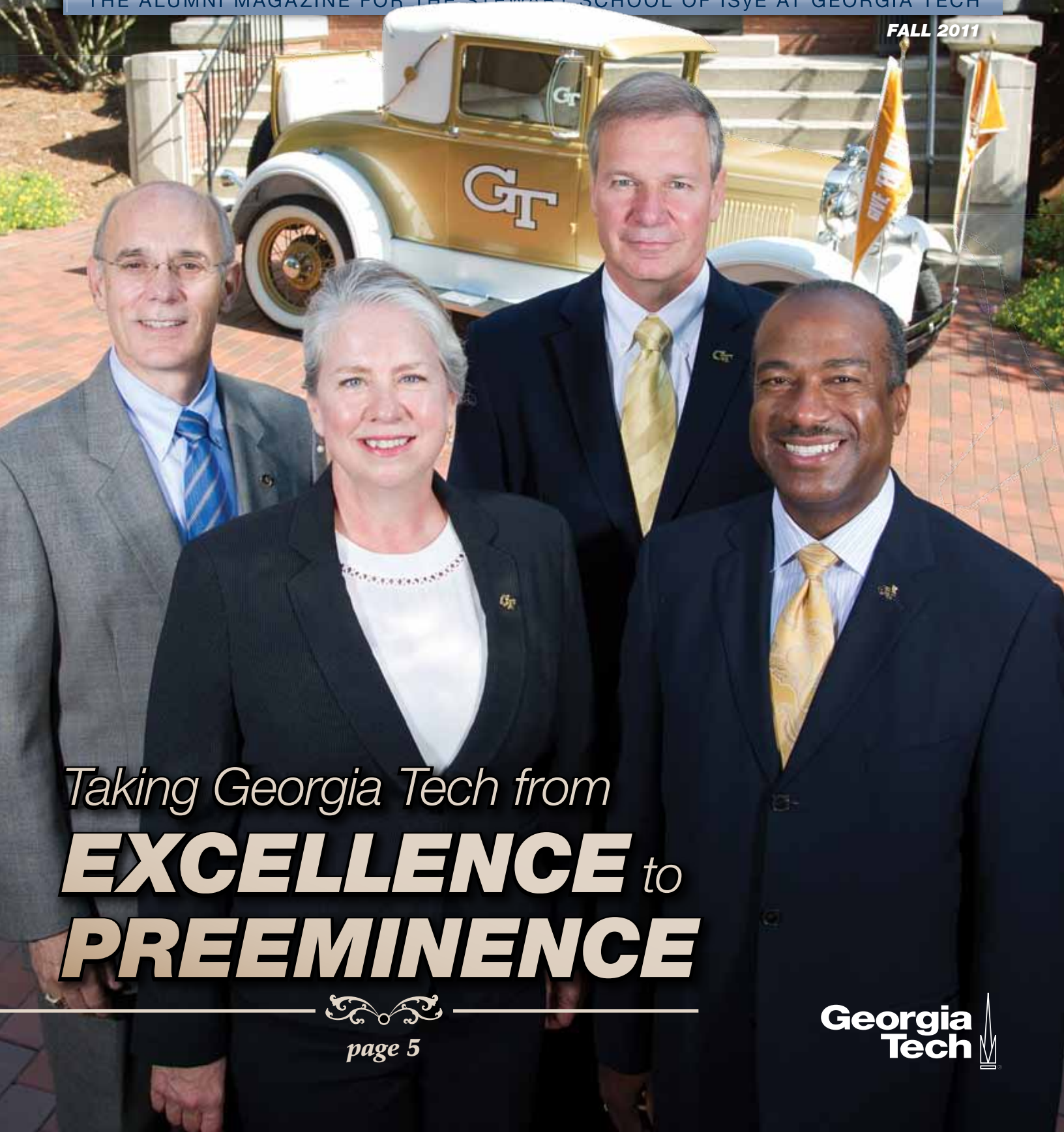


INDUSTRIAL & SYSTEMS ENGINEERING

THE ALUMNI MAGAZINE FOR THE STEWART SCHOOL OF ISyE AT GEORGIA TECH

FALL 2011



Taking Georgia Tech from
EXCELLENCE to
PREEMINENCE



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Georgia
Tech 

MESSAGE FROM THE CHAIR

Georgia Tech and the H. Milton Stewart School of Industrial and Systems Engineering (ISyE) have been an important part of my academic life, and it is an honor to be named the new H. Milton and Carolyn J. Stewart School Chair. I look forward to continuing my work in this new capacity with ISyE's renowned faculty, students, alumni, peers, and community as we continue to strengthen and influence what industrial engineers do today and in the future.

There are many global opportunities for industrial and systems engineers, and the grand challenges in the field are strategic imperatives for our efforts and impact. The articles in this issue of *Industrial and Systems Engineering* articulate the contributions Georgia Tech—in particular ISyE faculty, students, and alumni—makes toward solving some of the critical problems of today. In this issue, you will read how ISyE is at the forefront of helping to define the fields of manufacturing, supply chain engineering, and operations research.

The feature articles in this issue focus on leadership, introducing current administration and our ideas, strategies, and vision for Georgia Tech. Our alumni interview is with Bill George (IE 1964, Honorary PhD 2008), who discusses how to stay on a path to authentic leadership.

On September 30, the Supply Chain & Logistics Institute (SCL) launched a center in Mexico, focused on improving country-level logistics performance and increasing trade competitiveness. The center is the fourth addition to SCL's international innovation network of centers, joining Costa Rica, Panama, and Singapore.

You will also learn about ISyE's undergraduate capstone course called Senior Design, which is the most challenging undergraduate industrial engineering course seniors take as they apply what they have learned in the classroom to solve a complex, real-world problem.

In addition, you will learn about the hard work and dedication of our faculty and your fellow alumni, including six new ISyE Advisory Board members: Lou Fouts (IE 1990), Chris Gaffney (IE 1985, MS IE 1986), Joan Nelson (IM 1984), Denny Oswald (IE 2000), Sandy Pittman (IE 1988, MS IL 2009), and Ricardo Salgado (IE 2000). Jane Snowdon (PhD IE 1994) has been named chair of the Advisory Board, the first female to assume this role. This group serves as a sounding board for me and assists with our development goals so we can maintain excellence throughout our academic offerings, research, and outreach.

The 2012 Best Colleges rankings of *U.S. News & World Report* once again named ISyE the top-ranked graduate program of its kind, making this the twenty-first consecutive number one ranking for ISyE.

With the support of our alumni and friends, we will continue to provide our students with the tools to solve tomorrow's problems as we continue to improve the lives of people at home and around the globe. As an alumnus or friend of the School, I invite you to share your insights and knowledge with us as we work on some of the world's grand challenges and to help us develop the next generations of enlightened leaders who can tackle the problems we cannot even conceive of right now.



Jane Chumley Ammons

H. Milton and Carolyn J. Stewart School Chair
H. Milton Stewart School of Industrial and Systems Engineering



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On the cover: (left to right) Provost Rafael Bras, H. Milton and Carolyn J. Stewart ISyE School Chair Jane Ammons, Georgia Tech President G. P. "Bud" Peterson, and Dean of the College of Engineering Gary May, in front of the Ramblin' Wreck.



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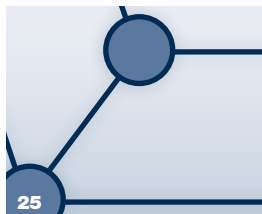
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Distinguished Alumni Join the ISyE Advisory Board



Jane Snowdon



Lou Fouts



Chris Gaffney



Joan Nelson



Denny Oswalt



Sandy Pittman



Ricardo Salgado

Six distinguished alumni have joined the H. Milton Stewart School of Industrial and Systems Engineering (ISyE) Advisory Board for the 2011 to 2015 term. **Louis “Lou” Fouts** (IE 1990), **Chris Gaffney** (IE 1985, MS IE 1986), **Joan Nelson** (IM 1984), **Denny Oswalt** (IE 2000), **Sandy L. Pittman** (IE 1988, MS IL 2009), and **Ricardo F. Salgado** (IE 2000) bring diverse professional and community leadership skills to the board, which has as its mission to serve as a sounding body for the school chair in an advisory capacity as well as to assist with the School’s development goals. **Jane Snowdon** (PhD IE 1994) has been selected to serve as the board’s new chair.

Lou Fouts is a partner at Water Street Capital, a large Jacksonville-based hedge fund, founded in 1987, that manages money for leading endowments, institutions, and family offices. Lou heads up Water Street’s initiatives in the commodity, energy, transportation, and automotive industries. **Chris Gaffney** has been with the Coca-Cola Company for fourteen years. In 2010, Chris was selected as the strategy lead for the

Coca-Cola Refreshments Product System Supply team. **Joan Nelson** is the director of Integrated Supply Chain Acquisitions at IBM. She is a strong advocate of IBM’s diversity initiatives, currently serving as the executive sponsor of the Global Black Diversity Network Group and participating on the steering committee for the Global Women of the ISC (GWISC). Since joining IBM in 1984, Joan has held several titles within the company, including director of customer fulfillment. **Denny Oswalt** is a director for the Walmart U.S. Logistics Engineering Team. Oswalt currently leads a team of industrial engineers responsible for supporting Walmart’s logistics network in design, process improvement, and strategic planning efforts. Oswalt has held multiple roles within Walmart’s engineering group since joining the company in 2001 and has also worked as an operations manager within the grocery distribution network. **Sandy L. Pittman** is a senior program and project manager with UPS’s Corporate Program Management Group, which is part of the Corporate Engineering Group. He has been with UPS for twenty-two years and is

responsible for program and project management support, enterprise business process improvement and re-design, and strategic execution support for enterprise-level initiatives. **Ricardo F. Salgado** is a managing director at Goldman Sachs and a senior member of the Bank Loan Distressed Investing desk. Previously, he managed high-yield distressed investing for Goldman Sachs in Brazil for two years and was on the Bank Loan Distressed Investing desks in both London and New York between 2003 and 2007. He joined Goldman Sachs in 2000 as an analyst.

Jane Snowdon has served on the board since 2008 and will remain on the board as the new chair. She is a senior manager and research staff member in the Industry Solutions and Emerging Business Department at the IBM T. J. Watson Research Center in Yorktown Heights, New York. Snowdon mentors researchers in the United States and China, and is part of IBM’s Makocha Minds initiative for mentoring African university students. She is currently co-leading a study on the industry impacts of climate change.

Ammons Named New Chair of Stewart School of ISyE



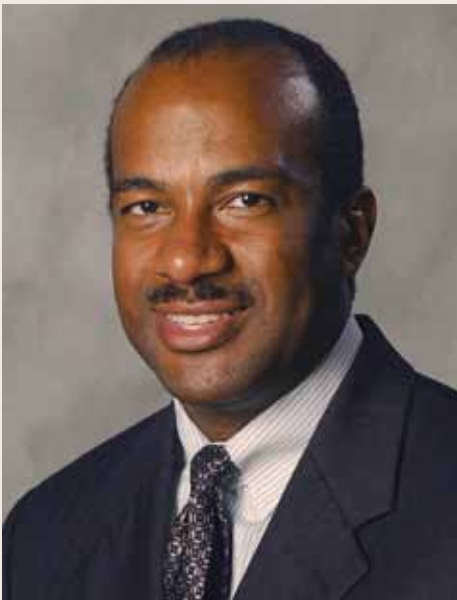
Bringing with her nearly thirty years of experience as a researcher, advisor, and recognized leader in the field of industrial engineering, Jane Chumley Ammons, PhD, was named the H. Milton and Carolyn J. Stewart Chair in Industrial and Systems Engineering (ISyE) at Georgia Tech effective July 1, 2011. Ammons is the first female to be named chair in the College of Engineering.

“Dr. Ammons brings with her a vision to lead the H. Milton Stewart School of Industrial and Systems Engineering to higher levels of excellence within a multidisciplinary and high-technology environment,” said Don P. Giddens, then-dean of the College of Engineering, upon the appointment. “Dr. Ammons is a well-rounded educator and administrator, and we look forward to the development of new curriculum, service, and research endeavors.”

A known pioneer of ISyE, Ammons became the first female to receive a PhD in ISyE from Georgia Tech in 1982 and later that year joined ISyE as the school’s first female faculty member. She holds the rank of professor in ISyE and previously served as associate dean for faculty affairs in the College of Engineering.

Ammons has authored or co-authored more than one hundred refereed and technical publications in the area of manufacturing systems and supply chain engineering. During her time at Georgia Tech, she has been honored with eight teaching or faculty awards at the school and university levels. In addition to her academic experience, Ammons has worked as a plant engineer for an industrial manufacturer and is a registered Professional Engineer in the state of Georgia.

May Leading College of Engineering



Continuing his legacy of leadership at Georgia Tech, Gary S. May, alumnus, professor, and chair of Electrical and Computer Engineering since 2005, was appointed Dean of Georgia Tech’s College of Engineering effective July 1, 2011. As dean, May assumed responsibility for directing the nation’s largest engineering program, one that enrolls nearly 60 percent of Georgia Tech’s student body and is home to about half of its tenured and tenure-track faculty.

“Gary exemplifies the type of leadership qualities we hope to instill in each of our students,” said Provost Rafael Bras. “As a faculty member, administrator, and representative of Georgia Tech, his impact on his profession and on this institution has been profound.”

After graduating from Georgia Tech with a bachelor’s degree in electrical engineering in 1985, May went to the University of California-Berkeley, where he received his master’s and doctoral degrees in electrical engineering. Shortly after leaving Berkeley, he came back to Atlanta in 1991 to embark on his career at Georgia Tech.

The first African-American dean in the college’s history, May has authored more than 200 articles and technical presentations in the area of computer-aided manufacturing of integrated circuits. In 2001, he was named Motorola Foundation

Professor and was appointed associate chair for faculty development.

May is the founder of Georgia Tech’s Summer Undergraduate Research in Engineering/Science (SURE) program, a summer research program designed to attract talented minority students into graduate school. He also is the founder and director of Facilitating Academic Careers in Engineering and Science (FACES), a program designed to encourage minority engagement in engineering and science careers. May is a member of the National Advisory Board of the National Society of Black Engineers.





Taking Georgia Tech from **EXCELLENCE** *to* **PREEMINENCE**



The winds of change are evident at Georgia Tech, particularly in the College of Engineering. There are new faces and new leadership—people who are committed to manifesting change in order to move Georgia Tech, the College of Engineering, and the H. Milton Stewart School of Industrial and Systems Engineering (ISyE) to their highest aspirations. As the technological university of the twenty-first century, Georgia Tech has to be flexible, adaptable, and continually improving and transforming. These new leaders represent the new face of Georgia Tech and engineering. They bring with them not only a sense of urgency, but new perspectives, strategies, and ideas.

G. P. “Bud” Peterson, president of Georgia Tech, arrived in April 2009. He was followed by Rafael L. Bras, who became provost in September 2010. Gary May, dean of the College of Engineering, and Jane Ammons, the H. Milton and Carolyn J. Stewart School Chair at ISyE, both started their new duties on July 1, 2011.

From their diverse backgrounds, these Georgia Tech leaders are crafting a vision of the future. Looking forward, they are envisioning exciting possibilities and enlisting others in a shared view to lead Georgia Tech from excellence to preeminence. The four recently shared their thoughts on Tech’s path forward.

There is a lot of discussion regarding the “Grand Challenges for Engineering” for the twenty-first century—some of which are health, clean energy, national security, and education and lifelong learning. What is Georgia Tech’s role in meeting these challenges?

Peterson: We believe that over the next twenty-five years, many of the world’s most critical problems will be solved at research and educational institutions like Georgia Tech. We’re already working on breakthroughs in a number of fields.

Bras: Our tradition is not only to create knowledge but also to use that knowledge for the betterment of society. The Georgia Tech Strategic Plan states: “Georgia Tech has accepted the challenge to create the conditions that lead to solving critical global problems. Rather than settle for incremental steps forward, we have set forth a course to facilitate bold and deliberate contributions to human progress.”

May: As the proprietor of the largest, most diverse, and one of the best engineering programs in the nation, it is incumbent upon Georgia Tech to be a leader in creating solutions and empowering students to meet societal challenges. The “Grand Challenges” are so named because they will require significant time, effort, and resources by a variety of constituencies to resolve them.

Ammons: Georgia Tech faculty, students, and alumni are creative, bold, solution-driven leaders when addressing the complex grand challenges of today. ISyE leaders are particularly equipped with holistic systems thinking approaches. Their success and impacts to date make us optimistic as we cultivate the leaders of tomorrow.

How can we help stimulate future collaborations of engineers with social scientists, industry, government, business, and other friends of the Institute to address complex societal issues?

Peterson: Tech has a long track record of creating collaborative partnerships with government, business, and industry, and we must continue. New interdisciplinary fields are emerging that span technology, science, policy, business, law, and the arts. Our success will depend on our ability to utilize science and technology to build on our history of excellence and shape our future.



Ammons: We celebrate the many ways that ISyE faculty, students, and alumni have collaborated with our disciplinary partners as well as business, government, and not-for-profit organizations to improve complex societal issues. Examples include our need for national economic competitiveness in manufacturing and supply chain engineering, our critical healthcare delivery systems, important environmental and sustainability thrusts, and humanitarian logistics and disaster relief. We will stimulate future collaborations by building on these successes and developing our students as leaders with systems thinking and collaborative mindsets.

How do we leverage our state and national leadership roles to advance our global aspirations?

Peterson: During the past two decades, Tech has grown into a globalized university, with partnerships in more than thirty countries and campuses and operations in France, Ireland, Costa Rica, Mexico, Panama, and China. Our Logistics Innovation and Research Center established last year in Panama, and the new Trade and Logistics Innovation Center in Mexico are prime examples of how we have leveraged our leadership and partnered internationally on projects that will benefit several countries, including the United States.

Bras: Tech is already a global university. The *Times Higher Education's* World University Rankings place Tech tenth among the world engineering and technology universities. More than 40 percent of our undergraduate students have an international experience, far more than most competitors. Through the prominent leadership roles of many among our faculty and our globalization efforts, we are in a unique position to propel our reputation for excellence to a new, very high level.

May: During the last two decades, the College of Engineering has played a leadership role in establishing Tech's global reputation. Not only do these activities better prepare our graduates for an increasingly "flatter" world, but they also allow the university to have better access to international student and faculty talent, to partner more seamlessly with multinational corporations, and to continue to build its brand.

What can be done to heighten interest in engineering and science education and research to increase the visibility and importance of these areas to society?

Bras: First we need to articulate the excitement of the creative nature of science and engineering, the value we bring to society as knowledge and wealth creators and drivers of progress, our role as providers of solutions to societal problems, and our capacity to transform and preserve life. Second, we must continue outreach efforts to K-12 education—that leaky pipeline must be fixed. And third, we must plug our own leaky pipeline by improving the delivery of our education, making it exciting, rewarding, and fun. Technology can help in that task.

May: Research shows that the general public still has a poor understanding of what engineers do. Data suggest that the public believes engineers are not as engaged with societal and community concerns as scientists or as likely to play a role in saving lives. When judging the relative prestige of professions, people tend to place engineering below medicine, nursing, science, or teaching.

As engineers, we clearly have a vested personal interest in more people having an accurate and positive impression of engineering. In addition, a better understanding of engineering would encourage students—particularly women and underrepresented minorities—to pursue engineering careers.

A consistent effort by the College of Engineering and its constituents can create positive momentum toward making engineering more appealing and better understood by students, educators, parents, policymakers, and society at large.

Peterson: Einstein once said that in the middle of difficulty lies opportunity. I believe we're experiencing this now as our nation and our state look for answers to growing globalization, the need for stronger domestic manufacturing, the need for innovation and getting those innovations to the marketplace to help create a stronger economy and more jobs, and the need to prepare the workforce for the future. Georgia Tech has a seat at the table for President Obama's new Advanced Manufacturing Partnership. Georgia Tech is a leader in science, technology, engineering, and math (STEM) education and is involved in four of the five "Race to the Top" projects recently selected by the state for funding. Today, we're helping to recruit and educate tomorrow's leaders in the STEM fields.

Ammons: We have a mandate to spread the excitement and creativity of science and engineering, including its role in creating wealth, jobs, and making our world a better place. From K-12 outreach to more inspiring hands-on learning experiences at the college level, we need to cultivate the spirit of the National Academy of Engineering's "Changing the Conversation" to inspire our current generation of engineering students that "Dreams Need Doing."

We have a mandate to spread the excitement and creativity of science and engineering, including its role in creating wealth, jobs, and making our world a better place.

What should we be doing to prepare our graduates with the skills necessary to be successful and to adapt, change, and advance in a truly global marketplace?

Ammons: Perhaps our task is as much about helping students "learn how to learn" and being stewards of their own intellectual and interpersonal development as it is understanding current knowledge and technology. They face a world with increasing technical and social change that will require them to continually increase the first and second derivatives of their personal growth and adaptation.

Peterson: Technology changes so rapidly that our graduates must commit to lifelong learning. I also feel that interdisciplinary and transdisciplinary experience is becoming a must. And, we need to continue to prepare leaders who are both innovative and entrepreneurial.

Bras: We cannot forget that an educated person needs understanding of much more than just science and engineering. We must provide our students with the communication skills, the knowledge of cultures and societies, and the social awareness and sensitivities to lead wherever they are.

May: We have the most talented students that we have ever had in the history of the Institute. These students have grown up with nearly instantaneous and ubiquitous access to information. Given these realities, it makes little sense to educate them exclusively using traditional methods in

traditional engineering curricula. On the contrary, our objective must be to empower our students to be independent learners and fearless in the face of complex problems. To accomplish this, the educational experience must maximize flexibility, have a multidisciplinary orientation, and encourage thinking that facilitates the creation of solutions.

How is the changing availability of resources affecting our students and faculty both near- and long-term?

Bras: During the past three years, the state support of Georgia Tech has been reduced by more than 90 million dollars. Although we have recovered a portion of that loss with tuition and other income, the overall support from the state is down to less than 20 percent of total annual expenses. Staff and faculty are doing more with a lot less, our student-to-faculty ratios are higher than ever, beyond what they should be to ensure continuing excellence. We will need to think of new revenue-generation ideas, new ways of controlling costs, and new ways of delivering education without sacrificing quality and excellence.

Ammons: ISyE faculty, staff, and students have been significantly impacted by the reduction in resources. ISyE has one of the largest student-to-faculty ratios of any Georgia Tech unit, and our students are frustrated by the very large class sizes and significant waiting lists for classes. On the positive side, our faculty and staff have been creatively seeking new revenue sources, controlling costs, and innovating in the classroom.

May: As we know, student and faculty interaction is also critically important and inextricably linked to the student-to-faculty ratio. The quality of student and faculty interaction will definitely improve with a more manageable ratio. Our students want and deserve an improved environment for intellectual exchange, and we are committed to that objective.

Peterson: We're all feeling the pinch of this global recession in one way or another, and it is definitely impacting higher education. Students have increased cost-sharing in their education. We continue to preserve the quality of our academic programs to ensure that we are able to provide an educational experience consistent with the very best institutions in the country. In times like these, we are particularly grateful to members of the Georgia Tech family, friends, and supporters who have contributed to Campaign Georgia Tech.

What is your vision for further developing the diversity of our students, staff, and faculty to leverage the diverse talent and perspective that is needed to solve the important societal problems?

May: The economy is critically dependent on the talents and knowledge of a diverse and available technical workforce. U.S. jobs are growing fastest in areas that require knowledge and skills stemming from a strong grasp of science, technology, engineering, and mathematics (STEM). In some areas—particularly in computer and information technology—business leaders are warning of a critical shortage in skilled domestic workers that is threatening their ability to compete in the global marketplace. To realize a diverse technical workforce, the educational environment for underrepresented engineering students must be systematically improved across all levels of the kindergarten to PhD educational continuum. Particular attention must be paid to transition points along that continuum—for example, from high school to college, college to graduate school, and graduate school to the workforce. At Georgia Tech, we've seen that a key factor for motivating students to pursue advanced degrees and research careers in STEM is a fruitful research experience as an undergraduate. As the nation's most diverse engineering college, this is nothing short of an obligation for us.

Bras: Georgia Tech is already nationally recognized as an innovator and leader in educating a diverse student body and in diversifying its staff and faculty. Although we lead in many of the normal metrics that measure diversity, there is a lot more to do to improve our education and work environment. The Georgia Tech Strategic Plan states: "We aspire to be an Institute that pursues excellence and embraces and leverages diversity in all of its forms. In the years ahead, we must continue to enhance a culture of collegiality, close

collaboration, global perspective, intercultural sensitivity and respect, and thoughtful interaction among a diverse community of scholars that includes all of our students, faculty, staff, and alumni." We will be led by that aspiration.

Peterson: We are continuing to strengthen our national leadership position in the total number of engineering degrees awarded to underrepresented minority students and women. And, we now have a number of programs in place to recruit and retain underrepresented minorities in all of the academic programs we offer—not just engineering—and in the past three years, we have increased the number of underrepresented minorities in the freshman class by nearly 40 percent and women by 8 percent. As we commemorate the fiftieth anniversary of the matriculation of the first black students at Tech, we are reminded of how far we have come and how much more we need to do to recruit, develop, retain, and engage a diverse cadre of students, faculty, and staff to create a campus community that exemplifies the best in all of us and fosters inclusive excellence.

Are there any capabilities, human or institutional, that we have that are under-developed or under-utilized, and what should we do about that?

Ammons: The heart of Georgia Tech is our people—our students, alumni, staff, and faculty. We have the opportunity to grow stronger and more impactful as we enhance the diversity of talent and perspective in people and our Georgia Tech leadership.

May: Our human resources—faculty, staff, alumni, and students—are our greatest asset. I would like to see us make greater use of these resources by identifying and utilizing more mechanisms for these constituencies to provide substantive input to our decision-making processes. We have access to many smart, gifted, and dedicated people. If two heads are better than one, then surely we as leaders can benefit from our people.

Bras: Of course, every organization can improve. We have an enormous opportunity to transform education with the opening of the G. Wayne Clough Undergraduate Learning Commons. We have an opportunity to reinvent the delivery of undergraduate education and redefine the role of libraries as a center of learning.

Peterson: As we create a more inclusive environment and campus community, we will be even more effective in realizing our full potential. In addition, we must continue to think and plan long term, looking at the big picture. And, without a doubt, the biggest wins will come through collaborative partnerships, within disciplines, with other universities, with government, business and industry, and with our alumni.

What are the things Georgia Tech should be most proud of as an organization, and why?

Peterson: Our people! Georgia Tech students, faculty, staff, and alumni are developing innovations, conducting breakthrough research, saving lives, and changing the world.

May: Georgia Tech has a culture of excellence. We believe in going far beyond the ordinary to pursue the extraordinary—in academics, technology, research, and service. We have a rich culture characterized by attributes such as rigor, pragmatism, collegiality, entrepreneurship, and diversity. Since its inception, Georgia Tech has embraced a “can do” spirit that is evident throughout all facets of campus.

Ammons: Our Georgia Tech core—the quality, drive, commitment, and successes of students, alumni, faculty, and staff.

Bras: We should be most proud of our students, past and future. We must be proud of our legacy of offering opportunity to all willing to work hard, many of whom are the first generation of college students in their families. We must find a way of making sure that cost is never an impediment to any meritorious candidate.

From your perspective is there a message or call to action we need to deliver to our constituents?

Ammons: Our call to action is clear: let’s work together to address the important needs of today’s world while developing well-prepared leaders of tomorrow.

May: The challenge in sustaining and enhancing the Georgia Tech culture requires an intellectual shift in focus from merely training technical professionals to empowering leaders capable of creating the solutions required by the global society. Within the College of Engineering, we will focus on the Georgia Tech global brand through fostering innovation, leadership, strong student-faculty relationships, and interdisciplinary studies.

We believe that over the next twenty-five years, many of the world’s most critical problems will be solved at research educational institutions like Georgia Tech.

Bras: “What does Georgia Tech think?” will be a common question in research, business, the media, and government. The only thing I have to add is to ask all alumni, students, staff, and faculty not to wait until asked—let’s tell the world what we think.

Peterson: Our Industrial and Systems Engineering program is the best in the nation, and it is because of the commitment and quality of our people. In addition to being proud of your alma mater, we challenge you to find ways to partner with the Institute and to help us develop leaders for the next generation.

Special thanks to Kay Kinard and Patti Futrell for their contributions and assistance with this article.



ALUMNI PERSPECTIVE

Bill George on Authentic Leadership

Bill George (BSIE 1964, Honorary PhD 2008), professor of management practice at Harvard Business School, is the author of five best-selling books: *7 Lessons for Leading in Crisis*, *True North: Discovering your Authentic Leadership*, *Finding Your True North* (workbook), *Authentic Leadership*, and the recently released *True North Groups: A Powerful Path to Personal and Leadership Development*. At Harvard, George teaches leadership and leadership development.

George is the former chairman and CEO of Medtronic and currently serves on the boards of ExxonMobil and Goldman Sachs. He is also a trustee of Carnegie Endowment for International Peace and the World Economic Forum USA. He has made frequent appearances on television and radio, and his articles have appeared in numerous publications. He has been named to the “Top 25 Business Leaders of the Past 25 Years” by PBS.

George received his bachelor’s in industrial engineering with high honors from Georgia Tech, his MBA with high distinction from Harvard University, where he was a Baker Scholar, and honorary PhDs from Georgia Tech, St. Thomas University, and Bryant University.

In 1999, he and his wife Penny founded the George Family Foundation as a way to foster wholeness in mind, body, spirit, and community and to further the development of authentic leaders. Their interests include integrative medicine, leadership, spirituality, and community.

The Georges, who reside in Minneapolis, MN, also support academia at Georgia Tech through fellowships and an endowed chair in the area of health systems.

What are some characteristics you believe every leader should possess?

BG: Leadership is about character, not characteristics. I could give you a list of characteristics that are desirable, but I could also show you leaders who have those characteristics and are poor leaders.

In 2006, we conducted research on 125 outstanding leaders asking them this same question. What we learned was that these leaders were not interested in talking about characteristics. They wanted to discuss life stories and their crucibles, and how they can stay true to their values. This research was the basis for my book, *True North*. Your “true north” is what you believe at your deepest level—your beliefs, values, and principles. The essence of leadership is captured in your character.

What are some frequent mistakes you witness in leaders?

BG: One mistake is when leaders deviate from their true north. It is quite easy when things are going well to practice good values. It is far more difficult and important to stay true when things do not go your way. A good question to ask yourself is: are you true to your values when the pressure is on?

Closely associated with that is putting your own personal interest ahead of the organization for which you are responsible because you want to get ahead or look good. Another mistake is when leaders do not own responsibility and blame others instead.

What advice would you give students who want to prepare for future leadership opportunities?

BG: Go lead! There are myriad opportunities on campus to lead, whether at the graduate or undergraduate level. I had tremendous opportunities when I was at Tech. In my freshman and sophomore years, I lost some elections, until some friends helped me get on track. After that, I ended up leading many student organizations at Tech. I learned a lot from those experiences, both in being rejected and in landing leadership roles. When I was at Medtronic, some of those early leadership experiences on campus kept coming back to me—the mistakes

I made, what I'd learned from them, and how to build genuine relationships with people. In my courses at Harvard, students learn to lead through a lot of personal sharing about their life stories, their crucibles, and their leadership experiences.

What advice would you give someone going into a leadership position for the first time?

BG: I would advise them to learn everything they can about the experience and to engage in it 100 percent. Don't look ahead to your next job, but make it a habit to learn from the people around you, especially from your subordinates. Take some risks, and ask for help when it is needed.

It is extremely helpful to have a support group of peers around you, a true north group. This is a group of trusted peers with whom you communicate on a regular basis. When you face dilemmas and difficult problems, you can take them to your group. They will probably not give you magic answers. However, they will be able to give you insights and help you uncover your blind spots which are essential in effective leadership.

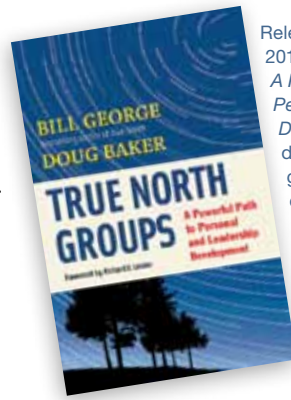
How do you select people to participate in your true north group?

BG: You can start with a group of trusted peers. These groups are a two-way street, as you have to be willing to offer to them as much as they offer to you. You select a group of people willing to be open, honest in giving and receiving feedback, willing to share openly, and willing to be authentic in their dealings and their relationships. My most recent book, *True North Groups: A Powerful Path to Personal and Leadership Development*, is dedicated to setting up such a group or enabling your current group to have deeper and more meaningful discussions about the vital questions of life.

What are you doing to ensure you continue to grow and develop as a leader?

BG: I continue to learn every day. My role shifted completely when I completed my term at Medtronic in 2002. Since then, I have been focusing on helping people become more effective leaders, from college students up to CEOs. I continue to learn a great

deal from my students even though they may be thirty years younger than I. I learn from new CEOs and the challenges they face. These days, I'm learning how to lead better by learning directly from other leaders. At Medtronic, I learned the importance of learning from my subordinates. Now, I'm expanding my knowledge and focusing on learning from other leaders.



Released in September 2011, *True North Groups: A Powerful Path to Personal and Leadership Development* is dedicated to setting up a group or enabling your current group to have deeper and more meaningful discussions about the vital questions of life.

Have you found a vast difference in leadership styles among universities?

BG: I have found dramatic differences among academic institutions. Essentially, it comes down to two questions: does the faculty genuinely want to learn from its students and help them exchange knowledge amongst themselves or is the faculty principally oriented toward transferring knowledge to students? I see many academic institutions where the latter is the case. This is a missed opportunity. Great academics learn from their students every day.

The second question gets to the nature of the world in the twenty-first century. Does the faculty work together across disciplinary lines? We live in a world of extraordinarily complex and intractable problems that are not subject to single-disciplinary solutions. Solving these problems requires that people work together across disciplinary lines. Although we hail scientific breakthroughs like sequencing of the human genome, without multidisciplinary approaches it will take decades to translate that into benefits for mankind. This is one of the things Georgia Tech does very well.

How can universities and businesses work together to bridge the gap from academic research to technology transfer?

BG: Some academic institutions are far too preoccupied with research grants and with publication of knowledge. They have not spent nearly enough time looking at how this knowledge is utilized in real-world situations. I think by engaging with business, academics can learn how business operates and how it uses information. Also, academics should consider how they approach businesses when it comes to their theories. I think it is best to come from a place of testing their theories instead of getting businesses to adopt them. Great academic institutions seek out businesses to work with to learn what they are doing and then see if they can take those specific cases and translate them to be useful to many other organizations.

Often businesses are too focused on achieving measurable results and are unwilling to take the disruptive or radical solutions that may be needed to improve performance. Academic institutions can play leading roles by providing test beds for radical innovation. We've seen that take place in medical technology. An example is the Georgia Tech-Emory research collaboration. I've seen it in the computing field where academic institutions were way ahead in spawning innovations like Google, Facebook, and Apple. That's why business and industry should be hungry to work with academic institutions.

What are some ways that ISyE could lead more effectively?

BG: I think the role of industrial and systems engineering is to become the great integrator and the systems thinker to guide us to those breakthrough ideas that will move society forward. It is essential that we solve critical issues today by looking at the whole system, something that is not being done in healthcare, for example.

I see ISyE as the integrating force throughout Georgia Tech. Every student at Tech, no matter the discipline, needs to have that broader approach to systems thinking and should be required to take courses in industrial and systems engineering. It is the only way we are going to be able to solve the critical issues we face today in healthcare, logistics, energy, the environment, and manufacturing.



Advanced Manufacturing at ISyE

When President Barack Obama named Georgia Tech President G. P. “Bud” Peterson to the steering committee of the Advanced Manufacturing Partnership (AMP) in June, he was acknowledging an established fact—the Georgia Institute of Technology is a national leader in supporting American industry.

Tech joined other top universities—the Massachusetts Institute of Technology, Carnegie Mellon, Stanford, University of California-Berkeley, and University of Michigan—in the \$500 million AMP push to guide investment in emerging technologies and increase the supply of high-quality manufacturing jobs and overall U.S. global competitiveness.

“We applaud this initiative, and Georgia Tech is honored to collaborate to identify ways to strengthen the manufacturing sector to help create jobs in Georgia and across the United States,” Peterson said. “Many of our challenges can be solved through innovation and fostering an entrepreneurial environment, as well as collaboration between industry, education, and government to create a healthy economic environment and an educated workforce.”

Today, the H. Milton Stewart School of Industrial and Systems Engineering (ISyE) leads the way in advanced manufacturing research and development at Georgia Tech. ISyE faculty specialize in many related disciplines, including computer-integrated systems, controls for flexible automation, manufacturing systems design, analysis and simulation, lean manufacturing strategies, and performance measurements.

Advanced manufacturing involves not only new ways to manufacture existing products, but also new products emerging from advanced technologies, observes Stephen E. Cross, Georgia Tech’s executive vice president for research. Cross, who is also a professor in ISyE, is working with President Peterson to support the AMP.

“ISyE’s competencies in manufacturing, logistics, supply chains, and methodological work in operations research, statistics, simulation, and decision support provide the intellectual core for a renaissance in advanced

manufacturing,” Cross said recently. “ISyE’s track record of excellence, combined with equally stellar research throughout the rest of the Institute, has made Tech one of the leading research universities in the world.”

ISyE Professor Leon McGinnis is supporting both Peterson and Cross in their work with the AMP Steering Committee. McGinnis is being joined by Ben Wang, who in January will assume the role of executive director of the Manufacturing Research Center (MaRC) at Georgia Tech and also become a professor in ISyE.

Both educators will serve on a Georgia Tech working group that will focus on ways in which research and education can maximize the impact of emerging technologies on the U.S. manufacturing sector.

Other ISyE faculty serving the advanced manufacturing thrust include Professor Chelsea (Chip) White III, Schneider National Chair in Transportation and Logistics, and Harvey Donaldson, associate chair of Industry and International programs. Both are involved in a workshop focusing on the Council on Competitiveness’s U.S. manufacturing competitiveness initiative. The meeting, planned for early 2012 at Georgia Tech, will focus on how the supply chain and logistics industry can best support U.S. manufacturing competitiveness.

“Advanced manufacturing can be viewed as a system of systems that involves design, processes, equipment, information, energy, materials, and the entire supply chain,” said Wang, who served as director of the High-Performance Materials Institute at Florida State University before coming to Georgia Tech. “This new kind of manufacturing relies on a highly educated workforce and on truly innovative research capable of furnishing the basis for new companies as well as supporting existing industry—and ISyE is uniquely positioned to supply both the skilled workforce and the innovative research.”

ISyE faculty members conduct some \$6.5 million in sponsored research annually, in areas that support all facets of manufacturing and industrial systems—optimization, stochastic systems, logistics, simulation, statistics, natural systems, economic decision analysis, and human-integrated systems analysis.

Below are instances (in alphabetical order) of the cutting-edge work being performed by ISyE faculty in areas related to advanced manufacturing.

➔ **Jane Ammons**, who is the H. Milton and Carolyn J. Stewart School Chair and a professor in ISyE, collaborates on reverse production systems with Matthew Realff, a professor in the School of Chemical & Biomolecular Engineering (ChBE) and the David Wang Sr. Fellow. For more than ten years, the team has focused on two important areas: the recovery and reuse of carpet wastes and ways to reduce electronic waste (e-waste).

Ammons, Realff, and their team have developed a mathematical framework to support the growth of used-carpet collection networks. Such networks could help to recycle much of the nation's annual carpet waste total of 4.7 billion pounds. The successful reuse of that carpet has a potential value of \$2.8 billion, versus a cost of \$100 million to send the waste to landfills.

In other work, the team is studying the problem of e-waste—unwanted electronic components such as televisions, monitors, and computer boards and chips. The e-waste stream includes multiple hazardous materials containing lead and other toxins, yet effective management and reuse of e-components can be profitable. Ammons and Realff have devised mathematical models that address the complexities of e-waste processing, with the goal of helping recycling companies stay economically viable.

“Working with both companies and government, our goal is to eliminate as much product disposal in landfills as possible,” Ammons said. “By extending our work to address new operational control and infrastructure design problems, we can help to address uncertainty and variability in closed-loop supply chain flows on a global scale.”

➔ Associate Professor **Nagi Gebraeel** conducts research in the area of detecting and preventing failure in engineering systems as they degrade over time. The goal is to avoid both expensive downtime and unnecessary maintenance costs.

“We could be talking about a fleet of airlines, trucks, trains, ships—or a manufacturing system,” Gebraeel said. “In any of these cases, it’s extremely useful for a number of reasons to be able to accurately estimate the remaining useful lifetime of the system or its components.”



To avoid both expensive downtime and unnecessary maintenance costs, Associate Professor Nagi Gebraeel conducts research in the area of detecting and preventing failure in engineering systems as they degrade over time. <http://bit.ly/ntnOzb>

In one project, Gebraeel and his team worked with Rockwell Collins—a Cedar Rapid, Iowa, maker of avionics and electronics—to monitor and diagnose the performance of circuit boards that control vital aircraft communication systems.

Since the exact time of component failure is unknown, airlines are forced to anticipate when replacements are needed. Scheduled maintenance can result in replacement of parts that still have usable life. Using circuit boards until parts actually fail will result in unplanned and expensive downtime.

As Gebraeel methodically exposes an avionics component to heat and

vibration, he employs a network of computers and sensors to record and analyze data on the degradation rate of the part he is testing. If he can reliably predict the failure rate of a component, he can help airlines replace parts at the most cost-effective time.

In another effort, Gebraeel has developed an adaptive prognostics system (APS), a custom research tool that allows him to investigate how quickly components degrade under vibration and other stresses. Gebraeel and his team can use APS to test a complex system—such as a gearbox—by using multiple sensors in a triangulated pattern to detect the frequency signals coming from individual components.

Gebraeel is currently in talks with a major airline to use APS to analyze critical engine components. The aim is to be able to predict engine wear rates in ways that will help optimize aircraft maintenance procedures.

“There’s a real need for information about the remaining life of components, so that users can find the economical middle ground between the cost of scheduled replacements and the cost of failure,” he said. “Think of the everyday problem of whether we really need to replace vehicle engine oil at 3,000 miles. If we replace it early, we sacrifice some useful time, but if we replace it later, we risk engine damage. It’s very useful to have detailed information about degradation in a system over time.”

➔ Professor **Leon McGinnis** focuses on model-based systems engineering, an approach that uses cutting-edge computational methods to enable capture and reuse of systems knowledge among multiple stakeholders. McGinnis, his team, and other faculty collaborators are pursuing several sponsored projects in this area.

In one notable project, McGinnis and his team are working with Rockwell Collins, the Iowa-based maker of avionics and electronics. The aim is to help the corporation speed transition of new products by automating the process that simulates physical manufacturing.

In order to optimize the resources needed to make products at the required rate, McGinnis explains, Rockwell Collins creates a computerized



Leon McGinnis is bringing the power of simulation to production and manufacturing engineers.

<http://bit.ly/vC6tE7>

simulation model of the manufacturing processes. Development of simulation models has traditionally been the province of experts who are skilled in using initial system designs to simulate the demands of actual production.

“This is not a trivial task—producing a simulation model requires some 100 to 200 hours per product,” said McGinnis, who holds the Eugene C. Gwaltney Chair in Manufacturing Systems. “Due to expert resource limitations, the company was only able to generate a few production models at a time, which created something of a bottleneck.”

To analyze the model-development process, an ISyE team interviewed Rockwell Collins engineers on the methods they used to develop a simulation model. The Georgia Tech investigators carefully analyzed the steps and methods that the engineers used to progress from an original system design to a simulation model.

Then the ISyE researchers turned to SysML, a language that enables the computerized modeling of complex systems. SysML lets designers delineate a new product—and multiple related factors such as people, machinery, and product flows—in a standardized way.

By describing the evolution of a given product using SysML, McGinnis and his team were able to automate the movement of that product from design to simulation. Even more importantly, the ISyE team created a domain-specific version of SysML that was customized

to the Rockwell Collins environment. That achievement allowed any of the company’s new products and systems to be plugged into an SysML-based automation process.

This new way to doing things appears to reduce the time required to build simulation models by an order of magnitude, McGinnis said. It also allows multiple products to be developed concurrently and encourages “what-if” studies that couldn’t be performed before.

“Essentially, this technology lets the people who own a process validate it without the middleman—the simulation expert,” he said. “There’s a two-part philosophy here—one is to articulate the system in a way that all the stakeholders can agree on, and then to automate the bringing of information and knowledge to the stakeholders without requiring mediation by experts.”

McGinnis is also working on several other projects. In one effort, he is collaborating with the School of Mechanical Engineering and the Manufacturing Research Center (MaRC) to develop semantics for manufacturing processes under a DARPA contract. In another project, he is collaborating with the Tennenbaum Institute to address the challenges of identifying and mitigating risks in global manufacturing enterprise networks. In other MaRC research, he is investigating the integration of product design and manufacturing

enterprise development for the aerospace industry.

➔ **Spiridon Reveliotis**, an ISyE professor, is currently involved in a project that addresses a cutting-edge approach to automation in manufacturing. This concept, known as flexible automation, involves variable-size batch production and the ability to reconfigure and rebalance the shop floor quickly to accommodate differing product mixes.

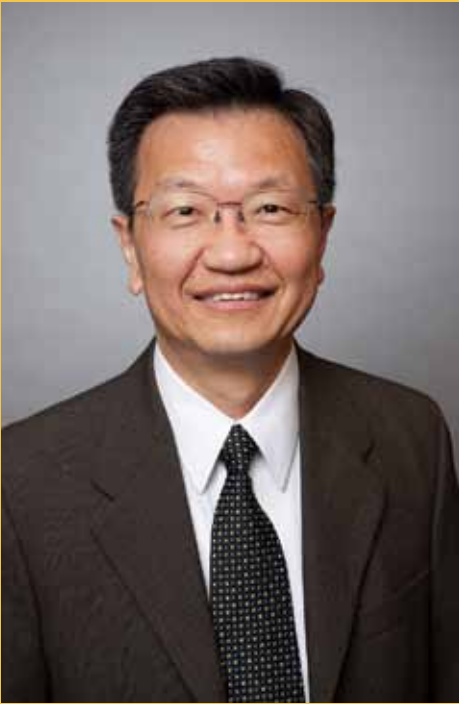
To date, Reveliotis explains, flexible automation has been most successful at the level of single manufacturing processes. To address this limitation, he is developing the analytical capability and computational tools to enable effective deployment and management of flexibly automated production throughout an entire manufacturing system.

Reveliotis is using the representation of a Resource Allocation System—an enriched version of a queuing network model—and also employing modeling and analytical capabilities derived from modern control theory, computer science, and operations research. Using these, he is seeking to build a framework and methodology to enable rapid reconfiguration of automated production systems, with control logic capable of managing the system operation in each new configuration.

One challenge, he said, involves managing the trade-offs between the quest for a high-fidelity model of the underlying shop floor dynamics and the need to keep the control logic and its deployment manageable.

In another project, Reveliotis is developing methods to help remanufacturing facilities approach component-disassembly tasks in the most efficient ways. This work, sponsored by the National Science Foundation, uses a learning-based approach comprised of efficient sampling techniques and novel machine-learning algorithms to determine the optimal disassembly plan for each product type.

Beyond addressing important practical problems in the manufacturing and remanufacturing domains, both of the above lines of work are also contributing seminal analytical results



Ben Wang Named Executive Director of Manufacturing Research Center

Starting January 1, 2012, Ben Wang will assume the role of executive director of the Manufacturing Research Center (MaRC). In addition to his work at MaRC, Wang will also hold an appointment as a professor in ISyE.

“Dr. Wang is an internationally renowned scholar and leader who will oversee Georgia Tech’s interdisciplinary manufacturing programs and their impact on economic development,” said Steve Cross, executive vice president for research. “Through his leadership, we will see a renaissance in manufacturing in this state.”

Currently, Wang is director of the High-Performance Materials Institute at Florida State University. He also serves as an assistant vice president for research in engineering and holds the following three distinguished professorships: the Simon Ostrach Professor of Engineering, the FSU Distinguished Research Professor, and the U.S. Department of Energy Samuel P. Massie Chair of Excellence. He is a Fellow of the Institute of Industrial Engineers, Society of Manufacturing Engineers, and the World Innovation Foundation.

Consulting with a number of national and international companies, Wang’s primary research interest is in applying emerging technologies to improve manufacturing competitiveness. He specializes in process development for affordable composite materials. Wang also does research in nanotechnology and is widely acknowledged as a pioneer in the growing field of nanomaterials science. His main area of research involves a material known as “buckypaper,” which has shown promise in a variety of applications, including the development of aerospace structures, the production of effective lightweight body armor and armored vehicles, improvements in energy and power efficiency, enhancements in thermal management of engineering systems, and construction of the next-generation of computer displays.

Wang earned his bachelor’s degree in industrial engineering from Tunghai University in Taiwan. He earned his master’s degree and his PhD in industrial engineering from Pennsylvania State University.

in the methodological areas that define the technical bases for these works.

➔ Professor **Jianjun (Jan) Shi’s** research addresses system informatics and control. He uses his training in both mechanical and electrical engineering to integrate system data—comprised of design, manufacturing, automation, and performance information—into models that seek to reduce process variability.

Shi, who holds the Carolyn J. Stewart Chair in ISyE, is currently working on several sponsored projects.

In one effort, Shi is working with nGimat, a Norcross, Georgia-based company that was a 1997 graduate of the Advanced Technology Development Center startup-company incubator at Georgia Tech.

nGimat is currently addressing the challenge of mass-producing a type of nanopowder for use in high-energy, high-density batteries for electric cars. With sponsorship from the Department of Energy (DoE), Shi is supporting nGimat as it works to increase its output of this nanopowder by several orders of magnitude.

“This nanopowder product has very good characteristics, and the task here is to scale-up production while maintaining the quality,” Shi said. “We must identify the parameters—what to monitor, what to control—to reduce any variability and do so in an environmentally friendly way.”

In work focusing on the steel industry, Shi is pursuing multiple projects including investigating sensing technologies used to monitor very high temperature environments used in steel manufacturing. With DoE support, he is working with OG Technologies to develop methods that employ optical sensors capable of providing continuous high-speed images of very hot surfaces—in the area of 1,000 to 1,450 degrees Celsius.

In steel manufacturing, Shi explains, continuous casting and rolling lines can be miles long and production can take hours. Variations in the process temperature—currently difficult to detect—can lead to costly quality problems, increased labor costs, and increased carbon dioxide emissions due to wasted energy.

“We want to catch defect formation in the very early stage of manufacturing,” Shi said. “By using imaging data of the product effectively with other process data to eliminate defects, we can help optimize the casting process.”

In another representative project, Shi is investigating ways to use process measurements and online adjustments to improve quality control in the manufacturing of the ubiquitous silicon wafers used in semiconductor electronics. In work sponsored by the National Science Foundation, he is working with several manufacturers to examine the root causes of undesirable geometric defects in wafer surfaces.

Shi explains that the first step of his approach involves developing a software model capable of detecting and accurately characterizing surface characteristics on a silicon wafer. If waves are present, the model must be able to capture both their mean profile as well as detect and characterize particular types of waves.

The second step requires using this model to judge whether an actual wafer surface is of acceptable quality. If the surface is faulty, the model returns data on what must be done to improve it.

“Wafer manufacturing is another instance of a continuous process where, if you catch imperfections early, you can quickly and cost-effectively return to a previous step in the process and correct the problem,” Shi said.

➔ Associate Professor **Joel Sokol**, A. Russell Chandler III Chair and Professor **George Nemhauser**, and Professor **Shabbir Ahmed** recently completed a project supporting a major float glass manufacturer. The company was automating a process where finished glass plates are removed from the production line and packed for shipment.

The company was concerned that the new machines that pick up and remove glass from the production line might fall behind, allowing valuable plates to be heavily damaged. What was critically needed was the capability to carefully schedule the sequence of production so the machines could function at maximum capacity with as little waste as possible.

The ISyE team tackled development of new software that could minimize production scheduling problems. They devised algorithms that allowed the machines to work at their maximum efficiency and enabled them to handle input data with more than 99 percent efficiency.

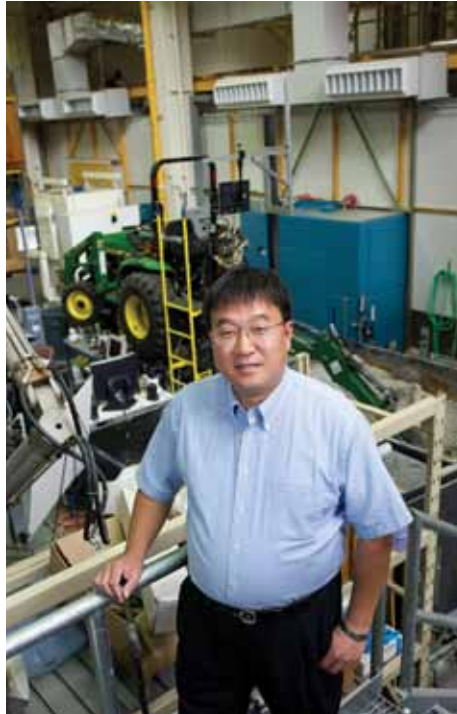
“The algorithms we delivered can also be used strategically to determine how many machines of each type should be installed on a production line,” Sokol said.

In another project, Sokol, Nemhauser, and Ahmed are collaborating on a project for Korea-based Samsung. The aim is to support production throughput at a Samsung semiconductor-manufacturing facility.

The challenge involves the physical movement of semiconductors from one processing station to another throughout the factory. Because the routing of semiconductors between processing machines can differ from item to item, there’s no linear assembly-line type of procedure; instead,

hundreds of automated vehicles pick up an item from one processing point and move it to its next step.

Because of the facility’s structure, these automated vehicles encounter congestion that can delay the production schedule, Nemhauser said. The ISyE team is developing ways to best route and schedule the vehicles to minimize congestion and move items between machines in ways that don’t delay production.



Jianjun Shi combines mechanical and electrical engineering to integrate system data into models that seek to reduce process variability.

“This is clearly a highly complex challenge that will require development of an accurate system model,” added Ahmed. “But it’s exactly the type of problem that can be solved by devising effective software and hardware modifications.”

➔ **Valerie Thomas**, Anderson Interface associate professor of Natural Systems in ISyE, is conducting research on the use of information technology, mediated by bar codes or radio frequency (RFID) tags, to improve recycling and end-of-life management for electronics and other products. This work has been presented to the U.S. Environmental Protection Agency and the U.S. Congress and has been featured in the *New York Times* and the *Wall Street Journal*.

In another area, Thomas is collaborating with Professors Matthew Realff and Ron Chance in the School of Chemical & Biomolecular Engineering (ChBE) and with ISyE PhD students Dexin Luo and Dong Gu Choi on the design, energy efficiency, water management, and carbon footprint for facilities to produce biofuels. This work is supported by Algenol Biofuels as part of their \$25 million DoE-funded pilot plant for the production of ethanol from cyanobacteria.

➔ Associate Professor **Chen Zhou**, associate chair for undergraduate studies, and Professor **Leon McGinnis** tackled sustainability issues for Ford Motor Company in a recent project. The issue involved shipping gearbox components from China to the United States in ways that would minimize not only cost but greenhouse gas emissions and waste.

It turned out that packaging was at the heart of the issue. The researchers had to configure component packaging so that the maximum number of components could be placed in a cargo container yet also allow for optimal recycling of the packing materials to avoid waste and unnecessary cost.

“This was definitely a complex problem,” Zhou said. “You must track every piece of packaging from its source to its final resting place, when it either goes into another product or into a landfill.”

The team created a model—a globally sourced auto parts packaging system—that optimized cargo container space. The model also enabled the use of packing materials that were fully reusable; some materials were sent back to China for use in future shipments, while the rest was recycled into plastics that became part of new vehicles.



ISyE Provides Leadership in the Evolution and Growth of Supply Chain Engineering: Closing the gap between state-of-the-art and state-of-practice

By Nadia M. Viljoen, Greg Andrews, and Harvey Donaldson

Unlike other emerging fields such as nanotechnology or cloud computing, the pillars that underpin supply chains are not novel at all. Since ancient times, mankind has been transforming raw materials into products, whether it was grinding grain and adding water for a wood-fired cake or smelting iron ore to cast the first weapons.



But raw materials had to be sourced. They were grown, mined, hunted, or collected—perhaps in a land “far far away,” so there was a need for perilous sea voyages, dusty camel treks over desert dunes, arduous hikes along treacherous mountain ranges, or perhaps just a donkey cart ride to the next village. “If I can make one for myself, why not make more than one to barter or sell for other useful things?”—enter the village marketplace. Of course, in the olden days people also felt the effect of seasonality, so there were barns, stockpiles, and mounds of pickled fish.

Much may have changed since the days of the Dutch East India Company—we now talk of inventory control, distribution channels, intermodal transportation, and lean manufacturing—but the key activities that comprise supply chains are as old as time. An outsider to the field would thus be excused for wondering what the hullabaloo of the past few decades is all about. The truth is that the revolutionary developments in industry and business over the last two centuries—and indeed the last few decades—has necessitated an entirely new approach to managing these fast-paced “chains” of activities that now span continents and involve multiple players. Companies in today’s

global markets recognize that it really is no longer “my product against your product,” but “my supply chain versus your supply chain.” It is a prevailing thought that a properly deployed, balanced, and strategically aligned supply chain is a competitive weapon in the battle for market share and revenue. It is the study and pursuit

of this balance, alignment, efficiency, and responsiveness that has spawned supply chain engineering.

The H. Milton Stewart School of Industrial and Systems Engineering (ISyE) has had its finger on the pulse of this new

field since the school’s founding in 1948. Research and courses were not restricted to manufacturing alone, as was the norm in industrial engineering at the time, and included physical distribution and material handling. Beginning in the 1960s, ISyE broadened its methodology expertise into operations research, entering the domain of transportation routing, network design, and inventory control. Through the 1970s and 1980s, a variety of ISyE research centers in material handling, logistics, and transportation were established. In 1992, the Logistics Institute was created to consolidate the wide range of logistics-related research and education efforts that have helped ISyE establish its number one ranking among industrial engineering programs.

The widespread recognition of the term “supply chain” has come primarily as a result of the globalization and outsourcing of manufacturing since the mid-1990s. Globalization accentuated the need for logistics strategies to deal with large and complex commercial networks. There has been an increasing trend to use the term “supply chain” to refer to strategic issues and “logistics” to refer to tactical and operational issues. This growing association of supply chain with strategy is reflected in the Council of Logistics Management’s changing its

name to the Council of Supply Chain Management Professionals (CSCMP) in 2005. CSCMP made the distinction that “logistics is that part of the supply chain process that plans, implements, and controls the efficient, effective, forward, and reverse flow and storage of goods, services, and related information between the point of origin and the point of consumption in order to meet customers’ requirements” while “supply chain management is the systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole.” Maintaining its relevance to industry, the Logistics Institute changed its name to the Supply Chain & Logistics Institute, reflecting the breadth and depth of ISyE’s expanding mission of developing technology and people to address the rapidly evolving engineering and management needs of the field.



However, don’t let the fact that there is a formal definition of supply chain management and an official-sounding council to govern its practice fool you into thinking there is widespread agreement in the supply chain industry. Debate rages regarding its definition, what it encompasses, and its rightful place in an organization. The discussion will most likely continue for

the simple reason that supply chains vary significantly from industry to industry. Despite this grappling about technicalities, there are pertinent supply chain “truths.” First and foremost, there is no supply chain without a customer. Whether that customer is a mother of five buying groceries in a retail store, a billion-dollar airline expanding its fleet, a starving tsunami victim in need of basic necessities, or a trooper in need of ammunition on the battlefield, there is a need that must be satisfied. What sets supply chains apart is how effectively and efficiently they satisfy this need. Two other central truths are that of alignment and balance. Added to this balancing act is the concept of strategic alignment with the organization’s goals—miss this and you will find yourself walking the wrong tightrope—to the detriment of the organization.

Commercial supply chains are, by far, the most widely studied and prioritized supply chains, simply because they affect every aspect of our daily consumer lives. They have in common the overriding objective of making and sustaining a profit but can differ vastly

in how they go about doing so. Take for example the difference between a supply chain for a retail distributor of fast-moving consumer goods and that of a high-tech electronics manufacturer.

Walmart comes quickly to mind in the retail sector. They will tell you very succinctly that they are not a series of stores spread out over the globe but rather well-defined and managed geographically dispersed supply chains. Can you question their level of success? Walmart does not manufacture anything. They are best at capturing point-of-purchase demand and then anticipating and even shaping demand through volume purchases and discount pricing.

Intel, on the other hand, boasts a high-tech electronics supply chain that is also considered a best of breed in its industry. They manufacture integrated microprocessors. Their success lies in their ability to navigate the perils of the high-tech industry, where the shelf life of a product is usurped by tomorrow’s technological advancements. Margins on new product releases must be realized and captured quickly before

they become commoditized or replaced by advanced technology. The time criticality of the industry and the nature and value of raw materials and finished goods prioritize lead time and speed to market as key decision variables within the high-tech industry.

Humanitarian supply chains are typically associated with disaster-relief efforts but also include the long-term, sustained distribution of services and material aid to impoverished individuals or communities. A good example of this comes from South Africa, where donated breast milk is collected, pasteurized, and redistributed by an NGO to premature infants with no access to their mother’s own milk. The infants’ predicament is not linked to a disaster per se, but is the result of the HIV pandemic and a lack of infrastructure and resources in the country’s public healthcare sector. Disaster or no disaster, these supply chains do not seek to make a profit—instead they seek to spend every penny to save more lives and improve quality of life. A whole different set of complexities comes into play. Resources



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<http://www.youtube.com/watch?v=rUb4wDGg5Ck>

are always scarce as demand almost always exceeds supply. Coordination, collaboration, and flexibility are absolutely necessary but difficult to achieve when lives are at stake.

In military supply chains, the word is readiness—poised to respond rapidly to low-probability, high-impact events that could occur almost anywhere and affect the security and safety of an entire world. It is understandable that these supply chains are gigantic, heavily regulated, and laden with inventory. When responding to one of these events, robustness and reliability become the key performance measures. There can be no disruption of supply to the battlefield, regardless of how many bridges get blown out or how many depots are infiltrated. Furthermore, soldiers in the field must receive their supplies when, where, and in the condition they expected, and there is very little room for error. Although military supply chains are concerned about the bottom line and cost-efficiency, a much higher priority is placed on establishing and maintaining predetermined readiness levels.

From these few examples, it is clear that successful supply chains need to be custom built to fulfill their purpose. That is why the field is termed supply chain engineering. Creating a supply chain from scratch or reengineering and optimizing an existing supply chain network to capitalize on new opportunities both require rigorous analysis and thoughtful design.

For each of these scenarios, the starting point is understanding the context. This goes far beyond understanding just the organization—which may be but one player in a vast supply chain. A deep appreciation of the dynamics of the entire supply chain is required. Who are the players, and how do their actions affect each other? What are the competing supply chains within the same industry, and what are the complementary supply chains in other industries? What is required to establish and maintain a competitive edge within the industry? Furthermore, if the supply chain has a global reach, one has to also understand how politics, trade agreements, laws, and regulations affect the supply chain.

Against this backdrop, the supply chain can be designed. Of tantamount importance is the understanding of the organization's strategic objectives and securing the buy in of upper-level management. Misalignment is easily the most common affliction of modern supply chains. The wrong set of metrics drive the wrong behavior—often departments are individually optimized to the disadvantage of the organization as a whole. Typically these first steps are considered the more “business” side of supply chain engineering.

Only once you have defined the strategy and established and aligned your key performance metrics against the backdrop of the problem context does it make sense to roll up your sleeves and jump into the tactical and operational aspect. This may include network optimization, organizational realignment, decision modeling and analysis based on landed cost, and risk management or more tactical initiatives such as inventory management, transportation management, SKU rationalization, vendor sourcing, and procurement strategies. The toolset

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Since 2000, **Georgia Tech's EMIL program** has been in a category of its own. Today, with its new name reflecting the challenges of supply chain management, the **Executive Masters in International Logistics & Supply Chain Strategy (EMIL-SCS)** offers senior logistics executives an advanced degree that strategically blends people, places and content beyond a class or workshop. It offers **life-enhancing opportunities** to spend quality time with others, like you, who seek to define the **future of supply chain logistics**. By working in teams across four continents, you will analyze and resolve **real world issues** while simultaneously building friendships with classmates, professors, speakers and industry executives that will last a lifetime.

available to the supply chain engineer is vast—borrowing from industrial engineering, operations research, business, and finance—and choosing the correct tool for the job is a fine art learned through experience and exposure. The result of the engineering



process is typically a small number of alternate designs (typically one or two) for the decision maker to choose from. Each of these designs will have been thoroughly evaluated by means of simulations, pilot projects, and/or quantitative analysis to understand and predict both the operational and financial outcomes of its implementation.

Supply chain engineering is both a science and an art. It requires rigorous analysis—both quantitative and qualitative—but also intuition, experience, and creative problem solving. Similarly, it is a field that allows for specialists and generalists, strategists and implementers. One could specialize in the development and application of network optimization algorithms or become a consultant who studies the industry and the company in order to help define the problem. Supply chain engineering is a field that gives you a wide range of career options. Within academia, there are a variety of research topics to be advanced and a multitude of young minds to educate and train. Industry offers an equally wide range. One could work for a consulting firm and get exposure to many different kinds of supply chains, be part of an internal supply chain team that designs and manages the global supply chain of a Fortune 500 company, or even be the chief supply chain engineer for a start-up company. One could work for the military, non-governmental organizations, governments, or organizations like the United Nations

and the World Health Organization. In deciding on whether to embark on a supply chain engineering career, the question is not whether there is work for you in the industry you are passionate about but rather whether you are passionate about the way of thinking, the problem solving skills, and the paradigms of supply chain engineering.

For more than sixty years, ISyE has provided a leadership role in the evolution and growth of supply chain

engineering. This is reflected in the evolution of the School's undergraduate and graduate curriculum as well as faculty research and outreach. ISyE's progress has been led by two strategic objectives:

- To offer more opportunities for specialization at both the undergraduate and graduate levels
- To recognize the importance of applying our industrial engineering methods to increasingly complex and global product supply chains

While ISyE still offers only one BS degree in industrial engineering, the BSIE degree now includes four unique curriculum tracks for students to follow, one of which is supply chain engineering.

The number of master's degrees offered by ISyE has grown steadily during its history, the most recent addition being the Master of Science in Supply Chain Engineering. The first twelve graduates of this professional master's program will receive their diplomas in December 2011. Visit www.sce.gatech.edu to learn more about this program.

ISyE also offers the Executive Master's in International Logistics & Supply Chain Strategy (EMIL-SCS), which was introduced in 2001. EMIL-SCS offers real-world, practical value through traditional course work, live cases, corporate site visits, webinars, and corporate-sponsored supply chain projects at the leading cusp of industry trends. Designed for experienced

executives, the EMIL-SCS program is built around five intensive two-week residences in the United States, Europe, Asia, and Latin America. No educational experience in supply chain engineering would be complete without emphasizing the "global" component. For this reason, great effort is made to incorporate cultural, geographic, academic, and experiential diversity into both the EMIL-SCS and the MS SCE programs. Visit www.emil.gatech.edu to learn more about the EMIL-SCS program.

Notably, education and training is only one facet of ISyE's impact on the field. An impressive group of professors and PhD candidates fervently pursue research adding to the field of supply chain engineering. Many of the faculty members are thought leaders in their own specialty, and numerous Georgia Tech publications are considered key references within supply chain engineering. But beyond the intellectual towers of academia lies industry—where the true value of all this new knowledge is put to the test. To remain relevant, ISyE (and especially the Supply Chain & Logistics Institute) actively engages in industry discussion through participation in associations and councils. A number of research centers have been established, both in the United States and abroad, that invite industry membership and participation. ISyE's approach to industry collaboration actively seeks to close the gap between state-of-the-art and state-of-practice issues. The world of supply chain engineering is growing daily, both in scope and significance. Through its education, research and industry outreach, the H. Milton Stewart School of Industrial and Systems Engineering is staying at the forefront of this evolution.

—
Nadia M. Viljoen is a graduate research assistant in ISyE and an industrial engineer at the South Africa Council for Scientific and Industrial Research (CSIR).

Greg Andrews is managing director of EMIL-SCS.

Harvey Donaldson is associate chair of Industry and International Programs.



At the Mexico Trade, Logistics, and Innovation Center inauguration: (left to right, front row) Miguel Martinez, executive director of the Trade & Logistics Innovation Center; George Wright, director of Distance Learning, Georgia Institute of Technology; Stephen Cross, executive vice president for research, Georgia Institute of Technology; Arturo Molina, president of the Tecnológico de Monterrey, Metropolitan Zone of Mexico City; Steven McLaughlin, vice provost for international initiatives, Georgia Institute of Technology; Daniel Moska, director of the Tecnológico de Monterrey, Campus Santa Fe; and Larry Jacobs, associate dean for academic affairs, Georgia Institute of Technology; (back row) Eric Porras, research director of the Trade & Logistics Innovation Center; Jaymie Forrest, managing director of the Georgia Tech Supply Chain & Logistics Institute; and Jane Ammons, H. Milton and Carolyn J. Stewart School Chair, Stewart School of Industrial and Systems Engineering, Georgia Institute of Technology.

Georgia Tech, Tecnológico de Monterrey Open Trade & Logistics Center in Mexico City

By Liz Klipp

Mexico is the top exporter of perishable goods into the United States. A stronger trade and logistics performance in Mexico could mean cheaper food prices at the grocery store for Americans, more money in the hands of Mexican farmers, and greater economic productivity for Mexico as a whole.

With this goal in mind, the Georgia Institute of Technology and Tecnológico de Monterrey launched the Trade & Logistics Innovation Center in Mexico City, Mexico, on September 30, focusing on improving country-level logistics performance and increasing trade competitiveness.

The center is the fourth addition to the Georgia Tech Supply Chain & Logistics Institute’s logistics innovation network of centers.

“In order for us to continue our global positioning, we have to understand the supply chain from an international perspective,” said Jaymie Forrest, managing director of the Georgia Tech Supply Chain & Logistics Institute. “It is essential that there be in-depth knowledge of major trading partners such as Mexico for Georgia Tech to be the leader in international trade.”

The Supply Chain & Logistics Institute at Georgia Tech’s H. Milton Stewart School of Industrial and Systems

Engineering in Atlanta is the main center in the logistics innovation network. Additional international centers operate in Singapore, Costa Rica, and Panama, each supporting the competitiveness agenda of its respective country.

A country’s productivity, as influenced by logistics performance, is critical to its global competitiveness. The World Bank’s annual Logistics Performance Index ranks the United States fourteenth, Panama fiftieth, Mexico fifty-first and Costa Rica seventy-second in the world in logistics performance. A clear need exists to improve these rankings through more effective and productive logistics, Forrest said.

Like the others, the new center in Mexico City will focus on three areas—education, research, and industry growth. Georgia Tech is partnering with Tecnológico de Monterrey to operate the center, which will be located in the Santa Fe area of Mexico City, where most of the country’s multinational companies have headquarters.

The center will offer professional and executive education on logistics and trade, the same extensive curriculum offered by the Supply Chain & Logistics Institute at Georgia Tech. Offerings include comprehensive programs in lean supply chain, transportation, warehousing, inventory, trade, and supply chain strategy.



Above left: Guest speaker Miguel Maron Manzur, Under Secretary of Small and Medium Enterprises (SME), recognized the efforts of Georgia Tech and Tecnológico de Monterrey to provide SME's with the needed education and support to improve competitiveness in international markets.

“We’re going to provide education and research to make sure Mexico has the capacity to do it on its own,” said Miguel Martinez, executive director of the Mexico center. “The fact that an institution like Georgia Tech is involved will help us get there faster with proven methodologies and success in other countries.”

For its research agenda, the center will work on projects for Mexico’s federal government in several areas, such as disaster management, humanitarian logistics, and improvement of the food and beverage supply chains. The center’s research areas will also include warehouse distribution and logistics, logistics and manufacturing, supply chain for emerging economies, and information technologies for supply chain management.

“Mexico is our third largest trading partner, our largest source of fresh produce and, increasingly, a major source of manufactured goods,” said John Bartholdi, the Manhattan Associates Professor of Supply Chain Management and director of global research for the Georgia Tech Supply Chain & Logistics Institute. “In return, Mexico buys more from us than does China. Georgia Tech will partner with Tecnológico de Monterrey to make these supply chains more integrated, efficient, and reliable, to the benefit of all.”

To reach Mexico’s industry base, the center will be partnering with one of Mexico’s largest business associations to develop education programs and tools for its members, so they have a better understanding of logistics and how it impacts them.

“The goal is to better prepare our infrastructure and our industries to be competitive at the local level and for export,” Martinez said.

Through its international centers, Georgia Tech’s Supply Chain & Logistics Institute has been leading the way in leveraging innovation and technology to improve trade and increase productivity.

Georgia Tech founded the Logistics Institute Asia-Pacific in Singapore in 1998 at the request of the government to support Singapore’s Asian trade hub with research, education, and consulting expertise in global logistics and supply chain management.

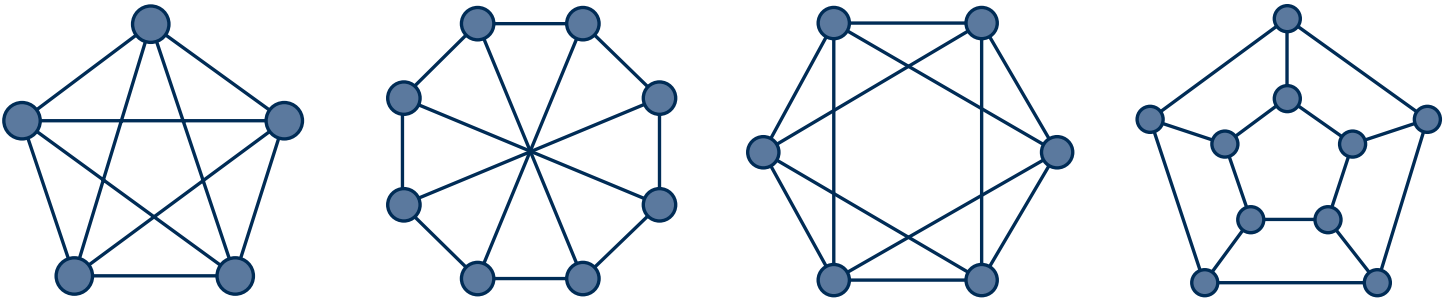
In 2009, Georgia Tech opened the Trade-Chain Innovation and Productivity Center in Costa Rica with a goal of increasing trade exports and improving logistics performance while supporting some of the country’s strategic initiatives and planning investments.

Last year, Georgia Tech created the Logistics Innovation & Research Center in Panama to improve the country’s logistics performance and establish the country as a trade hub to the Americas.

The Supply Chain & Logistics Institute is not stopping there. The Institute currently has interest from two universities in Chile as possible partners to establish the next center. It is also investigating future centers in Colombia and Brazil.

The centers are a win-win for all involved, Forrest said. The countries benefit by leveraging Georgia Tech’s expertise to improve logistics performance, which is the foundation for competitiveness and trade. Georgia Tech benefits by offering a richer learning experience for its students and faculty, while positioning the Institute as the global leader in international trade research.

“Research and development leadership requires a global presence and applied knowledge,” Forrest said. “Our network of innovation centers provides Georgia Tech the foundation for collaboration and application in the field for maintaining our expertise in supply chain and logistics.”



The four structures shown form the complete list of forbidden minors for the class of graphs known as partial 3-trees; such a list is not known for partial k -trees for any higher value k . The graphs were discovered by a Georgia Tech student, Richard Borie, PhD 1988, conducting research under the advisement of ISyE professors R. Gary Parker and Craig Tovey. This interdisciplinary research activity played a prominent role in motivating the ultimate creation of the elite Georgia Tech PhD program in Algorithms, Combinatorics, and Optimization.

Operations Research in the Stewart School

By R. Gary Parker

Try this (if you have little else to do): Pick a buddy, then grab a dozen people off the street—okay, to make it a little more interesting, when you visit for homecoming, just select a dozen people on campus—and ask them to define the field of study known as “operations research” (OR). Before doing this, however, make a wager with your friend: If at least two responses are the same, you will purchase for him two season tickets to the Atlanta Thrashers next year; otherwise, he has to mow your grass and rake leaves for a full year. Assuming he takes you up, how do you like your chances? Well, as they say: You have nothing to lose and everything to gain (hint: there is a very good chance you’ll be staying out of your yard for a year, but, if on the off-chance that you lose the bet, you won’t have lost too much on the purchase of those hockey tickets, since the Thrashers became the Winnipeg Jets last spring).

What’s in a name?

No matter the stakes, your bet was pretty secure because there is a very high probability that those dozen responses to the query posed above will be all over the proverbial map; some will have to be tightened to even reach the level of “nebulous.” And, even if a couple of descriptions are the same, it is entirely likely that both are vague, outmoded, or simply nonsensical. So is there a punch line here—a resolution of a riddle? Actually, there is not (at least from this author), but there is an article,

and its theme is this: We don’t really have an air-tight definition of OR either, but we do believe that in the H. Milton Stewart School of Industrial and Systems Engineering (ISyE), we do it at least as well as anybody and quite possibly better than any other academic program.

In order to have at least a fixed point, suppose we go straight to the description offered up by what many will argue is the flagship professional society representing this identity-conflicted field. The Institute for Operations Research and the Management Sciences (INFORMS) tells us on their website, www.informs.org, that “operations research is the discipline of applying advanced analytical methods to help make better decisions.” Paraphrasing the well-known sentiment expressed by Churchill regarding democracy as a system of government, this characterization of OR might well strike you as not so hot, but then none of the others we know about appear to be any better. Indeed, the professional society recently rolled out a somewhat slicker marketing version calling OR the “science of better.” Take your pick.

No matter one’s view on the definitional issue, it does remain that OR seems to occupy at least “brand name” status. Even if they can’t agree on a formal description (this is not a new frustration but rather one dating to at least the Second World War when the phrase was first introduced), most people

queried will certainly know the name. Universities, after all, teach plenty of courses directly related to if not actually titled Operations Research, many award degrees (mostly graduate) specifically designated as OR, and some even have Operations Research in their academic program name.

If we return to the INFORMS-sponsored version stated above, we are also instructed that the section in the description referring to “advanced analytical methods” includes the following fundamental methodologies: simulation, optimization, probability, and statistics. Okay, let us check the fall 2011 roster of fifty-one academic faculty with full-time appointments in ISyE. From that list, let us apply a conservative, if not fairly stern test that counts only faculty members who either originated and/or teach an advanced course in statistics, optimization, or stochastics (probability/simulation).¹ Since you’re reading this, I ask that you trust me to count for you; I get thirty-three. This means that nearly two of every three ISyE faculty members are apparently “doing OR” under the INFORMS description. But then if you turn back and focus on the word “applying” from the INFORMS description, and add those faculty who are, by their own admission, demonstrable and routine users of the stated methodologies, I can easily

¹A direct measure of strength in ISyE is that faculty teach in their primary specialties, especially at the highest level (doctoral courses).

identify at least ten additional faculty that can be counted.

So, thirty-three for sure and possibly as many as forty-five of fifty-one current ISyE faculty members are either teaching and conducting research directly in the methodologies of OR as defined by no less than the parent professional society or are doing work that routinely draws upon OR tools in their research applications. Would not even the most casual observer wonder: “Why isn’t it the Stewart School of Operations Research?” Well, it probably could be; however, tradition and history play a major role in negotiating that question and that’s how it should be. Indeed, it is quite common for industrial engineering (IE) programs to have much (or at least some) activity in operations research; to be sure, many ISyE faculty who are counted in the forty-five above have their educational backgrounds firmly rooted in modern industrial engineering and fully appreciate and respect that identity. On the other hand, many, especially from the gang of thirty-three, have their degrees in mathematics, statistics, and operations research. The larger point is, though, that the boundaries defining fields where operations research is done legitimately are blurred at best and without a doubt overlap substantially.

In fact, one of the reasons that your bet in the opening paragraph was pretty safe is that on the spectrum of academic programs at universities, there are a host of points where operations research is getting done, more or less. This easily includes programs in mathematics, statistics, computer science, various other engineering departments, and certain business schools. So, those dozen “random” people indicated above, chosen, and asked to define OR, might well know the discipline and offer honest descriptions of just what they think it is, at least what it involves, but those descriptions will likely be tailored or influenced by their respective domains and academic cultures.

Academics

If you’re a prospective student (at any level, but especially for those at the graduate level) and you want to avoid any coursework requirements covering OR methodology, you can

save the cost of application to ISyE. In the current list of active courses taught by ISyE faculty, nearly forty-five are devoted explicitly to methodology in optimization, stochastics, or statistics. A half-dozen of these are at the undergraduate level, in support of the BSIE; the remaining courses are master’s and doctoral-level courses.² At the master’s level, the School offers eight designated degree options, two of which are focused explicitly on OR and statistics (MSOR and MSStat, respectively) even though most of



Jon Bartholdi



Bill Cook



Arkadi Nemirovski



Jeff Wu

the other master’s (MS Industrial Engineering, MS Health Systems, etc.) also require OR methodology courses somewhere in their programs of study. At the doctoral level, the PhD in OR is (surprise) intensive in its requirements of advanced methodology courses, particularly in optimization and stochastics, but the PhD in IE, which breaks into four specializations, has heavy doses of the very same courses sprinkled throughout depending

upon one’s chosen specialization, e.g., supply chain engineering, economic decision analysis, etc.³ Again, these methodology courses are the hard-core, fundamental courses, taught almost exclusively by those thirty-three faculty members mentioned earlier. Naturally, we also teach many additional courses pertaining to the classic as well as contemporary application domains commonly identified with our fields and that apply these methodologies. Faculty whose primary responsibility is covering those courses constitute,

by and large, the others that produced the larger estimate of forty-five “OR-related” faculty.

People and Research

In this section, we profile just some of the School’s senior faculty members who make us look particularly good in the world of OR as we have interpreted it. It needs to be stated that many not

²See the *ISyE Graduate Handbook*, 2011-2012.

³PhD students specializing in statistics do so as if it was a separate PhD, but at the present time, it is identified as one of the four specializations within the PhD in IE.

on this list have equally justifiable cases to have been included. As genuinely uncomfortable as this dilemma is for this author, it does serve to corroborate the exceptional strength of the OR faculty in the School.

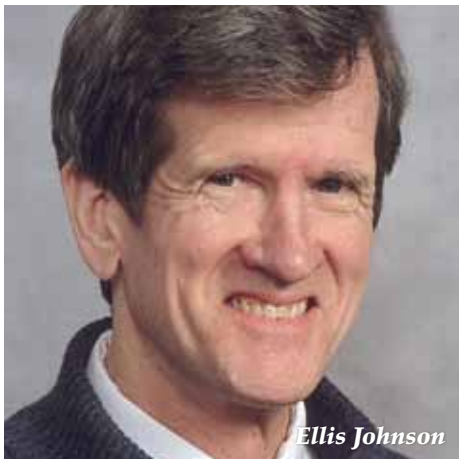
The position that the School has risen to among the elites in the context of OR owes its origin to a small number of individuals who, upon their arrival, sent clear signals to the broader community that ISyE was ready not only to build upon existing competence but also to move to the next level.



Jim Dai



Craig Tovey



Ellis Johnson



George Nemhauser

The obvious pioneer in this group would be George Nemhauser (PhD in Operations Research, 1961, from Northwestern). Attracted from Cornell in 1985, he came to Georgia Tech as the Russell Chandler Chair, the first endowed chair in ISyE. He also owns the remarkable distinction of being the first individual at Georgia Tech to be elected to the National Academy of Engineering while a sitting faculty member (1986). Long noted for basic work in integer programming and

combinatorial optimization, a hallmark of much of his research career has been influenced by an attraction to interesting applications that validate his methodological work. Many claim such interests, of course—George Nemhauser actually does it. Working with generations of students and colleagues spanning more than forty years, he has done impactful work in a broad spectrum of practical settings, including vehicle routing, production, transportation, and even sports scheduling.⁴ Insisting that work in

applied areas possess serious research content, he routinely attracts doctoral students who come from strong, theoretically grounded backgrounds (and who are recruited precisely because they do), but who also are interested in seeing their methodological work validated in practical settings. Always supported from sources typically aligned with funding basic/theoretical

⁴Nemhauser has completed projects involving Major League Baseball, the National Football League, and several college conference schedules, including the ACC basketball season.

work (e.g., NSF, ONR, etc.), he is one of our most successful faculty in attracting industrial sponsorship. Bridging the divide between theory and applications in a program of our stature and at the level exhibited by George Nemhauser is a rare feat.

A giant in integer programming, Ellis Johnson (PhD in Operations Research, 1965, from Berkeley) has been directly associated with no fewer than three of the most famous and influential names in the entire history of methodology fundamental to Operations Research. His PhD advisor was George Dantzig, the father of linear programming. While at IBM (and beyond) and working with Ralph Gomory, he of cutting plane theory that bears his name, Ellis produced elegant results pertaining to so-called corner polyhedra. Finally, with Jack Edmonds, the person who probably more than anyone is responsible for creating the prominence associated with the discipline of combinatorial optimization, Ellis authored fundamental results pertaining to the storied Chinese postman problem that still stand as seminal in the field. In 1988, he began a substantive collaboration with George Nemhauser and others in ISyE, including several long-term faculty visits. Then upon retirement from the mathematical sciences group at IBM's Watson Research Center, he joined the School as a permanent faculty member, taking the Coca-Cola Chair in 1993. If there is a "double-play combination" most responsible for sending a message that ISyE was ready to join the major leagues in OR, it would be the early presence of the Nemhauser-Johnson tandem. But as renowned as his work in fundamental integer programming theory is, Ellis Johnson's name also resounds in an application area that he, almost single-handedly, invented: airline operations research. His research, applying the tools from linear and integer programming and network flows, has enjoyed enormous success in modeling and treating myriad, hard transportation and scheduling problems specific to the airlines; his influence in passing this expertise on to numerous students and younger colleagues is well known. His stature is corroborated as the recipient of a number of research

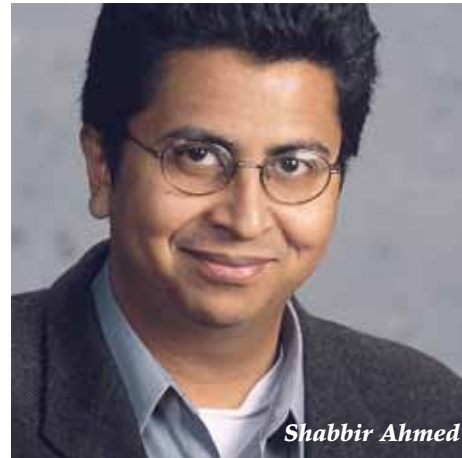
awards of the first rank; he was elected to the National Academy of Engineering in 1988.

The traveling salesman problem (TSP) is arguably the most celebrated example in combinatorial optimization. Required is that one find a minimum-distance itinerary that visits all of the cities in a set exactly once before returning to the starting point. While particularly easy to state, the problem is notoriously difficult. In fact, its position as one of the hardest of hard problems has been formalized by being named one of the so-called Millennium Problems by the Clay Mathematics Institute.⁵ Still, much work continues on and around this perplexing problem. Its applications are myriad in the real world and research on the problem itself, while not close to a formal resolution, spawns important results in related areas along the way; this is what forms good science, and ISyE has the MVP in this game. Bill Cook (PhD in Mathematics, 1983 from the University of Waterloo), holder of the Chandler Family Chair in the School, combines a knowledge of and a personal research record pertaining to the TSP that may have no rival anywhere in the world. He has written the definitive book on the subject and was awarded the prestigious Lanchester Prize for the effort. Importantly, he, along with research colleagues elsewhere, have been able to verify optimal solutions for the largest known instances of a special but important class of TSPs. Bill is one of the world's ranking researchers in computational optimization. Because of his reputation, he is an in-demand speaker in prestigious, public scientific forums and provides great visibility not only for ISyE but for Georgia Tech and across boundaries that span OR, mathematics, and computer science. He was elected to the National Academy of Engineering in 2010.

If anyone in academia can stake a claim as the ranking engineering statistician in the country if not the world, a safe bet is that it is likely to be Jeff Wu (PhD in Statistics, 1976, from Berkeley). Luckily for us, he holds the Coca-Cola Chair in Engineering Statistics in the

⁵In 2000, seven problems were named, much akin to the famous twenty-three problems posed in 1900 by the mathematician David Hilbert. Solve a Millennium Problem and you will win one million dollars.

Stewart School. Following distinguished careers at Wisconsin-Madison (Statistics), Waterloo (Statistics), and the University of Michigan (Statistics/Industrial and Operations Engineering), he has continued to conduct cutting-edge research in applied statistics that increasingly blends in and interacts with the activities historically prominent in OR, i.e., optimization and stochastics. That this is noteworthy follows because if we are to be true to the characterization of OR from



Shabbir Ahmed

INFORMS, statistics is a staple in the portfolio of methodologies that support the discipline; with Jeff Wu's role, the strength of that staple is more than secure in ISyE. As a research advisor, he routinely attracts the best doctoral students seeking work in statistics. Importantly, through his personal power of attraction coupled with a judicious hiring policy, he has added a marvelous group of young statisticians who, when added to existing strength, have made the engineering statistics group in ISyE an exceptionally strong one, certainly the best in the country. With particular expertise in experimental design, he too represents the School in prestigious, international forums. In August of this year, he was honored by giving the famed R. A. Fisher Lecture, named for the legendary statistician. In 2008, he was awarded a prestigious, honorary doctorate in mathematics from the University of Waterloo; he was elected to the National Academy of Engineering in 2004.

The British scientist and writer Jacob Bronowski⁶ said: "A genius is a man

⁶Popularly known for his book *The Ascent of Man*, which was detailed in a PBS series.

who has two great ideas." Now, we know that Bronowski hung out with the great physicists and mathematicians in the first half of the last century, so the application of his claim to that population assumed a pretty lofty bar on what constituted a "great" idea. Still, we can surely understand what his rule implies in general, and in that regard, if there is a candidate in ISyE who would meet the test, it would be Arkadi Nemirovski (PhD in Mathematics, 1974, from Moscow State University). A



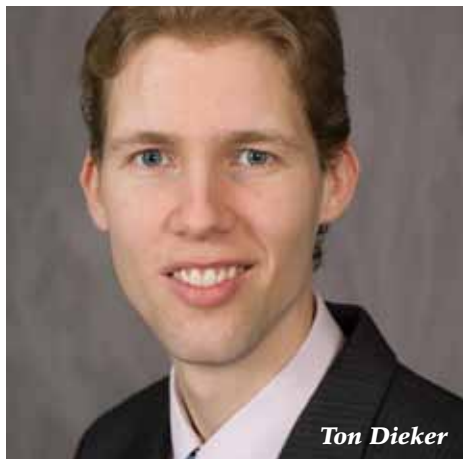
Santanu Dey

world leader in continuous optimization for more than thirty years, he has made three major breakthroughs in the field: the ellipsoid method for convex optimization, the extension of modern interior-point methods to convex optimization, and most recently, the development of a theory of robust optimization. He has won three of the most prestigious scholarly prizes in operations research and applied mathematics: the Fulkerson Prize, the Dantzig Prize, and the John von Neumann Theory Prize. In fact, he was the first individual to have won all three of these awards. Interestingly, when he was awarded the Fulkerson Prize in 1982, he was not permitted to leave his native Russia to accept the honor. Fortunately, in time, such barriers were dissolved. After some years on the faculty of the Technion in Israel, he was attracted to ISyE in 2005 and presently holds the John Hunter Chair. In 2006, he was honored with an invitation to give a plenary talk at the International Congress of Mathematicians.⁷ To

⁷The ICM convenes every four years and attracts mathematicians from around the world (i.e., that's a lot); very few invitations to give plenary addresses are awarded.

underscore this achievement, he is the only sitting faculty member from Georgia Tech ever to have been so honored. He was awarded an honorary doctorate in mathematics from the University of Waterloo in 2009.

It takes a certain level of “wizardry” to invent and ultimately present effective algorithms for hard problems that impress the user with their near-primitive level of simplicity, e.g., “How can something this simple, actually work so well?” Meet Manhattan

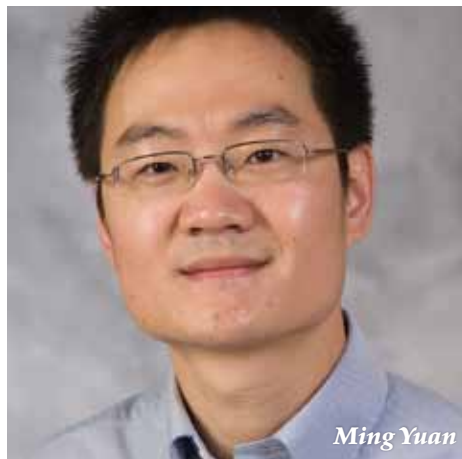


Ton Dieker

Associates Chair of Supply Chain Management John Bartholdi (PhD in Operations Research, 1977, from the University of Florida), and you’ll likely get some insight. Working often with his students as well as colleagues, John Bartholdi mines deeply for problems of great practical value—notably, ones arising in common manufacturing and logistics domains but that are, nonetheless, inherently difficult at their core. Yet, he manages to produce approaches that yield good quality solutions coupled with efficacy not by taking liberties that dismiss analytical or mathematical insights but to the contrary, by applying them. His work, employing some old and fairly sophisticated notions from geometry pertaining to space-filling curves in order to produce approximate solutions to various classes of routing problems, is well known and has been applied in a host of practical settings such as Meals on Wheels. Similarly, his “bucket-brigade” notion, which induces a self-organizing phenomenon for assembly lines based on fundamental results in stochastics, is so simple that even ants

can appreciate it.⁸ The models have been and still are being used in such real world settings as Subway, Readers Digest, Radio Shack, McGraw-Hill, and many others.

With little debate, most observers (at least those who have been around long enough) would agree that in the early 1980s, the most highly regarded doctoral programs in OR resided at Stanford and Cornell; Berkeley and MIT were close, but maybe a notch below. Lumped together, the four



Ming Yuan

formed something of a closed set in that graduates from those programs tended to join the faculties of those programs. Moreover, honesty compels one to admit that we were simply not competitive in the recruitment of those graduates to ISyE. However, in 1981, then-School Chair Mike Thomas made a concerted effort to change that state of affairs and convinced Craig Tovey (PhD in Operations Research, 1981, from Stanford) to come to Georgia Tech. Like Ellis Johnson, Craig conducted his work under the icon George Dantzig (who had moved from Berkeley to Stanford). Importantly, he brought a talent and scholarly depth to the School that was influenced by the culture from his Stanford experience and that took root in ISyE through his presence in teaching and research. Earlier in this piece, reference was made to various core OR courses that PhD students endure early in their programs; more advanced versions follow, of course. These are fundamental and quite rigorous courses that cover deterministic optimization as well as courses in applied probability

⁸http://www2.isye.gatech.edu/people/faculty/John_Bartholdi/insects.html

and stochastics. If there is a list of ISyE faculty who could legitimately teach, at the level our best doctoral students demand, more than two or three of these courses, that list would not be very long indeed, and it would most certainly include Craig Tovey.⁹ This breadth of rigorous, technical talent coupled with genuine depth carries over to his research, the span of which may also be unrivaled in the School, ranging from mathematical models of voting systems to formalisms of graph algorithms, from circuit board assembly to polyhedral combinatorics. He is the only ISyE faculty member to have an Erdős number of 1.¹⁰

Jim Dai (PhD in Mathematics, 1990, from Stanford) came to Georgia Tech in 1990 as a new assistant professor holding a joint appointment in the School of Mathematics and ISyE. He continued to hold the joint appointment all the way through his promotion to the rank of full professor after a remarkably short period of only eight years beyond graduation. In 2001, he reconstituted his appointment to only ISyE, and in 2007, he was named the Edenfield Professor in the School. Trained in applied probability and stochastics, one of his major research specializations is in the area referred to as heavy-traffic queueing theory (think of a large call center or a dense roadway network subjected to rush-hour traffic jams). Jim Dai has studied such problems for twenty years. Using advanced, multidimensional Brownian motion approximations to estimate performance characteristics for such systems, his research has led to important results that yield keen insights into attributes such as queue waiting times, expected lengths of queues, as well as various anomalous outcomes, e.g., is it possible for expected lengths of lines that form to drift off to infinity, yet for servers to have an abundance of idle or free time? (The answer is yes.) He tackles deep, subtle real-life problems with sophisticated mathematical machinery and enjoys

⁹Although that top spot could be a dead heat with younger OR colleague Anton Kleywegt.

¹⁰Paul Erdős (1913-1996) was a famous Hungarian mathematician who published more papers than any other mathematician in history. If you co-authored a paper with the great man, you are said to have Erdős number 1; your co-authors of any paper (other than Erdős) have Erdős number 2, and so on.

unquestioned recognition as one of the top world leaders in the field of applied queueing theory.

Distinction

This is a short section; don't expect any chants of "We're number one." Indeed, there are no formal rankings of OR programs akin to ones read about every spring in *U.S. News & World Report*. On the other hand, you can always just ask around and the bet is that a very, very short list will emerge that more or less defines the elite programs in the discipline; the claim is that the OR done in ISyE will be firmly rooted on that list. The eight profiles listed in the prior section could easily have been altered with several substitutes without missing a beat or diminishing the point that is being made. We could have spotlighted younger faculty who are poised or are already starting to earn world-class recognition, colleagues such as Shabbir Ahmed and Santanu Dey in optimization, Ton Dieker in stochastics, and Ming Yuan in statistics. They, and several others like them, represent our future; they would not come to a program like ours were it not for the attractiveness of working alongside world-class scholars already here. Name a major prize or award in or related to OR and applied statistics and somebody on this faculty has probably won it; many will have won several. This program is simply exceptional and the assemblage of faculty expertise and reputation is arguably second to none anywhere.

Summary

Within the set of similarly constituted or named academic programs,¹¹ ISyE is far and away the largest. But far more relevant, it's also an exceptionally strong program. Derived directly from the quality of its faculty, this level of strength spans a broad expanse of areas, many of which are unambiguously and fundamentally aligned with the field of operations research.

We began this article on a light-hearted but hopefully somewhat instructive note; we finish with a similar exercise: suppose every academic unit at Tech (schools and departments) was asked

to ascertain where its faculty members would relocate at the Institute if their unit were eliminated.¹² Now, there are some rules: a valid case has to be made that a faculty member actually fits in somewhere else, i.e., where they can teach real courses, sit on committees, and such. However, let us also require that they have to land at a place where their tenure is legitimate, where they could have been hired in the first place, and if not tenured, can earn it within the new unit's guidelines and standards; that their presence at the new place actually makes the latter better not just that it adds to the workforce. This is a pretty tough litmus test. Against this backdrop, suppose we define the "width" of a unit to be the number of distinct colleges at Tech where at least one member of the evaporating academic unit's faculty can be taken in legitimately as defined by the test just described. A program with a high-width number implies great breadth and strength that is deep, not cosmetic; those with a lower width, less of both.

So what's the width of ISyE? At Georgia Tech, there are six distinct Colleges: Engineering (CoE), Sciences (CoS), Computing (CoC), Management (CoM), Architecture (ARCH), and the Ivan Allen College of Liberal Arts (IAC). If we are to compute the width for ISyE, we pull out the current roster and start down the list: where could this faculty relocate (if anywhere)? For sure some would stay in CoE; likely homes would probably be mechanical engineering (for manufacturing) or civil engineering (for logistics or transportation) and maybe others. Some would land in CoM (for operations management, strategic planning, etc.). We even have a couple who could find a home in IAC (for public policy). This calculation gets our width to three, not bad. Now here's what's impressive. We have, within our exceptionally strong OR group, faculty members who would be welcomed in the School of Mathematics (CoS) and others, some of whom are interchangeable with the mathematics candidates, in CoC. You've seen the profiles of some of these above.

So, ISyE has a pretty solid argument that its width is at least five (who knows,

there may be somebody who would make a case for Architecture, but let us not push it). Given that the width of any unit at Tech is bounded from above by six, this is no small thing, but neither do we intend for this illustration to be gratuitous. If you can argue that another school or department at Tech rivals our width, that they can legitimately argue that its faculty could be placed in other college's units without the latter holding their noses or having the dean twist their arm, then so be it. In fact, you might be hard-pressed to name another IE or OR academic program in the country that betters the Stewart School width at their respective institution. Here, we are only paying attention to the Stewart School, your School, and how it can continue to thrive, knowing that much of its reputation rises and falls with regard to its presence in the field of OR—no matter whose definition is applied.

R. Gary Parker is the associate chair for graduate studies and a professor at ISyE.

¹¹Including industrial engineering and operations research, industrial and systems engineering, management science, etc.

¹²This is only an exercise. As the highest-ranked School in Tech's College of Engineering, we aren't planning on going anywhere.



The winner of the spring 2011 Senior Design competition was the Comcast project team: (left to right) Sagar Patel, Thien Huynh, Michelle Wang, Alejandro Santelises, Holly Thomasson, Daniel Kohlsdorf, Ian Balmaseda, and faculty advisor Alexander Shapiro.



The GE Energy project team won first place in the fall 2010 Senior Design competition: (left to right) Mohsin Lakhani, Swathi Narayanaswamy, Manan Bhatt, Avadhi Dhruv, Ariz Himani, Saloni Desai, Mark Herman, and faculty advisor Yajun Mei.

A Win-Win Collaboration: Senior Design Facilitates Learning and Benefits Industry

Every undergraduate student in the H. Milton Stewart School of Industrial and Systems Engineering (ISyE) culminates their education with the capstone Senior Design project. Considered to be the most important and most challenging undergraduate industrial engineering course, Senior Design pushes students to apply what they have learned in the classroom to solve a complex real-world problem that has a defined bottom-line impact for a corporation. The average project value runs in the six figures.

Senior Design is a unique opportunity for companies and organizations to partner and interact with these bright, creative, and dedicated students, and is truly a win-win collaboration for both the students and industry partners. Student teams select a major design project from a company or nonprofit organization and use their ISyE knowledge to develop a solution for the project client. These students gain confidence and practical professional experience working as part of a team addressing real-world problems. The industry partner gains a team of six to eight exceptionally bright undergraduate students who can provide a variety of innovative and creative solutions to an existing organizational problem. Many of these organizations end up making permanent job offers to students from the project team.

Each semester, there are approximately twenty teams who participate in Senior Design. At the end of the semester, each team competes for first place in a competition that highlights and celebrates the team that developed the best solution for their project.

The GE Energy project team won first place in the fall 2010 Senior Design competition. Students Manan Bhatt, Saloni

Desai, Avadhi Dhruv, Mark Herman, Ariz Himani, Mohsin Lakhani, and Swathi Narayanaswamy, guided by faculty advisor Yajun Mei, won for their project, Parts Allocation for GE Energy. The team designed a parts allocation system that enables sharing of gas turbine parts across GE Energy's maintenance contracts. By employing successive network flow optimizations and grouping methods, the project demonstrated annual savings of \$8.7 million, resulting from reduced new part purchases and increased utilization of contract assets.

The winner of the spring 2011 Senior Design competition was the Comcast team, guided by faculty advisor Alexander Shapiro. Students Ian Balmaseda, Thien Huynh, Daniel Kohlsdorf, Sagar Patel, Alejandro Santelises, Holly Thomasson, and Michelle Wang won for their project, Improving Comcast's Outage Detection System, which focused on reducing the number of service calls and unnecessary maintenance attempts for trucks that Comcast incurs because of inaccurate outage detection. A cost model was developed and various algorithms were created aimed at increasing the probability of detecting a genuine outage, thus lowering the unnecessary costs associated with responding to outage reports. A conservative estimate of the project's value shows it may save Comcast \$1.4 million annually.

For more information or to become an industry partner, contact Associate Professor and Senior Design Coordinator Joel Sokol at jsokol@isye.gatech.edu or visit www.isye.gatech.edu/seniordesign.

Sigrun Andradottir, professor in ISyE, and **Andrei Prudius**, MS OR 2004, PhD IE 2007, were chosen to receive the Naval Research Logistics (NRL) 2011 Kuhn Award for their manuscript "Adaptive Random Search for Continuous Simulation Optimization." The award is presented annually to an exceptional paper published in NRL during the previous three years.



Turgay Ayer joined the faculty of ISyE as an assistant professor on August 1, 2011. He received his PhD in Industrial

and Systems Engineering with a minor degree in mathematics from the University of Wisconsin-Madison. He was also selected as one of six finalists for the 2011 INFORMS "Decision Analysis Society Student Paper" competition. In addition, Ayer was selected as one of the finalists for the 2011 INFORMS "Doing Good with Good OR" student competition. Winners will be announced November 13, 2011.

John J. Bartholdi III, Manhattan Associates Chair of Supply Chain Management and research director of the Supply Chain & Logistics Institute, and ISyE Associate Professor **Steven Hackman** were recognized by the College Industry Council on Material Handling Education as first-place winners of the 2010 Outstanding Material Handling & Facility Logistics Research Paper Award for the paper they co-authored, "Allocating Space in a Forward Pick Area of a Distribution Center for Small Parts."



William J. Cook, Chandler Family Chair and widely known for his groundbreaking research in combinatorial optimization and in particular the traveling

salesman problem, recently wrote his second book on the subject, *Pursuit of the Traveling Salesman: Mathematics at the Limits of Computation*. He was also elected as an INFORMS Fellow for his

research contributions in the areas of combinatorial optimization and integer programming. In 2011, he was elected as a member of the National Academy of Engineering for his theoretical and computational contributions to discrete optimization.

Santanu Dey, assistant professor of ISyE, co-authored a paper titled "On the Chvatal-Gomory Closure of a Compact Convex Set" with **Daniel Dadush**, an algorithms, combinatorics, and optimization PhD student.

Antonius Dieker, assistant professor of ISyE, was nominated as a finalist for the INFORMS Junior Faculty Interest Group Paper Competition for his submission, "Sensitivity Analysis for Diffusion Processes Constrained to an Orthant." The paper was co-authored by Dieker's PhD student, **Xuefeng Gao**.

Ozlem Ergun and **Craig Tovey**, ISyE professors, were recognized at the ISyE Faculty and Staff Honors Luncheon for Outstanding Undergraduate Research Mentor (Faculty) Award and Class of 1934 Outstanding Interdisciplinary Activity Award, respectively.

Augustine Esogbue, professor in the Stewart School since 1972, retired in September 2010. In addition to his research, Esogbue taught courses in dynamic programming, stochastic operations research, engineering design, and neuro-fuzzy control.

Don Giddens, former dean of the College of Engineering, was also named a Fellow by the AAAS "for significant contributions to our understanding of the role of hemodynamics in cardiovascular pathobiology and for leadership of engineering education nationally."



David Goldberg joined the faculty of ISyE as an assistant professor on August 10, 2011. Goldberg comes to Georgia Tech from the MIT

Operations Research Center, where he recently completed his PhD.

Ellis Johnson, Coca-Cola Chaired Professor of ISyE and Georgia Tech alumnus, was inducted into the Academy of Distinguished Engineering Alumni for his contributions to the profession, field, Institute, and society at large.

Pinar Keskinocak was named the Joseph C. Mello Professor for her work in healthcare delivery operations. She recently co-authored the paper "Catch-Up Scheduling for Childhood Vaccination," which was awarded the 2010 EURO Excellence in Practice Award.



Eva K. Lee, ISyE professor and director of the Center for Operations Research in Medicine and

HealthCare, joined the highly integrated and interdisciplinary team conducting research in the Center for Systems Vaccinology at Emory University. Lee was also selected as a finalist for the INFORMS Daniel H. Wagner Prize for Excellence in Operations Research Practice. Winners will be announced November 13, 2011.

Leon McGinnis, Eugene C. Gwaltney Chair in Manufacturing Systems and ISyE professor, gave the 2011 Spencer Schantz Distinguished Lecture at Lehigh University, titled "Model-Based Industrial Engineering."

In Memory

Arthur G. Hansen, who came to Georgia Tech as dean of the College of Engineering and would later serve as president from 1969 to 1971, died July 5, 2010, following complications from surgery. He was 85.

Harrison Morton Wadsworth, Jr., professor of ISyE, died August 3, 2010. He was 85. Wadsworth was a statistics professor at Georgia Tech for thirty-one years and taught in China and Turkey. Following his retirement from Tech in 1991, Wadsworth operated his own quality audit-consulting business.

George Nemhauser, A. Russell Chandler Chaired Professor of ISyE, was honored as the first recipient of the newly established INFORMS Optimization Society Khachiyan Prize, for his lifetime achievements in the area of optimization.

Amar Ramudhin, director of Supply Chain Management and Technology at the Supply Chain & Logistics Institute, gave a keynote address to commemorate twenty years of industrial engineering education at Monterrey Tech in Mexico City, Mexico. Ramudhin spoke on the global challenges of industrial engineering, the importance of industrial engineering, and the relevance of higher education related to this career, as well as its importance for companies and for the development of countries like Mexico.

Donald Ratliff, executive director of Supply Chain & Logistics Institute, was invited to become a member of the World Economic Forum's Global Agenda Council on Logistics & Supply Chain for the 2011-2012 term. Ratliff was selected for his experience and intellectual leadership in international supply chain and logistics research.



Nicoleta Serban, ISyE assistant professor, was selected to take part in the National Academy of Engineering's

seventeenth annual U.S. Frontiers of Engineering Symposium. Serban was selected for her exceptional engineering research and technical work in industry, academia, and government.



Jianjun (Jan) Shi, the Carolyn J. Stewart Chair and ISyE professor, received the Albert G. Holzman Distinguished Educator Award from the Institute of Industrial Engineers for his significant contributions through research, publication, extension, administration, and teaching innovation.



Joel Sokol, ISyE associate professor, was selected to take part in the National Academy of Engineering's 2011 Frontiers of Engineering Education Symposium.

Sokol was selected for being among the nation's most engaged and innovative engineering educators.

Julie Swann, associate professor and co-director and co-founder of the Health and Humanitarian Logistics Center, was named the Harold R. and Mary Anne Nash Professor for her achievement and research in humanitarian logistics. Swann was also faculty advisor for the Senior Design group selected as a finalist for the INFORMS "Doing Good with Good OR" competition for their project, "Gwinnett County Public Schools: OR/MS Drives Improvements in Bus Logistics and School Times." Winners will be announced November 13, 2011. Swann has been invited to speak at the 2012 American Association for the Advancement of Science annual meeting in Vancouver. She was also selected for the *Atlanta Business Chronicle's* 40 Under 40 Awards. Winners will be announced November 10.

Valerie Thomas, Anderson Interface Associate Professor of Natural Systems in ISyE, was named a Fellow by the American Association for the Advancement of Science (AAAS) "for sustained commitment to combining science policy with innovative, interdisciplinary research in industrial ecology."

Chelsea "Chip" C. White III, Schneider National Chair in Transportation and Logistics, was appointed to serve on the Executive Advisory Committee for the Council on Competitiveness' new U.S. Manufacturing Competitiveness Initiative (USMCI).



C.F. Jeff Wu, Coca-Cola Chair in Engineering Statistics and professor of ISyE, was selected by the Committee

of Presidents of Statistical Societies (COPSS) as the recipient of the 2011 COPSS Fisher Lecture Award.

Advisor **Bert Zwart's** PhD student **Bo Zhang**, a PhD student in ISyE, has received both the George Nicholson Student Paper Award at the 2010 INFORMS annual meeting and the Best Student Paper Award at the 2010 International Symposium on Computer Performance, Modeling, Measurements, and Evaluation.

STUDENT SPOTLIGHT



▲ This past spring, **Breona Jenkins** and her dance partner, **Drew Loney**, competed in a dance competition at UNC Charlotte.

"My two passions are dancing and Spanish. I studied abroad last summer in Spain and Mexico and hope to travel back one day soon. If I could use my engineering skills to assist in furthering the development of the Mexican infrastructure, it would be a dream."

Breona, an undergraduate student in ISyE, is among the top of her class for academic achievement and leadership.



▲ **Connor Perkett**, a President's Scholar at Georgia Tech, is a second-year student on track to graduate in the spring of 2014.

"Throughout high school, I loved working with numbers and anything scientific. However, at the same time, I loved business and the decisions that are made in the business realm of companies. Therefore, ISyE was the best combination of the things I enjoy, and it is something that I can be happy about the rest of my life. Georgia Tech had a perfect balance of a work hard, play hard mentality that I couldn't find at other schools. The classes are very rigorous and challenging, but the sports are always there to cheer on the Yellow Jackets!"

Breona Jenkins and **Connor Perkett** are also included on the back cover.

1960s

Ronald W. Allen, IE 1964, former Delta Air Lines chairman and CEO, was named chairman of Guided Therapeutics, a developer of a rapid and painless testing platform that uses biophotonics for the early detection of disease.

Bruce Cook, IE 1967, is leading the One-Cent Solution Campaign as chairman and CEO of Citizens for Restoring America's Financial Future, a nonpartisan effort to balance the federal budget and reduce the nation's debt.

John H. Morris, IE 1965, was inducted into the Engineering Hall of Fame, an honor reserved for those who have made meritorious engineering and/or managerial contributions during their careers. Morris and his wife, Cherie, were on campus October 21, 2010, to meet and dine with some of the current ISyE graduate students who are recipients of his graduate fellowship, the Morris Fellowship.

1970s

Tom Akins, IE 1974, retired on March 31, 2010, after thirty-four years of working for Georgia Tech. Akins participated in the co-op program as a student and headed the program for the past twenty years as executive director of the Division of Professional Practice. With Akins at its helm, the division expanded its services to include undergraduate internships and study-abroad opportunities for students. Akins is working on a part-time basis to oversee planning for the co-op program's centennial in 2012-2013. Former co-op students with ideas for the celebration or interest in volunteering may e-mail Akins at tom.akins@dopp.gatech.edu.

William H. Booth Sr., IE 1973, became the deputy assistant secretary of the Air Force for Force Management Integration in the Office of the Assistant Secretary of the Air Force for Manpower and Reserve Affairs in Washington, D.C., in September 2010.

Hanif Sherali, MS OR 1976, PhD OR 1979, was inducted into the Georgia Tech College of Engineering Academy of Distinguished Engineering Alumni.

1980s

Roger Cunningham, IE 1982, is the CEO and head of global strategy at Idhasoft, which is based in Mumbai, India, and Atlanta. Recently, he helped with the redevelopment of the medicinal and pharmaceutical system for Saudi Arabia and developed a supply chain strategy for the People's Republic of China, Vice Premier Wang Oishan, and London Export. Cunningham presented the strategy at the fourth Sino-U.S. Economic Summit.

John Duddy, IE 1980, was named vice president and managing director of Boeing Defense Australia, a subsidiary of the Boeing Company that has about 1,500 employees.

In Memory

Ray C. Anderson

Known to industry leaders and environmentalists around the world as the "greenest chief executive in America," Ray C. Anderson, IE 1956, Honorary PhD 2011, beloved founder and chairman of Interface, died August 8, 2011, at age 77.

Anderson founded Interface in 1973 to produce the first free-lay carpet tiles in America. The company would later become one of the world's largest producers of modular commercial floor coverings and interior finishes. A self-proclaimed "radical industrialist," Anderson left the day to day management of Interface in 2001 to focus his time and energy on the business case for sustainability. Delivering more than 1,000 speeches and authoring two books on the topic, Anderson served as the driving force behind the company's efforts to completely eliminate any negative impact it has on the environment by 2020.



A loyal and devoted supporter of his alma mater for more than five decades, Anderson served as chair and vice chair of the Georgia Tech Advisory Board as well as serving on the ISyE Advisory Board. He has also served on the Georgia Tech Foundation Board of Trustees, the Capital Campaign Executive Committee, and his fortieth and fiftieth class reunion committees. In partnership with Interface, Anderson established the Anderson-Interface Chair in Natural Systems at ISyE.

"Ray was an inspiration to me and many of us here at Georgia Tech," said Valerie Thomas, Anderson-Interface Associate Professor in Natural Systems. "He shook things up; he made change that will continue. Ray challenged us to redesign the industrial system to eliminate waste of all kinds. We have a long way to go and we need to take giant steps. Ray took giant steps himself, transforming the sleepy carpet industry into a model for sustainable manufacturing worldwide."

Anderson recently received an honorary doctoral degree from Georgia Tech for his work to secure a greener world for future generations through his championing of the business case for sustainability. For those who would like to share thoughts about Ray and his life, visit <http://raycandersonblog.com>.

J. Chris Gaffney, IE 1985, MS 1986, was inducted into the Georgia Tech College of Engineering Academy of Distinguished Engineering Alumni.

Ramona M. Hill, IE 1983, was named vice president for enrollment management for Spring Hill College. She joined the college's administration in August 2008 as associate provost for graduate and continuing studies.

Ron Johnson, MS OR 1985, retired two-star general, oversaw the Army Corps of Engineers' \$18 billion reconstruction of Iraq in 2003 and 2004 and then supervised the clean-up of the Gulf Coast after Hurricane Katrina in 2005. Now Johnson is guiding the nation's top basketball officials in his capacity as the NBA's senior vice president of referee operations.

Wonya Lucas, IE 1983, was named president and CEO of TV One, a cable television network and entertainment company that targets African American adults. Most recently, Lucas was executive vice president and chief operating officer for Discovery Channel and Science Channel, where she was responsible for strategy and operations for the networks as well as oversight of the networks' research and marketing departments.

Mike McCarthy, IE 1983, was designated a certified systems engineering professional by the International Council on Systems Engineering.

Tom O'Brien, IE 1981, the co-founder of Axion BioSystems, has equipped the undergraduate teaching laboratories of the Wallace H. Coulter Department of Biomedical Engineering at Georgia Tech and Emory University with five new microelectrode arrays (MEA). The MEAs will allow students to study and probe the complex signaling of electrically active tissue.

Craig Pritzker, IE 1980, was inducted into the inaugural Georgia Tech Crease Club on October 8, 2010. The Crease Club and Hall of Fame were formed in 2010 to commemorate the lacrosse team's fortieth season as a club sport.

1990s

Jason Brownlie, IE 1998, and his wife, Jennifer, announced the birth of a daughter, Alexa Savannah, on August 10, 2010. Brownlie is an account manager at Manhattan Associates.

J. Louis Fouts, IE 1990, was inducted into the Georgia Tech College of Engineering Academy of Distinguished Engineering Alumni.

Randy McDow, IE 1995, now serves as the executive director of the Stamps Family Charitable Foundation, Inc., under the guidance of **E. Roe Stamps IV** (IE 1967, MS IE 1972). McDow worked at Georgia Tech for sixteen years prior to taking this new position.

Guy Primus, IE 1992, MS IE 1995, was inducted into the Council of Outstanding Young Engineering Alumni, an award that recognizes alumni who have distinguished themselves through professional practice and/or service to the Institute, the engineering profession, or society at large.

Heather S. Rocker, IE 1998, was inducted into the Council of Outstanding Young Engineering Alumni, an award that recognizes alumni who have distinguished themselves through professional practice and/or service to the Institute, the engineering profession, or society at large.

Maribeth Lawson Schaefer, IE 1999, and her husband, Jason, announced the birth of their son, Jackson Emmett, on May 17, 2011.

Victoria Selfridge, IE 1996, has edited and self-published *When Women First Wore Army Shoes*, her great-aunt Ethel A. Starbird's memoir of service as a member of the Women's Army Corps during World War II. She was also recognized as a 2011 Rising Star by the Colorado Springs Business Journal for significant contributions to her industry and community.

Michelle Wilkerson Thebert, IE 1995, and her husband, Matthew, announced the birth of their son, Collin Thomas, on April 14, 2011.

2000s

Nathaniel Adam Almon, ISyE 2008, and **Ashley Armstrong**, MGT 2008, were married in October of 2010 in Carrollton, Georgia. Almon works at Southwire Company in the logistics department, and Armstrong works in the company's human resources department.

Daniel J. DeCicco, ISyE 2001, and his wife, Jessica, announced the birth of daughter Kaylyn Elizabeth. Lt. DeCicco now is deployed aboard the USS Harry S. Truman in the Middle East in support of Operations Enduring Freedom and New Dawn.

Tim Hur, ISyE 2005, was named one of the Top 25 Most Influential Asian-Americans in Georgia for 2011 by the Georgia Asian Times. Hur started a new speaker electronics company, Aikonia, LLC / Jerboa Audio Solutions, in 2010.

Sarah Beckenhauer Lightner, IE 2001, and her husband, Chris, announced the birth of their daughter Victoria Leigh Lightner on March 1, 2011.

Matt Moore, IE 2005, was named the South Carolina GOP executive director. Previously, he served as the group's transition director. Moore is the president of the Georgia Tech Columbia/Midlands Alumni Network.

C. Matthew Rozier, ISyE 2003, joined the law firm of Fish & Richardson as an associate with its intellectual property litigation group in Washington, D.C. He was previously an associate at Sterne, Kessler, Goldstein & Fox, where he handled patent litigation and prosecution matters.

Charles "Chip" Tinsley IV, IE 2005, married **Mary Katherine "Katie" Watt**, BC 2008, on August 14, 2010. Chip is a project manager with AT&T, and Katie is an attorney with Carlton Fields in Orlando, FL.

Stephen Watts, IE 2001, MS IE 2002, and his wife, Stephanie, announced the birth of their daughter Elizabeth Margaret on March 11, 2011.

Nick Wellkamp, ISyE and Public Policy 2009, was named a Marshall Scholar and will attend the University of Oxford to pursue a master's degree in economics.

After receiving his PhD from ISyE this past spring, **Ran Jin** has accepted a position as an assistant professor at the Grado Department of Industrial and Systems Engineering at Virginia Tech.



“Professor Jan Shi heavily influenced my decision to pursue a PhD at Georgia Tech. I think the most important part of the PhD program is to find a good advisor, one that could lead you to the objective that you want to achieve and be a tour guide to explore other areas of interest. Professor Shi is just such a good advisor. I feel that was probably the best decision I ever made.”

Stay in touch! Drop us a line.

The Alumni News section highlights promotions, awards, scholarships, fellowships, and publication of books. Let us hear from you! It's a good way to stay in touch with your classmates.

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Where: _____

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Submitted by _____

Degree _____

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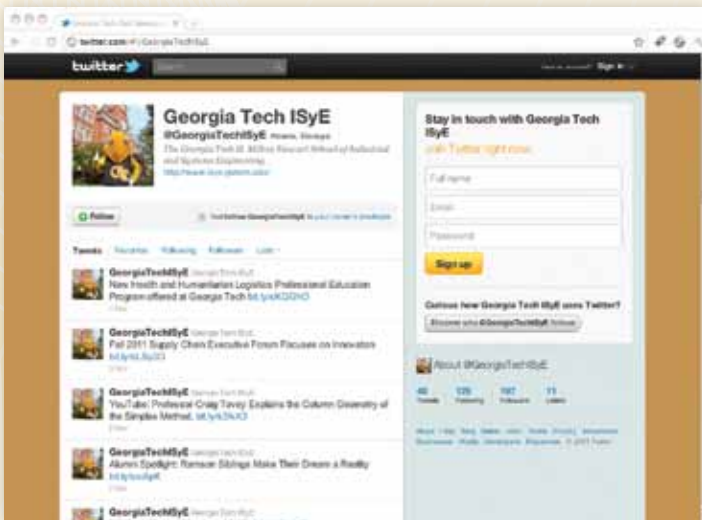


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www.twitter.com/GeorgiaTechISyE



www.youtube.com/GeorgiaTechISyE

On the rooftop garden terrace of the new Clough Undergraduate Learning Commons, a few of ISyE's exceptional undergraduate students take a break from their studies. Standing from left to right: **Aditya Singhal**, past president of Alpha Pi Mu; **Jose Sarmiento**, co-op with Delta Air Lines; **Frederick Grimm**, ISyE Presidential Scholar; **Erik Trum**, ISyE Presidential Scholar; **Mariah Mathews**, IIE president. Seated from left to right: **Breona Jenkins**, recipient of the Jack C. Webb Scholarship, and **Connor Perkett**, ISyE Presidential Scholar.



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