wielding eight-pound sledges, sissors and cutting out wheelbarrows full of ruined building materials.

"They are tremendous," Dyer said of the students, "and that comes from every Lockheed Martin employee that bumps into one of them. God bless the Tulane students for helping us turn this around." Sponsors of Tulane E-Week were the American Society for Engineering Education, Bob Bros. Construction Co. LLC and Coca-Cola.

The focus on Friday turned to the TURBO Robotic Design Competition, sponsored by Tulane University Robotics Battle Olympics. The event was promoted as "a ruthless and exciting competition where teams pit their rolling machines of destruction against each other for fun and prizes."

In addition to size regulations, teams have one cardinal rule for the construction of robots: total value of parts cannot exceed $300 on eBay. "And no marionette strings!" laughed David Emerson, a senior double-majoring in physics and English. Along with Biomedical Engineering senior Powell Kinney, Emmonson was on Team Trogrodor, who entered their giant robot in TURBO. Trogrodor is a remote-controlled, rectangular robot constructed of more than $50 and 70 pounds' worth of steel bolts framed atop a combination of Power Wheels and office chair rollers.

Trogrodor annihilated most of the competition, such as RC Car and Sir Bots-a-Lot. It chased Kratankator - a small, nimble, pyramid-shaped robot capable of flipping onto an alternative set of wheels - into a wall, where Kratankator bored in its drill-shaped nose and got stuck. "Last night we dropped the remote control [to Kratankator] in water, so we knew we were in trouble," explained Erin Gillian, a senior art and physics major. She created Kratankator along with Rob Hayward, a junior majoring in cell and molecular biology and math.

The one robot Trogrodor could not demolish was Ninjaneer, a huge black box powered by a 12-volt car battery and rigged with power saws. Blaring heavy metal music as it charged, Ninjaneer literally cut down its competition. However, because it violated the size regulations (it was larger than eight cubic feet), Ninjaneer was not eligible for a prize.

Excerpt used by permission of Carol Schlueter and Kathryn Holgred from The New Wave, March 10, 2006

The "House-Buster Trailer" draws visitors outside the Boggs Center during this year's E-Week festivities.
Biomedical Engineering senior Mary McCarty may be part of a revolutionary discovery in emergency medicine. Her findings could help limit bleeding in case of injury and reduce the need for surgery-related transfusions.

On April 5, 2006, Mary presented her paper, entitled “Inhibitors of endogenously formed CO arrest bleeding and confer protection in a model of severe hepatic injury,” to the The American Physiological Society (APS) at their Experimental Biology 2006 convention in San Francisco and as part of their Regulation of Cerebrovascular Function in Health and Disease symposium.

Mary McCarty
Award Nominee Presents Groundbreaking Paper

MCCARTY USED A CHEMICAL THAT BLOCKS CARBON MONOXIDE TO ARREST TRAUMATIC BLEEDING IN RATS.

The study of CO in the tissues – including its role in diabetes, cardiac dysfunction, hypertension and asthma – has become a subject of increasing interest for researchers, according to the APS. However, this is the first time scientists are looking at its role in soft tissue trauma, said McCarty. The small amounts of carbon monoxide that exist in the tissues help control blood pressure by dilating the blood vessels. McCarty and her team reasoned that blocking the dilating action of CO would cause injured blood vessels to constrict, limiting bleeding and maintaining adequate blood pressure.

The research is still a long way from use in humans. But if successful, the suggested application could eventually help stanch massive bleeding in instances of soft tissue trauma and help reduce the need for blood transfusions of patients facing lengthy surgery, among other uses.

“We wanted to apply our knowledge of CO production in the tissues to traumatic injury,” McCarty said. “We’re looking at CO’s function in the peripheral circulatory system, in particular, at the effect it has on the endothelium.”

A serious laceration damages the vascular endothelium, comprised of cells lining the blood vessels, by tearing it apart. When the endothelium is torn, it disrupts the production of nitric oxide synthase (NOS), a blood vessel dilator that is even more powerful than CO. Without the NOS production at the area of damage, the vessels dilate. However, CO continues to dilate the vessels around the wound. Inhibiting the CO, the remaining vessel dilator, allows further constricting at the site of trauma.

In the study’s first phase, the researchers removed tiny blood vessels, known as arterioles, from rats, and put the vessels in a chamber that simulated the body’s blood flow. They removed the endothelium in half the blood vessels, to simulate what happens in soft tissue trauma that causes massive bleeding. When the researchers administered a drug that blocks CO, they found that the vessels with the

Continued on page 12
Finding Could Limit Bleeding In Case Of Injury And Reduce The Need For Transfusions

intact endothelium dilated as expected, because the endothelium produces the dilator NOS. But vessels with damaged endothelium, in which NOS was inhibited, constricted. "The undamaged vessels continue to get blood to the other areas of the body," McCarty said. "This control of bleeding at the site of the trauma while allowing circulation in the rest of the body is one of the most exciting aspects of the study."

sored by the National Institutes of Health and the U.S. Department of Defense. Not only could it be used to save wound victims and reduce the need for transfusions for surgery patients, but the principal could be applied as a precaution to soldiers in battle zones. In fact, it may be possible to provide a diet that contains the preventive treatment.

ONE OF THE GREAT THINGS ABOUT WHAT WE'VE FOUND IS THAT, BY BLOCKING THE EFFECTS OF CARBON MONOXIDE, ONLY THE AREA OF DAMAGE CONSTRICTS.

In the second phase, the researchers anesthetized two groups of rats, lacerated the livers and measured the drop in blood pressure over two hours. The blood pressure of the rats that received the CO blocker remained higher for a longer time and significantly prolonged survival.

"It's exciting because it can have so many implications," McCarty said of the research, spon-

McCarty is one of 12 finalists for a David S. Bruce Undergraduate Research Award from The American Physiological Society. The American Physiological Society was founded in 1887 to foster basic and applied bioscience. APS provides a wide range of research, educational and career support, and programming to further the contributions of physiology to understanding the mechanisms of diseased and healthy states.

New June Date Allows Engineering Forum To Proceed Without The Threat Of Evacuation

As New Orleans faced yet another hurricane season, the organizers and sponsors of the annual Tulane Engineering Forum decided that holding the event in early June would decrease the likelihood of cancellation due to another you-know-what.

The theme of the 8th Annual Tulane Engineering Forum was Engineering in a Coastal Environment and Included concurrent sessions on Infrastructure, Environmental, Energy, and Aerospace as well as Coastal Erosion, Security, Petrochemical, and Shipping.

An expert panel presented a technical perspective of the effects of Hurricanes on the local infrastructure and economy — a timely topic. Discussions followed regarding design considerations for withstanding hurricane forces, protecting critical infrastructure and mitigating hurricane effects. Specific presentations were given on the emergency rehabilitation of the I-10 Twin Spans by Edward Scheuermann of Boh Bros. Construction Co. The afternoon was filled with practical discussions of environmental, energy, security and ethical considerations in a post-Katrina world.

Keep an eye out for more information at eng.tulane.edu as the 7th annual Forum is tentatively scheduled for May 2007, at the New Orleans Hilton Riverside and Towers.
Research Assistant Goes With The Flow

As they say in the fluids business, "The Flow Must Go On!"

Few researchers know this better than Mickaël Gay. His research in the area of computational mechanics of fluids was slowed to a trickle, thanks to hurricanes Katrina and Rita.

Gay explains, "I have been using the Immersed Finite Element Method (IFEM) to solve fluids, solids, as well as fluid-structure interactions problems. I apply this method to the modeling of complicated real-life problems such as thrombus formation in an artery and the deployment of a stent to cure a constricted artery from its blockage."

After spending a week evacuated to Houston, Mickaël went home to France. "Then, I contacted some professors from my previous university, Institut des Sciences et Techniques de l'Ingénieur de Lyon. I asked them if I could stay for a few weeks to work on my research. They were very helpful, offered me an office and access to their computational resources."

Even though he left most of his files in his office, Mickaël was able to conduct part of his research.

Just a week before the storm Gay concluded a collaboration with the Tulane Medical School. Dr. Salazar was supposed to generate computed tomography images of the left atrium of the heart, which Gay would use to reconstruct a three-dimensional geometry of it. "Unfortunately, we soon were told that the medical school was greatly affected by the storm and our collaboration gone."

"At that point in my research, this was a problem."

While in France, Mickaël spent weeks organizing a new international collaboration. "I have been able to get the same data as the one I should have gotten from the medical school from one lab in Italy and one in Germany," he notes. Mickaël returned to New Orleans in early January 2006 to finish his PhD.

I WASN'T GOING TO RESIGN NOW.

"I came to Tulane thanks to an exchange program between Tulane and my university in Lyon. I didn't really choose Tulane; I applied to go abroad and I ended up here in New Orleans. But I guess it says something that I came for a one-year program in 2000 and I am still here."

Gay continues, "I met great professors and friends here at Tulane. And if I am still here it is mainly thanks to my previous advisor Dr. Michaelides, the chairman of my department Dr. Mehrabadi and my advisor Dr. Zhang."

Currently, Mickaël is developing a fluid-structure numerical model to study blood flow inside the left atrium. His goal is to better understand a particular heart disease named Atrial Fibrillation, which is also related to blood clot formation.

Mickaël Gay is glad to be back at work in the lab. He enlisted the services of labs in Italy, Germany and France to complete his research after the storms.

Outstanding Research Assistant

Name: Mickaël Gay
PhD student, Research Assistant
Department: Mechanical Engineering
Faculty Advisor: Dr. L.T. Zhang
Hometown: Ligny en Brionnais, France

Plans after graduation: I am not sure yet. I am still debating myself between academic, post doc, and an industry position.
If I choose the industry position I would like to do research for a bioengineering company.

Awards:
Outstanding Research Assistant, Mechanical Engineering Department, 2006
Outstanding Teaching Assistant, Mechanical Engineering Department, 2005

On returning after Hurricane Katrina: I wasn't very surprised by what I saw. Many of my friends and family back home ask me how is New Orleans now. This is a very difficult question for me because we all know how the situation is but when I tell them that, in my everyday life, it is pretty much the same as before the storm, they are amazed. Living and working uptown are not that different compared to before...This is a weird feeling; it's like sometimes we forgot what happened.
Something’s Fishy In The EECS Department (And It’s Not Sushi)

Professor Raj Pandian’s new pet is curious, intelligent and sensitive. And it’s swimming around in a large tank of water in the robotics lab.

This pet project of Raj Pandian, assistant professor of electrical engineering and computer science, is a prototype underwater robot called TUNA (Tulane Underwater Navigator).

I AM WORKING ON INTELLIGENT UNDERWATER ROBOTS – ROBOTS THAT GO INTO AQUATIC ENVIRONMENTS TO AUTONOMOUSLY DO SURVEYING OR MONITORING, AS WELL AS MANIPULATION.

New Orleans is surrounded by water, and the safety and health of the city are directly impacted by conditions in the Mississippi River, Lake Pontchartrain and its tributaries, and the Gulf Coast. Pandian’s robotics research promises new techniques for gathering data regarding coastal erosion, pollution, and hurricane and flood control.

TUNA is equipped with a video camera for capturing visual images and environmental sensors. In the future, it will be equipped with guidance sensors and sonar, which can function even in murky waters.

One goal in designing the robot was to keep its cost low, according to Pandian. TUNA was constructed using commercially available parts, including trolling motors and data acquisition cards.

Testing the robot has been carried out in a tank in the robotics lab at Tulane, and Pandian wants to continue testing in Lake Pontchartrain and the Tchefuncte River. “We want to put it into real-world conditions, to see how much depth it can handle, how much flow. That will really be the test for any new system we develop,” he says.

In addition to advancing robot design, TUNA will be helping educate children.

“We have teamed with the Lake Pontchartrain Basin Maritime Museum in Madisonville, LA, and with the St. Tammany Parish school system on this educational project,” says Pandian. Tulane and the museum recently received a two-year education grant from the U.S. Environmental Protection Agency, with the robot as its centerpiece. The plan is to send TUNA to the museum to help encourage students to pursue careers in science. As the program develops, students will use the robot to observe old shipwrecks in the Tchefuncte River or to look at the environment of the lake.

“We are talking to the school district administrators about incorporating this into their curriculum,” says Pandian.

Tulane’s expertise in robotics delighted kids of all ages at the Wooden Boat Festival in Madisonville on Nov. 19 and 20. Tulane engineers hosted a booth at the festival, featuring a tabletop-sized underwater robot in a tank complete with fish and shells.

Pandian is currently at work on a next-generation underwater robot. “TUNA is a remotely operated vehicle, or ROV, requiring a human operator. The new robot will operate autonomously,” says Pandian. “It can go out on its own, do some monitoring or surveying, perform underwater manipulation or repair, and then come back.” Pandian’s research has been of interest to the Louisiana Universities Marine Consortium and the U.S. Naval Research Laboratory at Stennis Space Center in Mississippi, which are both concerned with improving coastal monitoring technology.

Excerpts used by permission of Arthur Hoad from The New Wave, November 31, 2005.
Goldwater Scholar Was Determined To Finish What He Started

E-school senior Jonathan Bakke did finish his degree in Chemical Engineering at Tulane. And he finished in first place!

Jonathan is one of two Valedictorians in the School of Engineering’s Class of 2006.

In a time when changes in the school’s structure are top-of-mind, it is easy to forget that our purpose hasn’t changed: to educate the next generation of leaders in Engineering science and research.

Jonathan is just one of many success stories from the past year. And he credits Tulane for much of that success. He explains that “growing up in Louisiana, I knew of Tulane’s great academic record, especially in engineering. I also wanted a much more holistic experience, and I knew that I would be able to expand myself in such a unique city as New Orleans and at a school with such a diverse student population as Tulane.”

This “holistic” approach means that Jonathan’s classmates were as much a part of his learning experience as the teachers or the curriculum, Bakke explains. “My first big project in engineering was during my sophomore year for my Material and Energy Balances class. There were around six four-member groups, and each group had to perform all the calculations around a methanol synthesis plant. I enjoyed the project because it was my first experience with an actual process that chemical engineers study, but the reason that project is such a great memory is because my entire class spent several all-nighters in the computer lab working on the project. We ordered pizza late at night and spent all night helping each other through difficult problems. That project was our first bonding experience as a class, and we became great friends, which made the next three years of work much more enjoyable and fun.”

Then the learning (and the fun) was put on hold.

“When the storm hit, I went home to Baton Rouge. And for that semester, I took classes at LSU. Throughout the semester I managed to contact my professors via alternate email addresses and eventually cell phone numbers. Once email and cell phones worked, I got in touch with a good number of my friends.”

Like most of the students and faculty, Jonathan continued to study during the evacuation. In fact, he was honored with the Barry M. Goldwater Scholarship while living in Baton Rouge.

Established by Congress in 1986 to foster and encourage excellence in science and mathematics, the Barry M. Goldwater Scholarship and Excellence in Education Foundation operates an educational scholarship program designed to provide opportunities for American undergraduate students with excellent academic records and outstanding potential. Goldwater Scholarships support study in the fields of mathematics, engineering and the natural sciences as preparation for careers in these areas. Awards are made on the basis of merit to juniors or seniors studying in these areas. Each award covers eligible expenses, including tuition, fees, books, and room and board, up to a maximum of $7,500 per year for one or two years.

I COULDN’T DREAM OF SPENDING MY LAST SEMESTER OF COLLEGE ANYWHERE BUT TULANE.

But graduating elsewhere wasn’t an option for Bakke. “I couldn’t dream of spending my last semester of college anywhere but Tulane.”

He returned to New Orleans as quickly as possible. “I first returned to visit one night during November with some of my fellow Tulane students at LSU,” says Bakke. “It was very strange. Once you leave uptown or the Quarter, New Orleans doesn’t look the same anymore. It is difficult to drive around and see entire sections of the city devastated.”

“The reality of it hit me hardest when I drove through Lakeview for the first time in November. There were no residents, and the yards and streets were full of random objects and trash piles from the people who had begun gutting their houses.”

Undaunted, Jonathan returned for good on the first day I could move in early January.

Tulane honors Jonathan Bakke as Co-Valedictorian, for his academic accomplishments in the past four years. And, in turn, he honors the School of Engineering with all his future accomplishments.

Co-Valedictorian

Name: Jonathan Bakke
Class of: 2006
Degree: Chemical Engineering and Mathematics with a Business minor
Advisor: Kyrilakos Papadopoulos
Hometown: Baton Rouge, LA

Plans after graduation: I am working for ExxonMobil Process Research this summer as an intern, and then I am moving to California to pursue my PhD in Chemical Engineering at Stanford.

Awards:
Barry M. Goldwater Scholarship (2006)

Jonathan Bakke

Tulane 34 Awards: given to 34 graduating students each year from all colleges at Tulane (2006)
Lao H. Scherck Award for Excellence in Engineering (2008)
Most outstanding Practice School group for Chemical Engineering (2006) Tulane University Dean’s Honors Scholarship (2002-2006)
New Orleans Chapter of the Louisiana Engineering Society Scholarship (2001)
AIChE Achievement Award: Highest GPA for a Chemical Engineering junior senior (2005, 2006)
Dean’s List for Tulane University School of Engineering (2002-2006)
LSU Chancellor’s Honor Roll (Fall 2005)
2005 Tulane Homecoming Court
NEW REBUILDING FUND’S ROLE IN OUR FUTURE

The Tulane University Rebuilding Fund, established in September 2005, will help the university rebound from Hurricane Katrina. In spite of the painful cuts that have been made to the University’s programs – especially those affecting our School of Engineering – I feel that we have an obligation to the students and faculty who remain to build a stronger and healthier system.

Because of the enormous challenges we face, Tulane has set a goal of raising $100 million in unrestricted gifts by 2007. This initiative is advancing thanks to generous support from our alumni and friends.

We are in extraordinary times – uncharted waters. But we are fortunate to have retained the leadership of Dean Atiero as the new Dean of the School of Science and Engineering. The university has pooled its resources to create this one, central fund to make certain that priority needs across the entire university are addressed in an effective and efficient manner.

But don’t fear! You may designate your Rebuilding gift to the new School of Science and Engineering or to a particular department within it. Your designations reflect the commitment and support that you have demonstrated for them over the years.

Associates’ recognition levels remain in place as we raise unrestricted funds earmarked for our rebuilding efforts.

Through the fund, your gift will make possible supplemental services and educational support that is crucially needed for students, faculty and staff through the rebuilding. Your gift also will help offset costs of various programs and scholarship assistance vital to student retention and recruitment. Additionally, your gift will aid in preserving and upgrading equipment, learning resources and facilities, especially when other means are insufficient. It is this final aspect of giving that will be of most help to our newly reorganized school.

Your gift will help renew Tulane University, the students and the researchers...and ultimately the communities we serve.

Tina M. Reynolds, Development Officer
Tulane School of Engineering
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THE SOCIETY OF TULANE ENGINEERS’ EPILOGUE

Faculty, staff and graduates attend the Society of Tulane Engineers awards banquet, April 19, 2006.

Admittedly, much has changed for our engineering family since Katrina struck last August. What has not changed is the relevance of this society and the impacts that our engineering alums will make in the future. After the university released its Renewal Plan, there was much to be disappointed about. The combined loss of the Department of Civil and Environmental Engineering, the Department of Mechanical Engineering, and the Department of Electrical Engineering and Computer Science is significant and should not be minimized. However, in the aftermath, there is much about which to be hopeful.

Regardless of what we strive for in life, all of us as members of this society are engineers. What does that mean? At its most basic definition, we use scientific knowledge to solve practical problems. What we are dealing with is a practical problem.

And one that is solvable.

Tulane University President Cowen has already amended the plan to include more specific details about the future of engineering at Tulane. And the Board of Advisors has been charged by him to help Dean Altiero produce a viable plan. Collectively, the members of the Society of Tulane Engineers share a vision of an expanded engineering presence within this new school. The divisions that have been established for the School of Science and Engineering certainly are a good foundation. Eliminated programs, such as Computer Science, have a natural home in the Mathematics and Computational Science Division. Likewise, for other appropriate programs. And the school’s commitment to Biomedical Engineering and Chemical and Biomolecular Engineering has never been stronger.

I ask that as the Society of Tulane Engineers we all work towards bringing that vision to reality. The great legacy of Tulane engineering demands no less from us. I believe the renewed legacy of an energetic, interested and effective Society of Tulane Engineers will be around for a long time to come.

David Kanger (CE ’96, MSE ’96), President
Society of Tulane Engineers