A Whale of an Aquarium
"Georgia Tech gave me an outstanding professional education, and one of my most valuable assets. It taught me how to think...This is priceless!"

Teresita and Juan Antonio Michelena,
ME 1962
Key Biscayne, Florida

- Native of Havana, Cuba, and a junior at Tech during the Cuban Revolution.
- Member of Pi Tau Sigma, mechanical engineering honorary fraternity.
- Worked as a development engineer with Celanese Corporation, manager of product development for Burlington Industries, and vice president for development for Texfi Industries.
- In 1977, named president and a member of the board of Celanese Venezolana.
- Retired as chairman of the board of Mantex, manufacturing and real estate development, after 26 years.
- Awarded the Order Francisco de Miranda by the president of Venezuela for contributions to the community.
- Served as president and a permanent member of the board of directors of the Venezuelan American Association of Commerce and Industry.
- Serves on the Georgia Tech Advisory Board.
- Inducted in 2001 into the Georgia Tech College of Engineering Academy of Distinguished Engineers.
- Married for 44 years; three children (Juan III, TE 1983) and ten grandchildren.

Gifts to Tech:
- Roll Call donor for 44 years.
- Bequest provision to support Reconstruyendo el Puente (Rebuilding the Bridge): A Fund for Scholars from Cuba, which provides support for students of Cuban descent, and eventually for students who are residents of Cuba.

Thoughts on Giving to Georgia Tech:
"Fidel Castro took over Cuba when I was a student at Tech, and I was separated from my family and had no financial support. During this time, Dean Griffin helped not only me but the other Cuban students so most of us were able to graduate.
Georgia Tech gave me an outstanding professional education, and one of my most valuable assets. It taught me how to think...This is priceless! With our bequest, my wife and I hope to repay this debt of gratitude to Tech and to help others achieve the same success in life."

Teresita and Juan Antonio Michelena are members of Founders' Council, an honorary society of alumni and friends who have made life income gifts or estate provisions of at least $25,000 for the support of Georgia Tech.
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The Best in the World

The high-flying School of Industrial and Systems Engineering was built in part by figuring out flight plans and schedules for planes heading out of Atlanta. The school, which has been ranked No. 1 for the past 15 years, saw Atlanta's lack of manufacturing and its emergence as a transportation hub more than 25 years ago and began to soar by focusing on logistics and transportation, operations research, optimization and supply chain systems.

Here's Looking at You, 'Casablanca'

You must remember this — Humphrey Bogart and Ingrid Bergman parting at the fog-shrouded airport. With a grant from the National Endowment for the Humanities, Georgia Tech is helping produce a digital critical edition of the 1942 classic film “Casablanca” so no one will forget the classic film as time goes by.

Cover Story

‘High-Tech’ Triumph

A beluga whale examines visitors visiting him at the new Georgia Aquarium. It's a whale of a facility and a “high-Tech” triumph for the talented pool of alumni who contributed behind the scenes and under the seas to open the world's largest aquarium.

Winning Bid

Kelly Braun, ICS 84, found her way to San Jose, where she went to work for an emerging Internet powerhouse called eBay, which now boasts more than 168 million registered users worldwide. Braun says skills learned at Georgia Tech have helped her reach her post as senior manager of user research for eBay's PayPal.

Cover Photo: Gary Meek

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Cover Photo: Gary Meek
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The Future in a Flat World

A new year is here and we extend our thanks to all of you for your support of the Alumni Association and Georgia Tech. These are challenging times. Your dedication, your leadership and your generosity make it possible for Tech to thrive — not simply survive.

Will Rogers said, “Even if you’re on the right track, you’ll get run over if you just sit there.” Never is that more true than today. The pace of change in the world is accelerating and if we “just sit there,” we will get run over. Recently Tom Friedman was on campus talking about his new book and his theory that the world is flat. He enumerates 10 reasons for this flattening. Interestingly, all 10 reasons are related to the impact of technology on society. From the fall of the Berlin Wall to the success of supply chain design and control, the world is changing fast.

Georgia Tech has played a significant role in this “flattening” of the world in many ways — the development and implementation of new technologies is just one of a thousand examples. And the Institute will continue to be a place of great discovery and innovation.

In December we announced a new partnership with China’s Shanghai Jiao Tong University to provide students with a dual master’s degree program in electrical and computer engineering. It’s significant because it’s our second step into the Far East. We have The Logistics Institute-Asia Pacific partnership with the National University of Singapore. We also have a new global executive MBA program.

These global learning programs show just how far we’ve come. They also foreshadow a great future for Tech. This is indeed a flat world. Preparing our graduates to compete and to do business across the globe is crucial to our success as a nation. And they keep us from getting run over.

Joseph P. Irwin, President
On the Band Wagon

I attended my 25th reunion at Homecoming this fall. First, I would like to thank the Alumni Association for making the arrangements. All the events that I was able to attend were very well done, lots of fun and meaningful.

Second, I would like to say how much I appreciate the Georgia Tech marching band. I don’t think that I realized when I was in school what a hardworking group they are. I saw them at our evening get-together, at the general alumni Buzz Bash, playing at a couple of locations around campus on Saturday and at the game. And the next day at the volleyball game they were hard at work again and so was the alumni band. Sitting next to the marching band and the alumni band really "made" the game for me.

Susan Esche, TCh 80 Rogers, Ariz.

Impressive Homecoming

I have been part of a few Homecoming weekends at Georgia Tech over the years and 2005 stands out as the best so far. We brought some friends and their son (who is considering Tech) and they were extremely impressed and had a great time.

The kids and adults really enjoyed Buzz Bash as well as the activities before the game. The campus looked better than ever and certainly more inviting than when I was a student.

Oh, and we appreciated the outcome of the game as well.

Daren Pietsch, ME 91 St. Simons Island, Ga.

Hitchhiking Rendezvous

Until I read the Fall ALUMNI MAGAZINE about Gene Espy’s treks, I thought I held the record for hitchhiking at Tech. In the 1950s, I was known as the crazy fool who hitchhiked to Baltimore on weekends. I would leave Tech about 3 p.m. on Friday, travel all night and be at my girlfriend's house on Saturday morning. I would leave there on Sunday afternoon and be back for my 8 a.m. class. I think I made five trips over two years. My family never knew of my travels and my girlfriend and I never married.

I served a military tour of duty in Korea and as they say, "absence makes the heart go wander." I met someone else — I took her to the Alumni Association's Club Officers Weekend, now Leadership Georgia Tech — and we were together for 40 years. She passed away about two years ago.

One thing I learned about hitching is not to accept the first ride that comes along and especially from farmers. They will drop you off in the middle of nowhere at 2 a.m.

I plan on returning to Tech to play in my first — and maybe only — alumni ice hockey game. I’m trying to set a record there as the only 73-year-old to play in the game.

Stu Hyatt, IM 60 Bellingham, Wash.

Fond Memories

Thank you for your recent article detailing the exploits of Gene Espy ("The Road Less Travelled," Fall 2005). As a Georgia Tech graduate and as an Appalachian Trail thru-hiker in 2003, your story brought back a wealth of fond memories.

The hitchhiking, strange looks and enormous appetites all hold memorable stories from my hike. However, the best memories were from the kindness of strangers I met on and off the trail.

For anyone who ever gets burned out from life’s hectic jobs and society, I highly recommend taking a few days — or months — out in the woods to put things in perspective.

Matt Thomas, ME 99 Atlanta

We Welcome Mail

The ALUMNI MAGAZINE welcomes letters. Please include your full name, address and telephone number. Letters may be edited for clarity, space and content.

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If you’re going to be successful in any kind of technology — or knowledge-based work, you’ve got to have a collaborative environment as well as a collaborative culture.

— Christopher Klaus
Founder of Internet Security Systems, in the Atlanta Business Chronicle

This is no different from plain murder. A person taking medicine to be cured of [malaria] is expecting science and medicine to help him. Instead he’s getting nothing, and it’s usually the most poor people on the planet.

— Facundo Fernandez
assistant professor in the School of Chemistry and Biochemistry who discovered several months ago that counterfeiters in Southeast Asia were making fake antimalarial drugs for illicit profit when he analyzed batches of fake artesunate, speaking to BBC News

I was studying this problem and I thought somebody had to do something about it. I thought, ‘Give me a couple of weeks and I’ll have this figured out.’ That was five years ago and a lot of money ago. It turned out to be enormously difficult, but we got there.

— Travis Honeycutt, MS Text 68 chairman and CEO of Reactive Energy whose company, Vystar Corp. in Flowery Branch, Ga., has a patented process to deactivate the proteins in latex that cause allergic reactions, speaking to Georgia Tech in the Atlanta Business Chronicle

If there’s an economic reason to do it, it will happen.

— Aaron Bobick
chairman of the interactive and intelligence computing division in Tech’s College of Computing, about “mobile visual search” — technology promoted as a more efficient way to get information on the wireless Web without having to type on a tiny keypad, on CNET News.com
FDA approval is the culmination of over four years of extremely hard work by the CardioMEMs team. It is the first unpowered, wireless sensor approved for the human body and will be remembered as a major medical milestone.

— Jay Yadav, interventional cardiologist and chairman/co-founder of CardioMEMs, which graduated from Georgia Tech’s Advanced Technology Development Center; CardioMEMs recently got the green light to sell a medical device to monitor patients who have undergone surgery to repair potentially fatal heart vessel damage, in the Atlanta Business Chronicle.

These days, students with an interest in video game development have more options than ever to study really, really hard, thanks to a growing number of interactive media programs that bridge the gap between academia and the $25 billion video game industry. Over the past few years, dozens of top-notch colleges and universities have set up gaming labs and forged interdisciplinary programs, offering bachelor’s and master’s degrees in ‘integrated media,’ ‘game engineering’ and ‘interactive entertainment.’ As convergence becomes the predominant trend in media, the same is happening at many schools, which are breaking down barriers to merge formerly segregated disciplines. Among the best programs: Georgia Tech in Atlanta, the University of Central Florida in Orlando, Carnegie Mellon University in Pittsburgh and the University of Southern California.

— Writer Susan Carpenter in the Los Angeles Times

Businesses can look at what customers want and what they’re willing to do in return for a discount and they can use that knowledge to make their production systems more flexible.

— Julie Swann, IE 96, a pricing researcher and assistant professor in Tech’s School of Industrial and Systems Engineering, in Inc. magazine

The system has worked quite well and obviously the growth of the Internet in part is a function of that effective management. But currently the Internet is under the political oversight of just one country, the U.S. But every other country in the world increasingly depends on it and relies on it as a critical infrastructure, so they’re uncomfortable that they don’t control their own infrastructure — another country controls the core technical resources of the Internet. They feel vulnerable because one country could — even through neglect or being distracted — not manage it as well as they would themselves since it’s so vital to their own national interest.

— Hans Klein, Georgia Tech public policy professor and a member of the Internet Governance Project, speaking to Radio Free Europe/Radio Liberty

The evidence that we are seeing with regard to hurricanes and global warming, the stuff that we are seeing that is going on in the Arctic in terms of melting ice, are just two signs that, in fact, the global warming process is occurring. It’s occurring probably faster than we thought it was. And we really need to get serious about making some real changes to offset some irreversible and rather unfortunate effects.


I am just so lucky to do what I do every day and get paid for it and love it. Those water towers on the highway are right. Gwinnett is great. Success does live here.

— Mai Yin Tsoi, MS Chem 99, Collins Hill High School, after being named Gwinnett County, Ga., Teacher of the Year, in the Gwinnett Daily Post

University-industry alliances are vital to future U.S. competitiveness. Globalization means industry can’t compete as in the past. Industry needs more science and engineering talent to compete.

— Wayne Hodges, vice provost at Georgia Tech for economic development and technology ventures, in the Milwaukee Journal

University-industry alliances are vital to future U.S. competitiveness. Globalization means industry can’t compete as in the past. Industry needs more science and engineering talent to compete.
Composer’s Music Calms the Soul

If it hadn’t been for The Weather Channel, Stanton Lanier might never have made it to the piano studio at George Lucas’ Skywalker Sound this past summer to record his fourth independent CD of instrumental piano pieces. “In the summer of 1999, I felt a real stirring to what my sense of purpose was. I had written all this music over the years, but I had never invested in recording it. In January 2000, I bought a synthesizer and a computer I could use to record music in a home studio,” Lanier, Chem 86, says. “I would take my inspiration from scriptures or Bible verses that held meaning in my life. By Christmas 2001, I had composed 10 pieces and I self-produced a digital recording called ‘Walk in the Light.’ I gave it to the people on our Christmas card list, to clients and co-workers and friends,” says Lanier, whose second CD ended up in The Weather Channel offices. “In February and April of 2003, two pieces on ‘Still Waters’ were played during the ‘Local on the 8s’ forecast.” When Lanier, who left his job as a financial planner to devote himself full time to music in 2004, began composing for “The Voice,” he contacted Grammy Award-winning producer Will Ackerman and agreed to record at Skywalker Sound, touted as the best piano studio in the country. The CD already has struck a chord with listeners around the world. “Instrumental music doesn’t have a language barrier. If people love the piano and want peaceful, beautiful music to help them relax or reflect, then that’s the vision I have, to bring peace to the soul.”
Freshman Callie Miller leaps to spike the ball in an Atlantic Coast Conference volleyball match against Virginia. Head volleyball coach Bond Shymansky, above, won his 100th career coaching victory earlier in the season when the Yellow Jackets defeated Miami. At season’s end, Miller and freshman teammate Talisa Kellogg were named to a six-person All-ACC Freshman squad. Senior Lindsey Laband and sophomore Ulrike Stegemann were selected to the All-ACC Second Team. 

Photo: Christopher Gooley
Innovation Best Competitive Strategy, Study Shows

Innovation is the most reliable competitive strategy, according to a 2005 Georgia Tech survey on manufacturing released in November. Companies with innovative products or processes enjoy higher returns on sales, pay better wages and have less to fear from outsourcing than do manufacturers relying on other competitive strategies.

Georgia manufacturers that rely on innovation for their competitive edge reported returns on sales 50 percent higher than companies that compete by providing low-cost products — a gap that grew substantially since the last survey in 2002.

Innovative companies paid workers a third more than the average Georgia manufacturer and were 40 percent less likely to lose work to outsourcing than were companies competing on low cost.

The Office of Economic Development and Technology Ventures and the School of Public Policy at Georgia Tech conducted the survey of Georgia manufacturers, part of a periodic study begun more than a decade ago.

Fewer than 8 percent of the 648 companies responding to the survey chose to compete on innovation. However, a much larger percentage applied innovation to products and processes that were part of other strategies. Nearly half of Georgia manufacturers had introduced a new or significantly improved product between 2002 and 2004.

The study found that returns on sales ranged from more than 6 percent for companies competing on innovation to less than 4 percent for companies competing on low cost.

A Desire Named Streetcar

Atlanta streetcar No. 19 made a final run down Peachtree Street and into the history books on April 10, 1949.

Half a century later, the Atlanta City Council and J. Michael Robison, Mgt 97, chair of the non-profit Atlanta Streetcar Inc., plan to restore the rails along the city’s most famous thoroughfare.

On Nov. 21, after more than a year of town hall meetings and feasibility studies, Robison, CEO of Lanier Parking Systems, handed the project over to Atlanta Mayor Shirley Franklin. A committee will conduct a detailed study to determine the cost, route and type of technology used.

The plan calls for a 12-mile line connecting downtown Atlanta to the Buckhead entertainment district with a shorter downtown loop connecting the newly opened Georgia Aquarium to the Martin Luther King historic district.

Robison, who was a College of Management IMPACT series speaker, says Lanier is perhaps the only parking management company to have a division concerned with alternative transportation. But that concern has paid off, helping the company land the parking contract for the 8,000-space underground deck in the new Midtown development Atlantic Station.

"It was a real coup for us," says Robison, whose involvement with other Atlanta parking projects includes the Georgia Aquarium and the 41-tower Symphony Center.

Tech Appeals NCAA Sting

The Institute has appealed the NCAA Division I infractions committee’s ruling of two years of probation for violations and penalties involving 17 student athletes in four sports over a six-year period. >>>
His face reflected in his work, John Cressler says Tech's research into silicongermanium integrated circuit technology could result in "a new approach that literally has the capability to revolutionize the way radar systems are built; this new GTRI-GEDC synergy is very exciting." Cressler is the Byers professor in the School of Electrical and Computer Engineering and a GEDC researcher.
"Mistakes were made, but they were inadvertent and confined to a small number of cases when you consider that we reviewed more than 800 transcripts."

Dave Braine
Athletics Director

"We want to make sure that our case has been adequately evaluated before we accept the committee's decision," President Wayne Clough says. "We are disappointed with the severity of the ruling of the NCAA infractions committee. We fully believe that our shortcoming was due to a failure to monitor a handful of student athletes from a period of 1998 to 2004.

"We have owned that responsibility as evidenced by a rigorous self-imposed study of every athlete that played a collegiate sport for Georgia Tech during that time period and our subsequent self-imposed scholarship cuts. We have examined our personnel, processes and reporting structures and made changes to assure that such violations are never revisited," Clough says.

The Athletic Association says an inadvertent misapplication of NCAA eligibility certification rules resulted in 17 athletes being improperly certified to compete. In April, the Institute and the NCAA enforcement staff submitted a summary disposition report that detailed the findings of a year-long investigation.

In addition to the probation, the committee enforced self-imposed grant-in-aid reductions and ordered Tech to vacate the performance of the football team in all games in which the ineligible players competed and points contributed by ineligible athletes in men's and women's track and field and women's swimming.

"Mistakes were made, but they were inadvertent and confined to a small number of cases when you consider that we reviewed more than 800 transcripts," Georgia Tech athletics director Dave Braine says.

"We conducted an exhaustive review, we have fully revamped our certification process and we self-imposed substantial scholarship reductions," he says. "All of these things clearly demonstrate our commitment to doing things the right way."

Former Beatle Paul McCartney gave astronaut Bill McArthur an unforgettable wake-up call.

McArthur, MS AE 83, and Russian cosmonaut Valery Tokarev were sleeping aboard the International Space Station gliding 220 miles above Earth on Nov. 13 when McCartney sang out "Good Day Sunshine" to rouse them from their slumber.

Performing a live concert in Anaheim, Calif., that was linked to the spacecraft, McCartney also sang "English Tea."

When McCartney learned the Beatles classic was played as a wake-up call in August for the space shuttle Discovery's crew because of a favorable weather forecast for landing that morning, he asked NASA officials if he could perform the song live for the space station crew.

"I can't believe that we're actually transmitting to space," McCartney told the astronauts. "This is sensational. I love it."

McArthur and Tokarev boarded the space station in October for a six-month stay. They are the 12th crew to occupy the station since the program began in 2000.
Questions Follow Technology

The rapid development of wireless technology has been quickly followed by security questions.

"Wireless technology is exploding, with enterprises and consumers quickly adopting new services in order to realize the significant social and economic benefits of wireless voice and data networks," says Mustaque Ahamad, director of the Georgia Tech Information Security Center.

The center's wireless security summit this past November drew a host of corporate executives, as well as industry leaders and technologists from around the country. Keynote speaker Mitch Gelman, vice president and executive producer of CNN.com, says, "While the usage of wireless and mobile technologies is quickly moving into the mainstream, the obvious lack of security associated with the communications medium presents a large obstacle for widespread adoption.

"In order for wireless service to thrive, the industry’s stakeholders must work together to secure wireless communications without sacrificing convenience," Gelman says.

A panel debated how security will impact the constant availability associated with wireless voice and data networks and whether security threats such as identity theft will increase because of less secure wireless networks and "hot spots."

BellSouth's Steve Zimba says stakeholders “have a responsibility to monitor security risks as new and more technically complex wireless devices and networks develop.”

Wittschiebe Hears Resounding Ole

Janice Wittschiebe, Arch 78, M Arch 80, was presented the Outstanding Alumna Award for her "enormous contributions" to the Georgia Tech community during the Women's Leadership Conference 2005.

"Awaken Your Passion, Reinvent Your Future" was the theme for the mid-November conference and an evening reception featured food with a Spanish flair and flamenco dancing.

"Ole," called out Wittschiebe, chairman-elect of the Georgia Tech Alumni Association, as she made her way to the podium to accept the award from Marilyn Somers, director of the Living History pro-

Administration Speaking Greek

There are 42 fraternity and sorority chapters at Georgia Tech with more than 2,300 undergraduate members and relations with the administration haven’t always been smooth. Now the Office of Greek Affairs is working with Greeks and other student organizations to pave over the bumps.

“We needed to emphasize a positive relationship with students, alumni and administrators over the previous mutual distrust," says Buck Cooke, assistant dean of students.

Work began last year involving Greek leaders, advisers and alumni.

Although all organizations are involved, Cooke, who directs Greek Affairs, says the effort began with the Greek system “because they have the most members and have had a traditionally adversarial relationship with the dean’s office.”

The meetings have defined each group’s responsibilities. “The judicial process had to >>>
“There has been an image-related problem between the Dean of Students Office and some campus organizations, particularly the Greeks. We're there to be an advocate for student organizations and put them on a track to success.”

Buck Cooke
Assistant Dean of Students and Director of Greek Affairs

become transparent and predictable,” Cooke says. “Student organizations must make ethical decisions, practice honesty and own up to their mistakes while the administration needs to work with organizations to find solutions to problems rather than putting out fires.”

Cooke says organizational sustainability is the biggest challenge the administration faces. “Student organizations need concrete measures to refer to when dealing with internal problems, Institute policy violations, sanctioned events — even emergencies,” he says. “This model defines everything from proactive disclosures of campus violations to proper response in emergencies.”

Gourmet Palates, Exotic Tastes

Here's a test. Offer a crayfish two meals — one the native plants that it eats every day, the other a similar but exotic species of plant. It will stick with the tried and true, right?

Not according to research at Georgia Tech, which suggests that plant eaters may prefer to nosh on exotic meals by a ratio of 3-to-1.

The findings could point the way to better strategies for controlling the billions of dollars in damage that invasive species cause every year.

The research runs counter to the enemy release hypothesis, first proposed by Charles Darwin in 1859, which holds that exotic species become invasive because they are free from the pressures of being eaten by their natural enemies.

“What enemy release doesn’t take into account is that while exotic plants may be free from their so-called natural enemies, they gain novel enemies in their new range,” says graduate student John Parker. “Because they’ve never had to adapt to being eaten by these consumers, they may lack the appropriate defenses to ward them off, essentially going from the frying pan into the fire.”

Damage caused by exotic species is estimated to be more than $137 billion a year in the United States alone.

Aerospace School Turns 75

The School of Aerospace Engineering celebrated the grant that launched it with a 75th anniversary program on Dec. 8.

Georgia Tech received a $300,000 grant from the Daniel Guggenheim Fund for the Promotion of Aeronautics in 1930. The Daniel Guggenheim School of Aeronautics began classes in September 1931 with 18 students, two faculty members and a budget of $10,000.

M.L. Brittain, president of the Institute at the time, used the funds to hire a director, plan for a building to cost $100,000, buy a $50,000 wind tunnel and other equipment and still invest one-half of the funds “in 5 percent bonds for endowment against financial troubles — already looming ominously in that year of 1930.”

Groundbreaking research was conducted at the school from the beginning. Montgomery Knight, who was the school’s chair until his death in 1943, developed one of the first jet-powered rotors for a helicopter and tested it extensively at Tech in the 1930s. A blade he designed and had built is displayed in the lobby of the Montgomery Knight Building, constructed in 1967 after a model shop was demolished.

Renamed the School of Aerospace Engineering in July 1962, Tech’s program now boasts about 750 undergraduate and 450 graduate students, nearly 90 faculty members and externally funded annual research expenditures of more than $18 million.
## GT WOMEN'S BASKETBALL

### Remaining 2005-2006 Home Schedule:

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<th>Date</th>
<th>Opponent</th>
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<td>Dec. 30</td>
<td>Alabama State</td>
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<td>Dec. 31</td>
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<td>Jan. 5</td>
<td>Miami</td>
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<td>Duke</td>
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<td>Jan. 22</td>
<td>Wake Forest</td>
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<td>Florida State</td>
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<td>North Carolina</td>
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<td>Feb. 19</td>
<td>Virginia Tech</td>
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The Best in...
The School of Industrial and Systems Engineering, ranked No. 1 in the country for the past 15 consecutive years, recognized Atlanta’s emergence as a transportation hub more than 25 years ago and began to soar by focusing on logistics and transportation, operations research, optimization and supply chain management.

By John Dunn
Photography: Gary Meek
“Georgia decided — very wisely, I think — to concentrate its engineering efforts at Georgia Tech. It has made Georgia Tech the largest engineering school in the country, and as a result, mass carries a lot of weight. Georgia Tech swings a big stick in almost every discipline in our engineering field.”

Michael Thomas

Michael Thomas remembers very well the first time Georgia Tech’s School of Industrial and Systems Engineering was named best in the country by U.S. News & World Report in 1990. Thomas was the immediate past chair of the school and had been named special assistant to then-Institute President John P. Crecine. Thomas was in a cabinet meeting with the president when his former secretary interrupted to deliver a copy of the magazine and a note from John J. Jarvis, who succeeded him as school chair.

“The message read, ‘Notice that ISyE is No. 1. And all that it took to make that happen was to get Thomas off our shoulders,’” Thomas laughs.

Thomas and Jarvis are longtime friends. Jarvis chaired the search committee that recommended Thomas for the job in 1978 and about a decade later followed him as head of the school, recognized as the best in the country for 15 consecutive years, recognition that continued through William Rouse’s four-year tenure as >>>
chair and passed on to Chelsea C. White, who was named the H. Milton and Carolyn Stewart chair of the school on July 1.

"We have a tradition of unparalleled excellence and leadership in research, education and service that has made ISyE nationally and internationally prominent," says White. "Many of our peer departments regard ISyE as the flagship academic unit in industrial and manufacturing engineering, and I agree."

The State's Engineering Focus

How did Georgia Tech's industrial and systems engineering school become the best in the country?

Thomas, who came to Tech from the University of Florida, says one reason for the school's strength is the support given by the state Legislature. "Politicians in Florida got the idea that they were destined to build an engineering school every place that an alligator crawled across a cow track. They have nine state-supported engineering schools," Thomas says.

"Georgia decided — very wisely, I think — to concentrate its engineering efforts at Georgia Tech. It has made Georgia Tech the largest engineering school in the country, and as a result, mass carries a lot of weight. Georgia Tech swings a big stick in almost every discipline in our engineering field."

White agrees that the concentration of engineering resources into Georgia Tech has enabled the school to have greater breadth and depth.

"In many areas, we are just flat-out stronger than our competition in terms of the number of people who can address problems in-depth — both from a methodological point of view as well as from an applications point of view," White says.

Rouse says a statistical analysis by the school is unequivocal — size is the dominant variable. "We are more than twice as large as the second-largest program. That gives you diversity, it gives you bench strength and it greatly increases the chance that some of your faculty will be stars in their respective disciplines."

The school has about 1,100 undergraduate and nearly 355 graduate students. Its 60 faculty members teach and study operations research, statistics, optimization, stochastic systems, simulation, economic decision analysis, natural systems, human-integrated systems analysis and manufacturing and logistics, which has evolved from material handling and facilities design into modern supply chain systems analysis.

"We have absolutely an excellent faculty, virtually to the person," the result of recruiting top faculty and mentoring them, White says.

The challenge facing the school, White says, is making certain its size is an asset.

"Our size is a unique aspect and we take advantage of it. There is more potential synergy in a large faculty," he adds. The school has an "intellectually diverse faculty capable of not only individual scholarly excellence, but forming groups, finding synergies and applying knowledge as part of interdisciplinary research teams."

When Thomas took over as director, he was struck by the lack of manufacturing in Atlanta and the city's emergence as a transportation hub. Thomas made logistics and transportation a major thrust, which fit naturally with its strengths in material handling, operations research, optimization, the mathematical sciences and statistics. At one time, more than 60 percent
of the faculty members were working in some aspect of logistics.

Rouse calls The Logistics Institute one of the "crown jewels" that helped the school achieve international renown in logistics and supply chain management.

The Logistics Institute was founded in 1992 under Jarvis' tenure by two faculty stars, Don Ratliff and George Nemhauser, bringing together the Material Handling Research Center, the Production and Distribution Research Center and the Computational Optimization Research Center. From its roots, The Logistics Institute spans more than five decades of industrial engineering and operations research.

The Tradition Begins

The industrial engineering program had its start at Tech in 1923 as one of four options in mechanical engineering. World War II created an appreciation of mathematics and scientific methods as important tools to analyze combat situations and in mid-1945, Tech's industrial engineering department was created and headed by Lt. Col. Frank F. Groseclose, who came from the U.S. Military Academy.

"One of the lessons learned from this war has been the great lack of industrial engineers, particularly in the South, and it is the aim of my department to rectify that situation and also to aid in the plans to make Georgia a model state in the balance between agriculture and industry," Groseclose told the alumni magazine.

The new program attracted 26 mechanical engineering students, including Frank Wallace, IE 47. "It was a cross between engineering and industrial management — it was slanted in that direction. We had a good many business courses," Wallace says.

The department grew quickly. In 1946, it occupied the top floor of the Coon mechanical engineering building. The next year the department moved to larger quarters in the Swann Building.

In 1949, industrial engineering was made a school and given the main floor of the French Building for classrooms and offices and half the basement for laboratories.

In four years, the school had grown to 500 undergraduate students and 30 students working on master's degrees. Courses were offered in motion and time study, material handling and factory layout and included research in methods work. In 1950, industrial engineering received funding for laboratories for micro-motion and motion study, work simplification and methods analysis. Two years later, the school had 11 full-time faculty members and had awarded 789 industrial engineering bachelor's degrees and 74 master's degrees.

"We have always considered industrial engineering as a branch of engineering — the area where engineering is applied to the general problems of manufacturing," Groseclose said in 1959, the year the school began awarding doctorates.

Harold Davidson, ME 47, IE 48, a PhD graduate of Ohio State whose specialty was operations research, was named chairman of graduate studies. The tools of operations research, he said, are "largely mathematical and deal in probability, statistics, matrix algebra and simple arithmetic."

When Groseclose retired in 1966, Bob Wallace, editor of the alumni magazine, >>>
hailed “the colonel” as the architect who built the industrial engineering school “from scratch into one of the best in the world.”

The American Institute of Industrial Engineers awarded him the Frank and Lillian Gilbreth Award, presented by longtime friend Lillian Gilbreth, renowned for her study of scientific management principles.

Groseclouse’s students wrote a scroll that was then hand-lettered by an Atlanta artist and presented to him. Editor Wallace paraphrased it to read: Colonel, you’re one helluva engineer.

Leon McGinnis, associate director of the Manufacturing Research Center, actually studied industrial engineering under Groseclose in the early 1970s, when the colonel taught a freshman class at Auburn University for one year.

McGinnis, who holds the Eugene C. Gwaltney chair in manufacturing systems, remembers, “I was a kid right off the farm trying to figure out what kind of engineer I wanted to be or if I wanted to be an engineer. He was very formal and he taught an interesting course — almost like great literature for engineers — about engineering through history. It was about engineering in Egypt, Greece and Rome. He was just a very interesting guy. Bob Lehrer, the second director of industrial engineering, hired me.”

Hiring the ‘Young Turks’

Robert N. Lehrer, associate director under Groseclose, was the colonel’s choice for the job of director. Lehrer had been a student under Lillian Gilbreth and her teaching had been a strong influence. He added “systems” to the school name, expanding the scope of industrial engineering.

Lehrer also attracted new faculty who infused the school with modern concepts. In 1968, Lehrer hired nine young faculty members, including future school chair Jarvis.

“He called us the ‘young Turks,’ ” Jarvis says. “We were the new guys — the modern guys — and we stuck together as a group and met periodically to talk about what we could do to change the school. We were really enthusiastic.”

Jarvis even shared an office with Groseclose. “He was emeritus and retired. Bob >>>
had given him an office, but they got tight on space and put two assistant professors in there. There was a desk, but he never sat in it. I think I met him at one or two functions.”

When Lehrer retired, Jarvis headed the search committee that hired Thomas as the department’s third director. McGinnis was Thomas’ host when he came on campus to interview for the job.

“Bob Lehrer turned the program from its traditional base into what is called modern industrial engineering. Mike carried that on — extending that into research,” Jarvis says.

Building the School’s Backbone

When Thomas became director in 1978, the industrial engineering department had a strong faculty, but many of them were nearing retirement. At the same time, the school was growing, allowing for new faculty positions.

“I picked out the best schools in the country, talked to the department heads and asked if I could talk to their PhD students,” Thomas says. “I went to Stanford, Berkeley, Northwestern, Michigan, Cornell and MIT. The key to the whole thing was hiring really good faculty.”

Jarvis says Thomas hired exceptional faculty members. “One of Mike’s great strengths is that he is a good picker of horseflesh. He rarely made mistakes in hiring people. He built up a good cadre of young people as well as some senior people to provide leadership.”

Thomas’ first recruit was Don Ratliff, a colleague from Florida who later was named to the National Academy of Engineers and is executive director of The Logistics Institute.

Craig Tovey, recruited from Stanford by

“Industrial engineers think about more than just one narrow aspect of the enterprise. They think about the whole enterprise. I think it really does give them a leg up when they go into business — and a lot of them become CEOs, presidents or own their own businesses.”

Leon McGinnis

Thomas in 1981, says the young professors formed “a very spirited” Junior Faculty Interest Group. “A lot of collaborations, many of them interdisciplinary, grew out of JFIG, which has spread to other industrial engineering schools and there are now JFIG activities at national meetings.”

The school received its first chaired professorship from a former co-op student, A. Russell Chandler, IE 67, who had made his millions by age 36 in hospital care management. Chandler credited Tech as a major factor in his success.

“There are many aspects of that which were important — the analytical basis that was developed at Tech and certainly a degree of perseverance. It was a very meaningful experience — I had a feeling at the time that I was in Marine boot camp,” he said in a 1981 interview.

Thomas readily recalls the day he met Chandler. “We had hired a number of young faculty in the first few years, when one day a guy named Russ Chandler stopped by and asked what we needed.

‘We need some strong senior people,’ I said. ‘What does it take to get them?’ he asked. ‘A million dollars,’ I said. He went back over to the development office and I didn’t hear anything for a while. Then all of a sudden we had the A. Russell Chandler chair. I went to Cornell and hired my PhD adviser, George Nemhauser. He’s a genius,” Thomas says.

Nemhauser was chairman of operations research for the industrial engineering department at Cornell when he came to Tech to fill the chaired professorship. Soon afterward, he was elected to the National Academy of Engineers.

“When I got here, I focused on the PhD >>>
Honeybees are nature’s industrial engineers and their hive management system serves as a source of inspiration to Georgia Tech professors.

In industrial and systems engineering, “we learn about natural systems, and we learn from natural systems,” says Craig A. Tovey, a professor in the College of Computing and School of Industrial and Systems Engineering who came up with a honeybee algorithm that he has applied to Internet server optimization.

In the late 1980s, Tovey and ISyE professors John Bartholdi and John Vande Vate used operations research techniques to study how bees allocate foragers among flower patches to bring nectar to the hive. It would be 15 years before Tovey found an industrial application for his research on bees.

But the study gave Bartholdi, the Manhattan Associates chair in supply chain management and director of The Logistic Institute’s research program, the concept for “bucket brigades” that has revolutionized order picking in warehouses around the world.

Bees and ants are highly efficient at organizing themselves without a blueprint or management, Bartholdi says. “We were all attuned to the issues of self-organization and decentralization in the emergence of behavior.”

Bartholdi and then-doctoral student Don Eisenstein, MS OR 83, PhD 92, now a professor at the Graduate School of Business at the University of Chicago, worked together to develop the bucket brigade technique as a way of organizing workers on a flow line for efficiency.

The difficulty in managing assembly lines is to balance the lines for maximum productivity. Engineers who define tasks so the work is divided equally among the workers manage the flow line, Bartholdi explains. Bucket brigades function as a self-organizing system that spontaneously achieves optimum effectiveness, without time-motion studies, work-content models and management.

Such diverse firms as Time Warner Trade Publishing/Little Brown, Reader’s Digest, Tug Manufacturing, Mitsubishi Consumer Electronics, The Gap, Walgreen’s and Subway, which assembles its sandwiches using the bucket brigade approach, have adopted the concept.

Bartholdi teaches supply chain issues, primarily warehousing, at both the undergraduate and graduate levels and in TLI’s professional education program. His background, however, is not all academic. He served two tours of duty in Southeast Asia as a paratrooper in a Naval Special Warfare unit after graduating with a degree in mathematics in 1968 from the University of Florida. He returned to Florida to earn a PhD in operations research. He came to Tech in 1980 and was named a Presidential Young Investigator by the National Science Foundation in 1984.

Tovey, whose principal research and teaching activities are in optimization, probabilistic analysis and natural systems, came to Tech in 1981 and was named a Presidential Young Investigator by NSF in 1985. He has been named co-director of Tech’s new Center for Biologically Inspired Design.

He had been patiently searching for an industrial application for his research on bees. The opportunity presented itself several years ago when Sunil Nakrani, a visiting scholar in the School of Electrical and Computer Engineering at Tech and a doctoral student at the University of Oxford, came to Tovey because of his reputation for heuristic algorithms.

Nakrani was searching for a method to allocate computers among different clients at a Web-hosting facility. Web hosting is a $30 billion-a-year industry that is growing.

“Every time you check the weather, buy merchandise or pay your bills online, chances are the computer you connect to is not actually run by the weather station, retail store or bank,” Tovey says. “Instead, you most likely connect to a computer at a facility which runs several Web applications on a large bank of computers.

“By aggregating the different and highly variable demand patterns of its various Web-app clients, the hosting center can achieve an economy of scale.”

Tovey and Nakrani began working together to determine the best method of allocating computers among Web clients. They developed an algorithm that mimics the behavior of honeybee foragers.

Their success is as sweet as honey to a bee. — John Dunn
and research programs in operations research," Nemhauser says. "The notion was to make that program more rigorous and more scientifically based and to spend a lot of time recruiting top students."

Nemhauser also became involved in airline scheduling of both planes and flight crews.

"Delta was the last major airline that had begun to use scientific knowledge for decision making," Nemhauser says. "We brought enormous improvements to that process to Delta."

More recently, Nemhauser has received national publicity for scheduling sporting events — something made infinitely more difficult because of the need to satisfy television broadcasting requirements.

Nemhauser, who is Georgia Tech's faculty representative to the Atlantic Coast Conference and National Collegiate Athletic Association, has been recognized for his contributions to the field of operations research.

"What we do for major league baseball can be improved. We're not near optimal. That problem is so big. ... While I think we've produced solutions of good quality, the technology is still not there. We're still working on research that will lead to better scheduling." George Nemhauser

George Nemhauser, left, Tech's faculty representative to the ACC and NCAA, solved game scheduling problems — including this one with center Ra'Sean Dickey — intensified by television broadcasting requirements. Nemhauser's success led him to expand to other conferences and from there to major league baseball.
used his airline experience to create ACC football and basketball schedules that happily met television obligations. The ACC satisfaction led Nemhauser to expand to other conferences. The success he enjoyed there led to scheduling for major league baseball.

"What we do for major league baseball can be improved," Nemhauser says. "We're not near optimal. That problem is so big and so hard. While I think we've produced solutions of good quality, the technology is still not there. We're still working on research that will lead to better scheduling."

Foundational Chairs

During the capital campaign observing Tech's 100th anniversary in 1985, the Coca-Cola Co. funded the school's second chair and Thomas recruited Ellis L. Johnson, Math 60, an IBM fellow who received his PhD at the University of California at Berkeley, where he worked under George Dantzig, the father of linear programming and one of the giants in operations research.

"I had no idea what a famous person he was and what a program they had," Johnson says. "It was a great couple of years in operations research at Berkeley."

Johnson says he attended Tech in the

"The people in the industrial engineering school were positive. They were upbeat. They knew what they were doing and they knew it was important. I decided I'd be better suited and happier coming to Tech. I'm glad I did."

Ellis Johnson

Dual Degrees

ISyE, ECE partner with Shanghai Jiao Tong University; Logistics Institute based on TLI-Asia Pacific partnership

Two Georgia Tech schools have formed partnerships with Shanghai Jiao Tong University in China. Tech President Wayne Clough was also awarded an honorary doctorate by the university on Dec. 6. The School of Industrial and Systems Engineering formed a partnership with Jiao Tong University in October to establish a Sino-U.S. Global Logistics Institute. The School of Electrical and Computer Engineering established a dual master's degree program with the Chinese university in December. The partnership allows students admitted to the two-year program to choose to study at either Jiao Tong or on Georgia Tech's campus. It also establishes a summer exchange program for students attending Tech and Shanghai Jiao Tong University.

ISyE's Global Logistics Institute with Jiao Tong University is modeled after The Logistics Institute-Asia Pacific, a partnership between Tech and the National University of Singapore.

"The focus of the Institute will be the Shanghai region of China," says Chelsea C. White, the H. Milton and Carolyn Stewart chair of Tech's School of Industrial and Systems Engineering.

White and Charles Liotta, vice president of research and dean of graduate studies, were joined by Georgia economic development officials at the ceremony inaugurating the program with Jiao Tong in October.

"The programs being developed in Shanghai and Singapore are part of an overall strategy to foster}
Georgia Tech's evolution toward an international technological university that encourages its students to experience cultures from around the world while pursuing their disciplines, Liotta says.

During the next few years, Tech may expand its dual-degree partnership program modeled after TLI-Asia Pacific with other top universities, Liotta says.

Students completing an 18-month TLI-Asia Pacific program earn dual master's degrees from Georgia Tech and NUS. In the program with NUS, participating companies and the Singapore Economic Development Board of Singapore share in providing full scholarships for students, who then work for the Singapore company for three years after graduation.

"Since Singapore is a city-state about the size of Atlanta, with about 4 million people, the government is interested in bringing in high-quality young people and educating them in hopes that they will stay in Singapore and help its economy grow," says Harvey M. Donaldson, director of The Logistics Institute.

Singapore is especially interested in creating an economy based on intellectual capital affluence and innovation, Donaldson says.

Students spend the fall semester studying at NUS and in January study for a semester on the Tech campus.

The semester at Tech is "sort of a super-semester," says Robert de Souza, executive director of TLI-Asia Pacific. "The students take six graduate courses — a 50 percent overload — in order to complete the requirements for residency and course work at Tech."

During the semester at Tech, the students also participate in a seminar program featuring lectures by logistics experts and business executives and outside speakers from around the United States. The students also tour such facilities as United Parcel Service's sort center, hangers at cargo operations at Atlanta's Hartsfield-Jackson Airport and the BMW plant in Greer, S.C.

The students return to Singapore in the summer for an internship with their sponsoring companies. They also prepare a master's degree thesis by December.

Before retiring in 2003, John J. Jarvis, former chair of Tech's School of Industrial and Systems Engineering, spent more than two years in Singapore as TLI-Asia Pacific's executive director. While there, Jarvis inaugurated the dual-degree program. Donaldson started the industry outreach program during past two years and de Souza has continued to expand these programs.

"The sponsoring companies are not only involved with us through the dual master's program, they engage with us in executive education programs and hopefully will engage in future research programs," Donaldson says.

"Our program has been a wonderful laboratory for Georgia Tech in developing a model for how to have a partnership with an Asian university. Georgia Tech is a sought after partner because of our reputation and rankings. We want to continue to expand our global partnerships with other world-class universities like NUS."

De Souza adds, "There have been many accolades from the sponsoring companies."

He says the Georgia Tech experience creates a unique bond that gives the dual-degree students a real sense of being Tech alumni. "They have an experience together in Atlanta that differentiates from just being in the United States or Singapore. I see with the initial alumni class that have been in industry for three years that they have a loyalty to both universities, but also to each other. They have a shared experience." — John Dunn
footsteps of his brother, Fred, EE 60, of Madison, Ga., who was "sort of an electronics whiz." But his brother "fought tooth and nail" with their father, who worked for the University of Georgia Cooperative Extension Service, to attend the Institute. Once their father learned about Tech's co-op program, however, "it appealed to his pragmatic side," Johnson explains. The battle was over.

After receiving his PhD, Johnson began attending professional society meetings, where he met Ratliff, Thomas and Jarvis. During a 25-year career with IBM, Johnson had held adjunct positions in academia.

"Once Nemhauser moved here from Cornell, they started a concerted effort to get me to move," he recalls. Although he was content at IBM, Johnson liked the atmosphere in the industrial engineering school. "The people were positive. They were upbeat. They knew what they
were doing and they knew it was important. I decided I'd be better suited and happier coming here. I'm glad I did."

Problem Solvers Worldwide

All engineers are problem solvers, but industrial engineers tend to be good decision makers too, according to Thomas. The school has 14,000 alumni, 25 percent of whom are presidents, chief executive officers or partners of their organizations. "I used to tell freshmen that industrial engineering is the liberal education of the technological age," Thomas says.

"Industrial engineers - as are all engineers - are taught to structure problems, ask logical questions about why there is a problem and to develop solutions and implement those solutions. That's not the kind of training that is given in other disciplines outside of engineering. But industrial engineering, with its emphasis on
statistics and optimization, focuses on decision making, which doesn’t have a particular context, but which is applicable all across the board,” Thomas says.

Adds Leon McGinnis, “If there is one thing that Georgia Tech’s industrial and systems engineering program is known for, it’s logistics. Industrial engineers figure out how to make systems more efficient.”

But, McGinnis continues, “There is a limitation in what we can do. Homeland security, for example, has a large political component, so it’s not just a technical problem. There is a great opportunity now for industrial engineering as a profession and Georgia Tech as a leader in the profession to say we need to expand from technical, economic and human to include political. We need to optimize systems where politics is as important as economics.”

ISyE: A Special Breed

Thomas says ISyE graduates come away with real-world patterns of thinking, of reasoning, of grappling with issues.

“I would tell our IE graduates the only reason I could see for getting an MBA, given they had the undergraduate industrial engineering background, was to get into the professional fraternities. The stuff they didn’t know was stuff that wasn’t hard to learn and they could learn it on the fly by themselves,” he says.

“It takes a special kind of person to get through any engineering school because the workload is very heavy — and that’s especially true at Georgia Tech. Look at the quality of students. If you believe things like high school grades and SAT scores, it’s the best public education in the country and has been for the last 15 years,” Thomas says.

Industrial and systems engineering has been especially appealing to female students, who make up 32 percent of the student body.

“Women like industrial engineering because it is more than just the technical side of engineering. There is the human side of it, the economics side of it and I think women tend to like that broader view of the world,” McGinnis says.

Jane Ammons was named the “spirit of Georgia Tech” professor of industrial and systems engineering in 2001 and her enthusiasm is infectious.

In 1982, Ammons became Tech’s first female PhD graduate in industrial and systems engineering and the first woman on the faculty, recognizing that Helen Grenga preceded her as a member of the engineering graduate school faculty. Ammons is now an associate dean in engineering, professor in ISyE and serving her fifth year of a five-year chair as ADVANCE professor, working to help mentor and develop Tech’s junior women faculty members.

“We strive for excellence in all things,” says Ammons, who was a Presidential Fellow at Tech. “We have some fantastic things happening and I feel lucky to be a part of it. We have all kinds of flexible teams forming — not only in ISyE, but collaborating across fields within engineering and across campus.”

Jane Ammons
some of the best people in the world who complement your strength.”

Ammons has been named an outstanding professor and was presented the Class of 1940 W. Roane Beard Outstanding Teacher Award in 1998.

“This generation is much more in tune to computer game kind of learning than to dry, boring lectures,” says Ammons, who taught a manufacturing systems class at the graduate level that gave her students a taste of life in the real world.

“We’d play this online game where we’d run a factory and worry about all this stuff coming through. For those who don’t have their acts together, it’s a little like ‘I Love Lucy’ in the factory and they get into a mess and go bankrupt on you. And they lose points because you loan them money and charge them interest. You keep score by the money they’re making or losing. Running a factory begins to make a whole lot more sense to them.”

In her probability class, Ammons wanted her future industrial engineers to be able to deal with uncertainty “because there is a lot of uncertainty in running systems.”

The M&M Test

In Ammons’ classes, students are gamblers. And when the stakes are a pop quiz, the bets can evoke screams.

“I’ll say, ‘The bet is going to be on a package of M&M’s. I’ll open a package and you’ll bet on how many draws I take until I get three green ones.’ It’ll really cover multi-distribution. I’m trying to stimulate them to read that section before they get in class so they can figure out which side of the bet they want when they get to class. They’re trying to head off having to take a pop quiz on that section of material.”

Ammons would pass out M&M’s to the whole class so they could test probability distribution for themselves.

“I enjoy the students,” Ammons says. “I enjoy seeing the light bulbs go off in their heads. I enjoy getting to know them as people. It’s a delight to be in the classroom with them because they are bright and hardworking and they are going on to be world-beaters.”

Industrial Engineering’s Future

William Rouse, executive director of the Tennenbaum Institute, has a vision of the future of industrial engineering that he is sharing around the world. “Industrial engineers have analyzed the shop floor, the factory and the supply chain — the future will be to address the enterprise as a whole,” says Rouse, who served four years as chair of Tech’s School of Industrial and Systems Engineering. “That’s the way industrial engineering is going to grow and its impact is going to grow. The Tennenbaum Institute is a piece of that — looking at how enterprises fundamentally change, the difficulties they encounter and what to do about them.”

The Tennenbaum Institute is a multidisciplinary center bringing together academic, government and corporate experts to create industry-shaping business models. “We’re trying to bring the best and brightest people to address some complicated, messy problems.”

In addition to business models, the Institute is looking at the overall health care system and analyzing roles and interactions of the many stakeholders in this system. It is prepared to approach the security and environmental issues in the same way. Michael Tennenbaum, IE 58, contributed $5 million to establish the Institute center to develop business practices that help enterprises become more cost-effective and competitive by leveraging technological and market innovations.
When Ricky Wolfe retired at age 48, he returned to his LaGrange, Ga., roots and his boyhood memories of sipping milk shakes at Smith's Rexall Pharmacy and sacking quarterbacks for the hometown Grangers.

"I must have eaten meals at nine out of 10 kitchen tables as a mill village kid," says Wolfe, IM 71. He left home for Georgia Tech on a football scholarship, then kicked off his business career. While he was gone, the mills were sold and the sunny neighborhoods of his youth faded.

Wolfe says he was grieved by what he saw when he returned to LaGrange in 1999. Children no longer cruised on bikes down Brownwood. Elderly residents on South Lee were afraid to stand on their own front porches as crime rates soared.

Wolfe is good at building things. As a partner in Clark-Schwebel Inc., he helped build the electronics company into a three-continent, 4,000-employee corporation.

His success allowed him to retire young and fill his hours with volunteer work. In early 2000, Wolfe joined the local Habitat for Humanity board of directors and confronted the housing problems burdening his hometown.

"Of the 11,000 housing units in LaGrange, 3,000 were below standards," Wolfe says. "We found that the problem went deeper than bricks and mortar."

Only 47 percent of citizens in LaGrange owned homes, compared to the national average of 66 percent, Wolfe says. In the 275-acre Hillside neighborhood, only 32 percent of residents wrote mortgage checks. "People had no skin in the game, no vested interest in the community long term."
In 2002, after informal discussions with dozens of citizens, Wolfe proposed Dependable Affordable Sustained Housing, a nonprofit organization to lead the revitalization effort. To solidify his vision, Wolfe drew up a DASH business plan and presented it to the Callaway Foundation.

DASH would use a trust-type fund to buy derelict properties and wholly restore them for sale to first-time and low-income buyers. Any profits would help refurbish more properties.

Familiar with the decline of the mill villages, Callaway boosted Wolfe's mission with a $5 million grant.

DASH set to work buying 18 of 72 homes on South Lee Street, a main artery of Hillside, and implementing its “fully integrated” approach — credit and debt counseling, mortgage lending and assistance for down payments and closing costs.

Wolfe and company located the DASH headquarters less than a mile away from the pulse of the problems. Residents could walk to his office. Staff could meet the neighborhood’s residents and hear their problems firsthand.

To date, DASH has bought and refurbished 125 properties, rebuilt almost 50 structures and sold 38 homes in LaGrange. About 50 local businesses, churches and nonprofit organizations are official partners. Interface, which operates a textile plant in LaGrange, donates carpeting for every DASH property and last July hundreds of volunteers gathered to “Paint the Town” in a weeklong face-lift effort.

DASH also looks to develop the area’s economy, like gutting and refurbishing a restaurant, and community spirit with Saturday markets and a Terrific Tuesdays summer camp.

In November 2004, the U.S. Department of Housing and Urban Development awarded DASH a $2.6 million grant to convert an abandoned school into apartments for low-income, elderly residents.

Wolfe currently is evaluating opening a Gulf Coast office to offer DASH services to hurricane-ravaged towns.

“DASH is more than lipstick on houses,” Wolfe says. “It is about a community coming out of the ground again.”
In the late 1960s, “Casablanca” used to play every semester during finals week at the Brattle Theatre in Cambridge. Harvard students would recite the dialogue along with the characters, hiss and boo the Nazi general and enthusiastically sing the “Marseillaise” as if they were the patrons of Rick’s place.

I remember a group of undergraduates in the front row standing up and opening a bottle of champagne as the resistance hero Victor Laszlo, played by Paul Henreid, raised his arms to strike up the anthem.

More than two decades after its premiere during World War II, “Casablanca” had found an enthusiastic audience among postwar baby boomers, who responded to this timeless story of wartime heroics and romance in the midst of an era that was deeply suspicious of both. Even today, in an age when divorce has lost its stigma and adultery its shock value, the mutual renunciation of Humphrey Bogart and Ingrid Bergman remains a romantic ideal.

Georgia Tech received $200,000 from the National Endowment for the Humanities to design and produce a digital critical edition of “Casablanca” in collaboration with the American Film Institute. The critical edition will bring together the famous lines, script changes, production...
You, ‘Casablanca’
The original movie script was read at Warner Brothers the day after the bombing of Pearl Harbor. 'Casablanca' premiered less than a year later.

notes and background materials to create a searchable educational tool for studying the film.

“Casablanca” is the epitome of the Hollywood studio film — a melodramatic, topical story adapted from an unproduced stage play. It was hastily and repeatedly rewritten by several hands and was still incomplete on the last day of shooting.

Bogart had mostly played hoodlums before he landed the lead role and he had never carried a movie as the sympathetic romantic lead. Bergman was under contract to another studio when casting began. The original script was read at Warner Brothers on the day after the bombing of Pearl Harbor and purchased within a month. The film premiered less than a year later in November 1942. It was a rushed production, made more difficult by wartime shortages and security curfews on the West Coast.

And yet the film works: The love story and the political adventure blend together in a satisfying plot. The audience cares about the characters and believes in their peril, their passion and their courageous sacrifices. Despite its formulaic elements and hurried production, “Casablanca” is a masterpiece of American filmmaking that provokes close study.

There is a wealth of material available about the film. Warner Brothers has preserved the shooting script, memos, production reports and outtakes, some of which can be seen on existing DVDs. Aljean Harmetz has written a production history of the film. The Italian semiologist Umberto Eco has written about its mythic structure; Robert McKee has made it the centerpiece of his scriptwriting course; film critic Roger Ebert has created a second sound track commentary. But none of these critical resources — library archives, essays, books, lectures or even DVDs with production materials and running commentary — permit the detailed examination that is taken for granted in the criticism of literary texts.

With print works, specific passages and annotations can be set side by side with the text. The reader can move easily from focusing on the work of art to focusing on the critical commentary. Film scholars have long made use of videotape and digital technologies to examine films and to present them in the classroom, but the copyright situation of films has made it impossible to distribute these segments as part of a scholarly or educational work.

As a result, film criticism is forced to rely on still images and cumbersome verbal descriptions of passages that should be cited as moving images and sound. Because a segment of a film is worth thousands of dollars per minute when licensed to a television show, scholars are prohibited from cutting and pasting such segments.

With a grant from the National Endowment for the Humanities, the Digital Media Program at Georgia Tech is collaborating with the American Film Institute to lay the foundation for a series of digital critical editions that will combine copies of American films purchased from the copyright holders (currently on DVDs) with Web-based educational resources delivered within a single interface.

A common information design standard and an online authoring tool will allow scholars to create and link Web-based resources such as commentaries, outtakes and scripts to one another and to specific moments within the DVD. Viewers will be able to see the copyrighted materials only if they have already purchased or licensed a copy of the film.

Warner Home Video has given permission to make a prototype of the system using “Casablanca” as its focus. When the prototype “Casablanca” is completed, it will form the basis for a new approach to film study.

Having an edition of film in digital form will enable students to reference small segments and analyze their content, to follow the collaborative process of filmmaking and to see the contributions of the individual artists in detail.

For example, viewers can find every place in the film where Max Steiner’s score incorporates excerpts and variants of the melodies of “As Time Goes By” and “Marseillaise” into the background music.

They can trace the creative contributions of producer Hal Wallis by comparing his extensive memos and editing notes to specific moments in the film. Viewers can compare the dialogue as it appears in the finished film with the shooting script, which is full of crossed-out typescript lines and handwritten changes and additions, or they can examine outtakes side by side with the final scene.

There is even footage of a scene that never made it into the film in which Rick visits Laszlo in jail. The outtake does not have a sound track but the text of the scene can be found in the shooting script.

The film is divided into 813 component shots that are linked via a relational database to the resources, so the film scholar or fan can follow themes (such as war or sacrifice), techniques (such as close-ups or dissolves) or repeated lines of dialogue (“Here’s looking at you, kid,” “I stick my neck out for nobody”) throughout the film.

An addition to the digital archive is the text of the original play “Everybody Comes to Rick’s” by Murray Burnett and Joan Allison. The play script, which has never been published, was
Professor Murray describes “Casablanca” as “the epitome of the Hollywood studio film.” It has been a favorite of moviegoers since its first screening.

donated by Adrienne Burnett, the widow of the principal author. Murray Burnett was a New Yorker who wrote the play after a terrifying 1938 trip to aid Jewish relatives in occupied Vienna.

By putting the script into the database-driven system and linking it to parallel scenes in the film, the digital edition shows which elements of the original play survived into the movie. This produces some surprises.

It is usual to attribute the success of the film to the four screenwriters who adapted it. Julius and Philip Epstein are widely recognized for contributing witty dialogue such as this exchange between Rick and the corrupt French police captain Louis Renault about Rick’s mysterious past:

RENAULT: And what in heaven’s name brought you to Casablanca?
RICK: My health. I came to Casablanca for the waters.
RENAULT: Waters? What waters? We are in the desert.
RICK: I was misinformed.

Howard Koch sharpened the political plot, adding touches such as Rick’s background running guns to Ethiopia and fighting against the fascists in the Spanish Civil War. Although he did not receive a writer’s credit, Casey Robinson deepened the love story, filling out Ilsa’s relationship to Victor and building up the piano player Sam’s role as the witness to Rick and Ilsa’s passion.

It is surprising how much of the plot itself and even Rick’s cynical manner of speaking are present in the original play script. The original scene between Rick and Annina, the refugee bride under sexual coercion by the French captain, contains this exchange:

ANNINA: M’sieur, you are a man. If someone loved you very much, so that your happiness was the only thing in the world that she wanted and she did a bad thing to make certain of it, could you forgive her?
RICK: No one has ever loved me that much.

ANNINA: But, m’sieur, if he never knew — if the girl kept this bad thing locked in her heart — that would be all right, wouldn’t it?
RICK, harshly: You want my advice?
ANNINA: Oh, yes, m’sieur, please.
RICK: Go back to Bulgaria.

This scene is little changed in the final version, and it marks one of the few moments where Rick loses his cool. The tough romantic line — “No one has ever loved me that much” — is unchanged in the shooting script, although Bogart gives it a more colloquial phrasing: “Nobody ever loved me that much.” Looking at the play, the script and the finished film one can trace the ways in which the core of Rick’s character and the theme of self-sacrificing love were laid down in the original play and strengthened by the film.

The ending of the film echoes the play: Rick must outfox the corrupt French captain and send Ilsa, who is once more in love with him, off with her husband, Laszlo. In the
The filmmakers’ difficulty in closing ‘Casablanca’ and beginning ‘a beautiful friendship’ parallels the evolving political situation of 1942.

original play script, Strasser, the Nazi, rushes in:

STRASSE: You imbecile! You stupid swine! They’re gone! They were on that plane!
RINALDO [renamed Renault in the film]: I know it.
STRASSE: And your fine neutral here. He’s responsible. (Then he sees the gun and checks. Rick takes the gun and points it very deliberately at Strasser.)
RICK: At the present moment, I am debating very seriously with myself the question of killing you. I don’t see any reason why I shouldn’t except that I have never killed a man. (He throws the gun contemptuously on the table. Strasser leaps for it and covers Rick.)
STRASSE: You are under arrest.

As Rick is being led off, he remains calm and gets the last word. When Rinaldo asks him why he did it, he jokingly refers to their wager on whether Laszlo will escape Casablanca:

RINALDO: Why did you do it, Rick?
RICK: For the folding money, Luis, for the folding money. You owe me five thousand francs.

In the Hollywood version, Rick shoots Strasser, although like any movie bad guy the Nazi is required to ignore a warning and draw first so that the hero can shoot in self-defense.

The screenwriters were then left with the awkwardness of getting Rick and Renault off stage. The Epsteins had the happy inspiration of reviving Renault’s earlier reference to rounding up the usual suspects, which allows them to let Rick get away with murder while maintaining plausibility and a consistent ironic tone. But there was still the question of what would happen next to Louis and Rick, who had placed themselves beyond the framework of the political situation and also of their previous relationship.

The final lines of the movie required several revisions. As the ending was originally shot, the film ends with Louis suggesting that Rick go to the Free French garrison at Brazzaville until things die down:

RENAULT: That ten thousand should be induced to arrange your passage.
RICK: With the ten thousand francs.

This was the final line of the film when shooting ended on Aug. 3, 1942, but it was considered inadequate and the writers continued to work to come up with the additional dialogue to superimpose over the visuals of Renault and Rick walking away together. There is a script page in the Warner Brothers archive with three rather wordy versions of a final exchange between Rick and Renault and an Aug. 7 memo from producer Wallis that reduces them to two pithy alternatives for Bogart alone to record:

RICK: Luis, I might have known you’d mix your patriotism with a little larceny.
Alternate line:
RICK: Luis, I think this is the beginning of a beautiful friendship.

It is not until Aug. 21 that Wallis sends a memo with the final version of the last line:

RICK: Our expenses (pause), Luis, I think this is the beginning of a beautiful friendship.

The filmmakers’ difficulty in bringing the film to a close and placing Rick on the same side as the French captain parallels the evolving political situation of 1942. The change in Rick’s attitude from isolation to renewed idealism and heroic engagement is often compared to the change in American policy and in public opinion after the attack on Pearl Harbor. A digital edition can trace both the production history and the historical background, linking them to specific scenes and documents.

The aim of a digital critical edition is not to distract the viewer from the experience of watching a film such as “Casablanca” but to deepen the engagement with it, to make clear the artistic, cultural and social context of the film.

Viewers can watch the film with no critical apparatus and then on reviewing can turn on alerts for related outtakes, commentaries and other materials. They can choose to enter the edition through the commentaries or the documents and to go from there to the associated shots in the film. Scholars can make use of a separate interface to add commentaries to the edition and to access the complete database, which identifies each shot by dialogue, characters, setting, fictional time, framing, camera movement and editing technique.

“Casablanca,” as the quintessential classic Hollywood movie with an impact that only seems to grow with the passing decades, is the ideal test case for reinventing the critical edition. It will no doubt continue to challenge us as it continues to captivate us as time goes by.
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Intellectual Property Partners LLC, 817 West Peachtree St. NW, Suite 400, Atlanta, GA 30308
Georgia Aquarium awash in thrills as 'HIGH-TECH'
With the largest viewing window in North America, the Georgia Aquarium is in a league of its own. Opened with waves of "wows" the week of Thanksgiving, the aquarium not only boasts the window, actually six 20-ton panels standing 26 feet high and measuring 24 inches thick, but is the only facility on the continent with whale sharks, which are greeted by camera flashes, exclamations and points. 

Photo essay by Gary Meek
Text by Kimberly Link-Wills

Georgia Tech Alumni Magazine • Winter 2006
Showstoppers. That's what executive director Jeff Swanagan, MS TASP 93, calls the Georgia Aquarium's five beluga whales, including Nico and Gasper, acquired from an amusement park in Mexico City, where roller-coaster cars rumbled over their tank 65 times a day. The whales' bigger-than-life personalities draw crowds as they mug for cameras at the aquarium, the world's largest with 8 million gallons of water.
If the beluga whales represent the colossal size of the aquarium and the mammoth effort it took to fill it with more than 100,000 animals, the leafy seadragon illustrates the fragile beauty of small undersea creatures and their camouflage tactics to hide from predators. The seadragon's skin filaments blend with the blades of kelp in its native waters off southern Australia. Like its cousin the seahorse, the male leafy seadragon carries the eggs laid by the female.
The touch pools give guests the chance to reach in and feel stingrays, sea urchins, shrimp and starfish. David Brinson, EE 73, project executive for mechanical contractor McKenney's Inc., says, "The aquarium is absolutely amazing. It does have a 'wow' factor, doesn't it? It was a job where all the folks really cared a lot about producing a world-class facility."
For beholdner, jellyfish can be beautiful or bizarre — or even both. One young aquarium visitor forms her opinion on opening day. Ninety-seven percent water, jellyfish don't have eyes or brains. Nerve cells signal the muscles in the bell that food or danger is near. For protection, the tentacles are covered with thousands of microscopic harpoons. Jellyfish also have several mouths on their arms. Beautiful and bizarre. >>>
Tech alumni contribute expertise to build and fill world’s largest aquarium
By Kimberly Link-Wills

Tech’s ties to the Georgia Aquarium run deep. Benefactor Bernie Marcus reeled in Jeff Swanagan, MS TASP 93, as executive director of what would become the world’s largest aquarium in 2001, when the ship-shaped building, now docked on nearly nine acres of Coca-Cola-donated land next to Centennial Olympic Park in Atlanta, and its 8 million gallons of water were little more than The Home Depot co-founder’s dream.

McKenney’s Inc., headed by Tech alumni, was hired as the mechanical contractor. Institute faculty came aboard for a coral reef exhibit and a computer-animated depiction of Marcus’ vision. The father of five, Swanagan has a son at Georgia Tech. Brian, a math major, is set to graduate in the spring. Swanagan also talks about Ralph and Norton like a proud papa passing around snapshots of his brood. Ralph and Norton are the aquarium’s biggest stars — literally. The whale sharks are the biggest fish on the planet. Already about 17 feet long, Ralph and Norton could grow to 40 feet in length, like moving from a pop-up camper to a motor home.

“This is the largest viewing window in North America. We had to put the panels in before we put the roof on,” he continues. “Behind the window is 6.2 million gallons of water.

“It’s a hoot to get in there and clean the acrylic. It’s a privilege to dive in a tank like this. I get in on Sundays and help clean,” Swanagan says, pointing out that one of the divers wiping the window with a cloth diaper hails from Georgia Tech.

Swanagan grew up along Lake Erie watching Jacques Cousteau on television and dreaming of becoming a marine biologist. He earned a comprehensive science degree at Ohio State, began graduate studies and worked for Columbus Zoo director and frequent talk show guest Jack Hanna before being lured to Atlanta to study under Tech philosophy professor Bryan Norton, who specializes in sustainability theory and bio-diversity policy.

“I was really inspired by some of the course work,” says Swanagan, who worked his way up to deputy director of Zoo Atlanta under longtime leader and Tech psychology professor Terry Maple.

Swanagan says Maple knew of his “serious passion about aquariums” and threw his name into the pool to take over the struggling Florida Aquarium. “I was a reluctant candidate. It had hit rock bottom. I went for an interview because they had manatees and I love manatees.”

Once in Tampa, Swanagan was hooked. During his tenure he was able to operate the aquarium in the black four straight years. Meanwhile, Marcus was fishing around for names of top candidates to make his dream a reality.

Marcus says he and Swanagan visited every aquarium in the world — just a drop in the bucket compared to the more than $250 million he shelled out of his own pocket to build Atlanta’s landlocked ocean liner, which had a price tag of an estimated $290 million.

The Vitek Lab at Georgia Tech’s College of Architecture produced a computer-generated fly-through of what the aquarium would look like to help secure corporate sponsors to build the five galleries — Ocean Voyager, Tropical Diver, Georgia Explorer, River Scout and Cold Water Quest.

Swanagan credits McKenney’s Inc. with making the aquarium’s opening possible less than two and a half years after ground was broken. “That’s
incredibly fast-paced. The McKenney's team went above and beyond. It was a labor of love for them.”

David Brinson, EE 73, was the project executive for the mechanical contractor, which ran 62 miles of pipe and wire through the aquarium.

Helping Brinson with the firm’s single largest project to date was a team that included Derek Smith, ME 95; Andy Portwood, ME 72; Johanna Spivey, IE 03; Matt Elliot, ME 01; and, of course, Dave McKenney, Phys 60, IE 64, and John McKenney, IE 90.

McKenney’s also was responsible for the HVAC system, equivalent in size to one needed for a 50-story, 1 million-square-foot building. Brinson adds that 218 pumps combined to produce 4,160 units of horsepower push 261,000 gallons per minute through the 60 aquarium habitats.

A team from Georgia Tech also supplied cultivated rock from a conservation and economic development project off the coast of Fiji led by biology professor Mark Hay for what is touted as the world’s largest coral exhibit.

Hay and his team, which included biology professor Terry Snell, international affairs associate professor Kirk Bowman and biology, chemistry and biochemistry assistant professor Julia Kubanek, taught villagers in Fiji how to plant a crop of synthetic rock rather than break off pieces of live coral reef substrate to sell.

Studies have shown that the organisms living on cultivated rock are as effective as those on live rock in purifying aquarium water. Five metric tons of rock were used in the Georgia Aquarium exhibit, which features waves rolling in on a shore over visitors’ heads.

“No one has ever built something like this before. We built this building in 28 months,” Marcus says. “It has more concrete than anything you’ve ever seen in your life.”

Marcus beams as Gov. Sonny Perdue, Atlanta Mayor Shirley Franklin and corporate leaders applaud the aquarium during an unveiling catered by celebrity chef Wolfgang Puck.

AirTran president and COO Robert Fornaro is one of the business leaders on stage with Marcus. AirTran sponsored the Tropical Diver exhibit featuring the coral reef.

When Fornaro takes the podium, he congratulates Marcus on his vision and quotes Carl Sandburg: “Nothing happens unless first a dream.”

The 550,000-square-foot ship-shaped aquarium was designed by Thompson, Ventulett, Stainback and Associates, the architectural firm headed by Tom Ventulett, BS 57, Arch 58. Jeff Swanagan, MS TASP 93, at left, was lured away from Florida by benefactor Bernie Marcus, who poured $250 million of his own money into the Atlanta attraction. Professor Mark Hay and his team supplied cultivated rock from a project off the coast of Fiji for the coral reef exhibit, top left.
Field Surgeon

Seventy-one-year-old physician John Burson volunteers for duty on the front lines in Iraq

By Neil B. McGahee

With his thick white hair and chiseled face, John H. Burson looks more like a grandfather than a soldier in the U.S. Army. But in December, the 71-year-old Villa Rica, Ga., physician traded time at his ear, nose and throat practice for a three-month stint in a MASH tent in Iraq.

"I retired from the Army Reserve in 1985 but two years ago I got an e-mail offering retired medical reservists an opportunity to go to the Middle East and relieve young doctors who may have a family and would like to return home for a few months," he says. "I have never seen war first-hand. I missed World War II and Korea and my unit was never called up for Vietnam, so I always felt like I missed something."

On Nov. 20, Burson boarded a flight to Fort Bliss, Texas, for a thorough physical exam followed by a two-week Army refresher course that included instruction on treating injuries caused by improvised explosive devices.

Two weeks later Burson arrived at Camp Victory in Baghdad. He was temporarily assigned as the physician at the U.S. embassy, then deployed to a field hospital.

"I don't know where I'll be going but I do know it will be a close support command for the 101st Airborne Division near Tikrit or Baghdad," Burson said before he left. "I will be working as a field surgeon providing lifesaving and stabilization for combat casualties so they can be safely transferred to hospitals in Europe or Asia."

Such changes of direction have occurred with some regularity in Burson's life.

"My family asks me when I plan to grow up," he says with a laugh.

After earning three degrees from Tech, Burson, ChE 55, MS MET 63, PhD 64, remained on campus as a chemical engineering professor and biomedical research engineer at the Engineering Experiment Station, the forerunner of the Georgia Tech Research Institute.

"I always had an interest in the life sciences and that research renewed my interest," he says, "so I decided to become a doctor." Burson walked away from a 15-year teaching career at Tech and enrolled in the Emory University School of Medicine.

"Why not? I was 37, I had four children and no source of income," Burson quips. He was elected president of his junior and senior medical school classes at Emory.

After completing his internship and his residency with the Emory University Affiliated Hospitals, Burson decided to specialize in otorhinolaryngology.

In 1979, after finishing his residency, the new doctor went home to Carrollton, Ga., and opened an ear, nose and throat practice. About 20 years later Burson noted a northern population shift to the growing Villa Rica market.

"Villa Rica had no medical offices and an outdated hospital, so three of us began a practice," he says. "As we expected, the population continued to grow and a new $17 million hospital opened in 2003."

Burson moved his practice entirely to Villa Rica and formed Chattahoochee Healthcare, a multi-specialty practice that includes orthopedics, general surgery, urology and otorhinolaryngology.

Not everyone was thrilled about Burson's decision to go to Iraq.

"My wife, Barbara, is not real happy about this, but she has been a good sport about it," he admitted, explaining that in addition to the holidays he was missing their 50th wedding anniversary.

"This is like your high school football coach showing up on your doorstep 50 years later saying you're eligible to play one more game. Would you suit up? You know you would."
Winning Bid

Kelly Braun knew the way to San Jose — and what a ride

By Kimberly Link-Wills
Photography: Caroline Joe
When Kelly Braun joined an emerging Internet powerhouse called eBay in 1999, she wanted to make the online auction site easy enough for her mother to navigate. Now the senior manager of user research for eBay's PayPal, Braun, ICS 84, can proudly proclaim that her mother routinely logs in, bids on and buys quilting fabric.

At the close of the third quarter 2005, eBay reported 168 million registered users worldwide. With an estimated 6.4 billion people on the planet, that means roughly 2.8 percent of the Earth's population buys or sells on eBay.

"EBay's business model is really incredible," Braun says. "EBay has no inventory. We're a venue for people to buy and sell almost anything. We charge a fee to put an item up for sale and we take a percentage of the sales price."

The profit can be mere pennies on a rock-bottom-priced trinket, but a business that sells billions of little gems will rake in mountains of pennies. eBay cashed in with net revenues of $1.1 billion during the third quarter.

The total value of "successfully closed items" was $10.8 billion, according to an eBay end-of-quarter report. ACNielsen reported in July that more than 724,000 sellers in the United States use eBay as a primary or secondary source of income. Another 1.5 million Americans sell on eBay to supplement their incomes.

Braun says it's heartening to hear the stories of eBay's PowerSellers, those who earn more than $1,000 a month. She has heard stories from people who lost their jobs when the only mill in town closed and now support their families through the sale of anything from antiques to quilting material.

"EBay is more than selling Beanie Babies, it's also people's livelihoods," Braun says.


Within a year Braun, who was working for Oracle as a usability engineer, had not only become familiar with eBay, she had gone to work for the San Jose, Calif., company as its 191st employee. That same year eBay broke into the international market by expanding to Canada and the United Kingdom.

EBay now has more than 10,000 employees in 33 markets around the globe, from Australia to India, Poland to Taiwan.

"Germany is the biggest site that we have besides the U.S. The penetration is actually higher than in the U.S. The bricks-and-mortar German market is not the most efficient market. Their shopping is very constrained. That's perfect for eBay. We're available on Sundays, we're available at night," Braun says.

She played an integral role in the development of user-friendly sites for the Asian markets. "In Asia, we found there were differences, not only in the culture, but in the language structure itself, the visual of the language and in what was already there on the Web. In China, the blue is a different color. The standard blue used in the U.S. was too intense for the characters in Chinese.

"Korea has a large broadband penetration. Their Web sites look very different from the U.S.," Braun says. "In the U.S., we've started using Flash on home page merchandising. There was a lot of resistance to putting moving things on the page. But in Korea there are a lot of moving images. If we were to take all the flashing stuff off, it would not seem as sophisticated or trustworthy to the Koreans."

Private Jets and Petrified Sandwiches

EBay's research has shown that the Koreans buy more clothes than anything else. In Germany, new, in-season items are the most popular. In the United States, the eBay Motors division hauls in the most money, generating $14 billion in the third quarter, miles beyond the $3 billion Americans spent on new and used clothes.

It makes sense that eBay Motors is the most profitable since the site markets everything from an auto part to a private business jet, the most expensive item ever sold on the auction site, going for a winning bid of $4.9 million.

Private jets aren't flying off the virtual shelves, but jewelry is. Someone buys a diamond ring on eBay every 12 minutes. And American consumers, in the third quarter, spent $3 billion on electronics and another $2.5 billion on books and music.

The TVs and CDs don't garner the attention that the more unusual merchandise does. The media jumped on the story of a woman who sold advertising space on her pregnant belly. Then there was the woman who claimed her 10-year-old grilled cheese sandwich bore the image of the Virgin Mary and sold it for a lot of bread: $28,000.

"You can't sell anything, you >>>"
don’t actually own and can’t deliver, the governor of California for instance. Someone tried to sell Arnold Schwarzenegger,” Braun says. “We have a list of items that are prohibited, but most things that you want to buy or sell, you can buy or sell on eBay.”

You can’t buy live animals, with the exception of tropical fish and aquatic snails. “Bear products,” including claws and rugs, aren’t permitted.

Native American burial artifacts and prayer sticks are taboo. Hazardous materials, such as carbon tetrachloride, radioactive waste and Freon, are off-limits. And don’t even think about trying to sell your liver. Human organs, bones and blood are all prohibited.

Almost anything else you’re looking for can be found on eBay. A recent search using the word “Elvis” brought up 2,730 categories — not items, categories. Typing in “lock of Elvis’ hair” found only one category, but there it was, an authenticated strand of the King’s mane.

A search for “Georgia Tech” found 1,183 items. “Ramblin’ Wreck” generated three. “Brad Pitt” got 2,683 and “Angelina Jolie” 3,032.

Braun can be found on eBay too. The book she co-authored, “Usability: The Site Speaks for Itself,” often can be found for sale.

She was among the experts on a panel discussing computer-human interaction at the CHI 2005 conference in Portland, Ore. A contingency from Georgia Tech also attended. “I talked to some of the professors and they said, ‘We’d love to have you come talk at Georgia Tech,’” Braun says.

Paving the Way to San Jose

She returned to campus in October and delivered a lecture at the Graphics, Visualization and Usability Center titled “From Georgia Tech to eBay: Do You Know the Way to San Jose?”

After the meeting, Braun visited with professors, explored a campus that looks quite different from the one she left in 1984 and joined old friends for Southern food and the sweet tea she can’t find in California.

“I always say Georgia Tech is the toughest thing I ever did in my life and it’s also been the most valuable thing I’ve ever done,” she says. “I learned some of the really valuable skills that I have carried into business — determination, sticking with a problem even though you don’t see an answer, learning from your mistakes.

“I wanted to go to a school that was very academic. The thought of going to a school where all they did was party actually frightened me because I was not that social. I wanted to find people like me who really wanted to study and I wanted to go someplace where there really wasn’t a winter,” says the New Jersey native.

“I had never been to Atlanta before. My parents brought me down for my campus tour. It was January and rainy. To be honest, Georgia Tech was this very ugly place then. We went back to the hotel and I cried. I thought, ‘What am I doing?’”

She cried again late that summer when her parents were getting ready to drive back north after settling their daughter in her dorm room. “My father said, ‘Kelly, we took all that stuff up three flights of stairs. You’re staying.’”

Braun found her niche during her second quarter at Tech. “I met some people on the Technique staff and I had been reading it and thought it was very funny, that they had a kind of sarcastic humor like me. There were women there, but it was still a little bit of the old boys network. But I stuck with it and I became the first woman editor.

“I think that experience, the things I was
"Tech is the toughest thing I ever did in my life and it's also been the most valuable thing I've ever done. I learned some of the really valuable skills that I have carried into business — determination, sticking with a problem even though you don't see an answer."

exposed to, working with the administration, trying to make people aware of education funding issues prepared me for life," she says. "The Technique taught me a lot. How do you motivate people to stay and help get the paper out who aren't being paid, who are already overworked and stressed about classes?"

Lane Changes Along the Way

Braun says she too was stressed. She arrived at Tech not knowing how to study. She had never had to do it before. "The hardest thing for me was getting out. I have a PhD from Duke and it wasn't as difficult for me. Tech has a lot of students who are used to being the best. All of a sudden you're not the best. You may not even understand what's being taught. That kind of stuff helped me the most because eBay is definitely the most intense job I've ever had. We move very quickly."

Her Tech education also helped Braun make "little switches along the way," although it did take some adjustments when she began studying for her doctorate in cognitive psychology.

"A professor would ask, 'What do you think of this? What's your theory?' I thought, 'Why would they care about my theory? What's the right answer? It works or it doesn't, like in computer programming,'" Braun says. "At Duke I learned a lot about how to see the gray. At eBay that's been very important because it's not always an absolute. There are business objectives as well as usability objectives. We have to figure out how to address both."

Braun made the switch to manage the PayPal user research team in the fourth quarter of 2005. Founded in 1998, PayPay enables anyone with an e-mail address to send and receive payments online. Acquired by eBay in 2002, PayPal now has 86.6 million account members worldwide — more than the entire population of Germany.

"Understanding how you make the best user experience and still meet your business goals is very critical," Braun says. "On the Internet usability is a product. It can be the differentiator between your site and another site."

EBay CEO Meg Whitman, named Fortune magazine's most powerful woman for the second year in a row, has been a strong supporter of user experience research, Braun says.

When Braun started at eBay, Whitman's cubicle was a few rows over. "One of the things I loved about my early eBay experience was hearing Meg's laugh from across the cubes. Meg's presence out in the cubes made us feel like we were all part of a tight-knit team," she says.

Although the corporation has experienced tremendous growth, Braun says the team spirit remains. "There's a lot of team effort at eBay. You have to be able to work with a team or you can't be successful. That's one of the things we're measured on — works well with others."

Braun says good communication skills also are essential in order to express the value of one's work to the business. "That was how we were able to grow the user research team from three people to 15 and get funding for four usability labs. This is from a company that is very cost-conscious. But I was able to make a business case for why we needed labs and more researchers."

Ditching the Supermom Theory

For a woman with a 4-year-old daughter, juggling skills don't hurt either. "She came very close to being born in the office. Apparently I was in labor when I got to work. I went through my day, interviewed someone for a position," says Braun, who confided to co-workers that she felt awful and was going to be out of the office for an hour to pay a visit to her obstetrician.

"Less than two hours later I had my child."

Braun calls the first two years of Josie's life "very difficult" as she sought balance between her demanding career and the demands of motherhood.

"These last two years have actually been easier because my husband got laid off with the downturn in the economy. I asked him not to go back to work. He was a little skeptical about being a stay-at-home dad. Now he does more of the actual hands-on child care than I do. He takes her to the pediatrician and to preschool," Braun says.

"The whole supermom thing is something you struggle with. There are times I'll say to my husband, 'Well, if I was a good mom, I'd do this.' Yes, there are times when I wish I had more time. One of the things we were told growing up in the '60s and '70s was: 'You're a woman, you can have it all.' That's not true.

"You have to have trade-offs. You have to make concessions. In my youth I was very focused on school and my career. I don't think I could have focused on being a mom at that time in my life," Braun says.

"I didn't meet my husband until I was older so I didn't have to make a decision about children until I was older. But there are times when I wish I was a bit younger and not be exhausted and could just sit on the floor and play dollies." GT
YOU THINK ANYONE WOULD NOTICE IF I DIDN'T SHOW UP?

This is grad school... they'll notice furniture missing before they notice you.

Can you believe they gave the guy who draws that 'Fox Trot' comic strip an honorary PhD?

So?... and they just give it away to some cartoonist!

---

Piled High

A Tech alum's online comic strip chronicles life in grad school

By Neil B. McGahee

Photo by Jamie Howell

A Georgia Tech alumnus who lampoons his graduate school experiences in an online comic strip has developed a cult following among graduate students around the world.

Jorge Cham, ME 97, author of "Piled Higher and Deeper," pokes fun at the miseries of postgraduate education — "adviser-student relations, procrastination, sleep deprivation and the endless search for free food."

Cham appeared at the Tennenbaum Auditorium in October, part of a 19-campus tour promoting his second collection of cartoons, "Life is Tough and Then You Graduate." His first book, "Piled Higher and Deeper: A Graduate Student Comic Strip Collection," was published in 2002.

First published in 1997 in the Stanford Daily, the comic strip examines the lives of four graduate students — Cecilia, Mike, Tajel and one who is unnamed.

"To alleviate some of the stress, I would write down funny things that happened to me or other grad students," Cham says. "That's why the main character doesn't have a name, because when you're in grad school you usually have to tell your adviser who you are four or five times before they remember. To them you're just another brain on a stick.

"Over the years, procrastination became a theme. What seems to stress grad students the most is the knowledge that there is always something you should be doing. It's not like a 9-to-5 job where you can leave everything at the office — there's always more homework, more research you can be doing, so we feel guilty and that makes for some funny situations."

Cham says he had little experience in cartooning and no artistic training, "One day I saw an ad in the Daily for a cartoonist and I decided to try it," he says. "I started drawing based on my own experiences but it soon became apparent that a strip just about me was pretty boring so I invented some other characters — composites of other students I had known."

The strip began to grow slowly in popularity around the Stanford campus then caught on through the Web site at other California schools. The strip has appeared or been featured in the journal Nature, the Chronicle of Higher Education, IEEE Potentials, Math Horizons and Canada's The Peer Review magazines and has been linked to the USA Today Web site.

In September, the phd-comics Web site recorded more than 2.4 million page views from more than 1,000 schools worldwide.

"Your comic strip makes me feel that I am not alone and there are others suffering through the penniless ignominy that is grad school," a University of Houston student wrote. A Brigham Young grad student wrote, "It hurts! It's all so true and so evil! I can't tell whether I should be laughing or crying in sympathy."

Cham, a native of Panama, earned a master's and doctorate from Stanford, also in mechanical engineering. When not drawing the strip, he is a postdoctoral instructor and researcher at the California Institute of Technology in Pasadena studying brain-machine interface technology for neural prosthetics and "smart" neural recording devices with movable electrodes.

"I work with people who are paralyzed due to spinal cord injury or a disease like Lou Gehring's that disables the entire motor system," he says. "The only way they can communicate is by blinking their eyelids so I'm trying to find a way to bypass the damaged nerve system and gain access to their brain signals so we can communicate or manipulate their environment more effectively."

"The difficult part is establishing a mechanical interface with neurons in order to get into the brain and stay there without causing more damage."

Cham says he never dreamed his cartoon would be so popular but he's unsure about its future.

"Anyone who does any kind of art eventually wants to have their work seen," he says. "In some ways I would like to see the strip syndicated and carried to a mainstream audience, but it's popular because it is specific to the grad school experience and that audience is limited."
OK, NOBODY.

"I SMARTCRJ I NOW?" WELL, AT LEAST IT WAS ONLY A HUMANITIES PHD.

LUH.

WHAT DO Y... HEY!

VAAAWNi LATE NIGHT? HEA!

SO, YOU WANNA WORK ON THIS PAPER? YESTERDAY.

HUL EXTENSION?

WELL THEN STOP PROcrastinating AND LET ME NAP.!

5PM TODAY. ALLRIGHT, WAKE ME UP AT 4.

MIKE, IT'S 3:55.
Communications technology sometimes develops in curious ways, says John A. Copeland, who notes with amusement that television moved from a wireless to a wired — i.e. cable — environment, "while computer networks and Internet access are moving in the opposite direction, from wired to wireless." The John H. Weitnauer Jr. technology transfer chair at Georgia Tech's School of Electrical and Computer Engineering and a Georgia Research Alliance eminent scholar, Copeland's research embraces the area of wireless computer networks, particularly their associated security issues. Much of his work is done through the Georgia Tech Information Security Center.

Copeland's research is pressed by the phenomenal growth of wireless. More than 10 million homes in the United States have wireless fidelity (Wi-Fi) base stations or routers that provide a high-speed Internet connection. Routers also may connect computers with printers, external storage devices or other devices. Only five years ago, the number was essentially zero. The adoption of wireless computer networks by business has followed similar explosive growth. The advantage of mobility provided by wireless is tempered by new concerns arising from the vulnerabilities of wireless to hackers and data thieves, says Copeland, whose many hats include directorship of Tech's Communications Systems Center, which performs research on high-speed optical fiber networks using asynchronous transfer mode switches to carry Internet protocol data, video conferencing and other high-bandwidth applications. He also serves on the Governor's Information Technology Policy Council, charged with planning Georgia's next digital communications network.

Copeland earned his undergraduate, master's and PhD degrees in physics from Georgia Tech in 1962, 1963 and 1965, respectively. He joined the campus faculty in 1993 with his appointment to the Weitnauer chair and began a three-year term as director of the Georgia Center for Advanced Telecommunications Technology.

The growth of wireless devices has been remarkable over the past few years. Where do you see the technology heading?

People like anything that increases their mobility and that's the advantage wireless provides. With the way the technology is developing, it has become very inexpensive to add wireless capability to something that in the past was wired. We're already seeing a rapid convergence of home computer networks to wireless, just as many people are using cell phones instead of land lines.

Wireless isn't going to replace wire completely. Cable and telephone companies offer very high, fixed bandwidth to homes and offices through optical fiber and that trend is going to continue.

One sees the term "Wi-Fi" in connection with wireless. Are they the same thing?

Wi-Fi just means the protocols that were used on the initial wireless computer networks. Wi-Fi had an encryption algorithm called wired equivalency privacy, which wasn't very good, and hackers immediately started distributing programs to break it. Wi-Fi was sort of synonymous with wireless local area networks for computers for a while, but I don't think that term is being used much anymore. In a generic sense, Wi-Fi is the wireless networking that's common now. It's installed in a lot of new laptops and you can buy Wi-Fi wireless cards and hubs and so forth. The technology is not going away, but the buzzword is.

Newer protocols have replaced the Wi-Fi protocols. One of those technologies is called WiMax. It is for long-distance, point-to-point communications. Some cell phone companies are using it because they can cover a much wider area. For instance, you might be a mile or a mile and a half away from the base...
station and still get a high bit-rate connection though WiMax.

Is wireless inherently less secure?

I don't think you want to depend on the things that come with your wireless router and wireless card to protect your data. You want to run higher-level programs that encrypt the data and keep it private.

For instance, there are several good types of what are called virtual private network programs which encrypt the data before it leaves your PC and it stays encrypted until it arrives at the server.

But if you don't set the rather weak security features that wireless has, and you're not encrypting your data, then you are broadcasting it for anybody who wants to listen to it.

When you use a wireless link in your data connection, there's always the possibility that someone with an antenna and a wireless card can be listening to everything that you say. But that's also true on wired networks.

In the past, many people didn't think about security. Even now they often don't set the security...
features available on the wireless card and hub and they don't protect themselves by using encryption protocols at higher levels. If that's the case, your data is at risk.

**Why don't some people at least enable the security features that come with the hardware?**

They're just too difficult to set up. Security devices, like what you'd find with a wireless local area network card for instance, aren't on by default because they have to be configured based on a number of conditions that vary from person to person and machine to machine. If the configuration isn't done properly, the card won't work. The whole process might take an hour or two going through the manual and a call to customer support to get all the settings right.

Computers should serve people, not vice versa — that's something of a mantra at the Georgia Tech Information Security Center. Not only do we develop secure techniques to protect data, but we want to find ways of making those measures transparent to the user.

When I use my cell phone, my voice is encrypted from the phone to the point where it goes into the regular telephone network. I didn't have to set up anything. It's designed in such a way that it works automatically. That's where we need to be with wireless computer networks.

**What are some of the concerns related to wireless access to corporate networks?**

The new danger to the corporate network is that somebody can hook into the network behind the firewall, which is between the internal network and the outside world, to prevent packets coming through that might be used to set up a connection with your industrial servers.

Even without wireless, someone inside the company, inside the building, can use the local area network to access those servers that are not blocked out by the firewall. Somebody down in a closet somewhere could tap into your ethernet line just like they'd tap into a phone line and they could read all your data there.

But if somebody buys a wireless access point and plugs it into the wall, he can go to an empty room and use his laptop to connect to the network.

The signal from these wireless hubs only goes 100 to 150 feet, but with a directional antenna a hacker might be able to sit in a parking lot 500 feet away and get into a corporate network. Once in, he'd start scanning it with packets to find out what computers are on the network and then he could run programs to try to break into those computers. It's a way of bypassing the corporate firewall.

The Georgia Tech wireless network is set up so that when you log on, the only way your packets can get off is to go through a firewall. That keeps people from doing bad things from within Georgia Tech.

One of the things my research group in the Information Security Center is doing is monitoring network traffic in certain ways to see if we can tell when an unauthorized wireless hub has been installed on it.

**What are some of your other research areas?**

Generally we work in the areas of networks and network security. Some of our projects are specific to wireless, like the location of rogue access points I just mentioned.

Another project involves fingerprinting wireless computers, that is, being able to tell remotely what type of wireless card someone is using. This would be helpful when an intruder uses a wireless link to break into a network by spoofing or forging the IP address or the ethernet address of somebody who normally uses that network. If we can detect that the wireless access card in use is not the brand it's supposed to be, that's one way of tipping us off that we have a rogue host on the network.

We're looking at other methods of fingerprinting as well — other attributes that could help identify a specific computer.

We're also interested in ways to enable wireless network users to move from one kind of network to another without opening up security gaps. Say you have someone who is working at a hot spot on Wi-Fi and when he gets out of range switches over to a digital cellular system. A little farther down the road he might have to switch to an analog cell network.

Someone else could log onto the analog network by pretending to be the person who was just on the digital network. So we want to develop encryption, authentication and authorization protocols that will let people move around freely and securely among different types of networks.
Securing your computer is another important way of avoiding unauthorized network access.

It is. And that's why people are exploring so many different approaches such as biological identification — automatic fingerprint identification and retinal pattern identification.

One of the most secure techniques so far involves a little fob that has a six- or eight-digit password that changes every second. When you want to log on to the computer, you look at the fob and type in whatever number is there. The computer has a similar, synchronized clock that's encrypting the digital representation of time the way the fob is. If the numbers match, or come within a second or two of matching, you can log on. Even if someone is watching you on the keyboard, they can type the same number a few seconds later and it won't work. Another advantage of the fob is that once you've used a number, it can't be used again.

Staying ahead of the bad guys is a never-ending challenge, isn't it?

Whether you're using wireless or wired connections, I think you have to assume that somebody somewhere is listening — unless you use the right security protocols to protect your communications. GT

Another project involves "fingerprinting" wireless computers — that is, being able to tell remotely what type of wireless card someone is using. This would be helpful when an intruder uses a wireless link to break into a network.
Georgia Tech opened its Center for Rehabilitation Technology in January 1981 with a ceremony attended by Gov. George Busbee, who observed, "The center will develop, test and evaluate" devices designed to help disabled people and "develop the manufacturing and marketing methodologies needed to promote the production of these devices and systems." Center director Richard L. Martin said the principal emphasis of the program would be "on designing and evaluating adaptive equipment" to help the disabled population.

Blake R. Van Leer, who died Jan. 23. Van Leer became president on July 1, 1944. During his tenure, research grew from $50,000 to $2 million and three major structures were completed: the Price Gilbert Library, the architecture building and the Harrison Hightower Textile Building. In addition to Tech's look, its personality began to change under Van Leer: In 1952, women were admitted as full-time students.

After being voted the most famous amateur sportsman in the world, Bobby Jones began a 26-week coast-to-coast radio broadcast for NBC on Jan. 14, 1931. "This will be my first experience before the 'mike' and I am willing to admit being subject to some fright," Jones said after signing the contract.

Blake Van Leer (third from left) was Tech's fifth president until his death. Shown is the campus in 1956.
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Elliot Moore's research is "attempting to analyze different characteristics of a person's speech to gather information on their emotional or mental makeup at..."

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**A Voice of Reason**

Elliot Moore might have been a pilot if his mother had not steered him toward engineering. In 2005, Moore garnered Georgia Tech Savannah's first faculty CAREER Award for his speech analysis research.

By Gary Goetting

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Even as a small child, Elliot Moore II displayed one of the telltale signs of a future engineer: He liked taking his toys apart to find out how they worked.

"I wasn't all that successful at putting them back together," laughs Moore, an assistant professor at Georgia Tech's Savannah campus and an inveterate movie buff and Christian fiction reader. "My mom didn't mind too much — she thought it was better for me than watching television."

Moore, EE 98, MS EE 99, PhD 03, joined the Tech faculty in Savannah in 2004 and teaches electrical and computer engineering. His research interests center on digital signal processing and applying its techniques to speech analysis.

Last year, he became the first Savannah-based Tech faculty member to win a CAREER Award from the National Science Foundation. His award-winning project was titled "Extraction and Integration of Voice Source Features into the Acoustical Analysis of Spoken Affect."

Born in the Azores to a military family, Moore's childhood was spent at a number of Air Force installations around the world. His favorite stop...
was Iceland. "We lived on the Air Force base, so there were a bunch of other kids to hang out with," he says.

"During the summer, you had 24 hours of daylight. We did all the normal things kids do — play sports, hang out at the playground — but we were out at 12 o'clock at night because it was so bright outside.

"During the winter, you had maybe three hours of daylight, but at night you could see the aurora borealis — the Coriolis effect in the sky — and that was pretty cool."

Moore's original career ambition had been to join the U.S. Air Force, like his father, and become a pilot.

"But my vision wasn't all that great," Moore says, "so my mom suggested engineering as an option. In high school I took a lot of honors science courses and honors math courses and started getting interested in computers."

He visited Tech just as the campus was starting to gear up for the 1996 Olympics, "and that was a major selling point. The campus impressed me, I got to see the computer science department, the electrical and computer engineering department and some of the cool things you could do in engineering."

In short order, "Georgia Tech was the only place I wanted to go," says Moore, who was accepted by MIT and others for graduate school. "But by then I had met my wife, Jodi-Ann, who is from Atlanta, and it made more sense to stay here."

As an undergraduate he had developed an interest in digital signal processing, which he carried throughout his graduate career and into his position at Georgia Tech Savannah.

"The research that I do is heavily involved in speech analysis," Moore says. "We are attempting to analyze different characteristics of a person's speech to gather information on their emotional or mental makeup at the particular time they are speaking."

The work is closely related to voice stress analysis, commonly used by law enforcement to ascertain whether or not an individual is being truthful. Moore is taking that idea much further, theorizing that voice inflection and other qualities may provide windows to other parts of the mind.

In most situations, people can judge someone's emotional state simply by the tone of his voice, Moore explains. "Humans are trained to understand what emotions sound like. We must be hearing something in a voice, so the idea is to try to track and mimic whatever that is."

In addition to the rhythm and tone of speech, Moore is interested in measuring physical changes, movement and air flow patterns through the vocal folds, which direct air through the voice box.

"It's a very difficult, unsolved problem, but that's why it's research," he notes.

Ultimately, Moore's work could provide the means for electronically analyzing speech to detect certain emotions or stress. The technique could improve existing methods for detecting deception as well as add a useful dimension to human-computer interaction.

"For instance, in a dialogue-based human-computer tutoring system, you may want to detect if the user is becoming frustrated or angry with the system," Moore says. "Or in situations like a call center where you're monitoring a lot of calls for quality assurance, you could automatically search calls for angry customers or unhappy customers."

From a medical perspective, Moore's database of vocal nuance could support clinical applications related to certain emotional disorders. In fact, his dissertation was written about the speech characteristics of individuals diagnosed with clinical depression.

"We formed a collaboration with the Medical College of Georgia's department of psychiatry," Moore says. "They collected voice samples of people who were diagnosed with clinical depression. For comparison, we collected samples of people reading basically the same material, but who were not clinically depressed.

"My dissertation performed an in-depth analysis on the speech features and characteristics of the two groups. Based on speech alone, we were able to create some distinctions between normal speech and the people who were suffering from clinical depression."

The hope, according to Moore, is that speech analysis may be incorporated into some kind of new diagnostic or even serve as an early warning sign for depression.
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