

INDUSTRIAL & SYSTEMS ENGINEERING

ISE NEWS

SPRING 2009

WWW.ISE.UFL.EDU



CHAIRMAN'S COLUMN



it may not be easy to find a job in this economy, I am confident that engineers will continue to fare well – especially Gator Engineers. This is important, as we graduated more than 60 bachelor's and 70 master's students this spring. For the past 12 months (summer, fall and spring graduations), the Department produced 95 B.S. graduates and 145 M.S. and M.E. graduates. The master's number is a record while the bachelor's number has only been surpassed once in the past decade. (I must admit that I laughed for quite a while when Al Atkins told me his graduating class in 1965 was 12!)

Unfortunately, the dire national economic outlook has also reached campus. As I sit here writing, the dean has sent out a memo to the faculty outlining how the college

will cut \$5.36 million from its budget for the next year. The proposed cut to our department was 9.6%, but has been pared down to 4%, or roughly \$110,000.

What does this mean to the educational experience at UF? More than I would like to admit. Last year, our department took a budget cut of roughly 8% and with this year, we are dealing with a cumulative cut of more than 12% since my arrival. Those funds were budgeted for faculty and staff salaries and student support, such as teaching assistants, graders, learning laboratories, and student group functions.

We have taken this opportunity to employ good industrial engineering practices to streamline our processes and eliminate waste. Unfortunately, this budget cut is far deeper than the savings we can achieve from these endeavors.

The net result is that we are asking our faculty to do more with less – teaching assistant and advising support has been cut as will funding for student groups (such as funding for our IIE Student Chapter to attend its regional meeting). I am seeking alumni and industrial sponsors to make up for some of these losses, but our partners are also experiencing difficult times. This will mean that students may have to wait in longer lines; have fewer office hours in which to seek help; sit in larger classes; or have fewer elective class choices.

Despite these cuts, I assure you of the

following: (1) Our renowned faculty remain committed to delivering the high-quality programs that our students have come to expect and (2) we will continue to offer our required courses each semester so no student's graduation date will be impacted by scheduling. Furthermore, as noted in earlier correspondence, I have constituted a student advisory council that meets with me monthly in order to keep students apprised of our situation.

As we move forward, we can hope these tough budgetary times will pass. In the meantime, we will tighten our belts. If you have any concerns or suggestions (such as another industrial contact), feel free to contact me.

Sometimes, taking a look back at the old days helps us get through the tough, current times. Did you know that our Department started 75 years ago at UF? It is true, and cause for celebration. You will be learning more about the history of our programs and our department in a special newsletter this summer. Also, I ask that you make plans to return to Gainesville this fall – November 6, 7 and 8 – to celebrate the 75th anniversary of our program and the 100th anniversary of Gator Engineering. The weekend will feature departmental functions (tours, presentations, panels, a banquet) and fun (football game, tailgate). More details will be forthcoming via mail and our Web site.

As I have said many times in previous letters, I am truly awed by the strength of the Gator Nation and enjoy hearing from you. Feel free to contact me (352-392-1464; hartman@ise.ufl.edu) if you have something to share or want to get involved. GO GATORS!

Sincerely,

A handwritten signature in black ink, appearing to read "J.C. Hartman".

Joseph C. Hartman
Professor & Chair

352-392-1464
hartman@ise.ufl.edu

Dear Alumni and Friends,

Whether reading the newspaper, watching the news, or browsing the Web, we are inundated with news about the economy – and it isn't good. The news is worse in the State of Florida, as drastic revenue shortfalls have led to wide budget cuts at all state agencies with great concern for the future.

What does this economy mean to our recent graduates and alumni? Despite the economic outlook, it is still a great time to be an engineer – especially an industrial and systems engineer. Firms are a bit uncertain about the future, but they are hiring. Students graduating this year have received offers from a wide array of companies, including Entergy, ExxonMobil, General Electric, Harris, Intel, Lockheed Martin, Northrop Grumman, PepsiCo, Raytheon, Schlumberger, Siemens, Target, Trane, and Tropicana, to name a few.

As chair, I have worked hard to bring more companies to campus to provide even further opportunities to our students. These efforts include Cameron International (supplier to the oil and gas industry), Campbell Soup (food and beverage), Capital One (credit cards), Coca Cola Enterprises (largest bottler for Coca Cola products) and Nielsen (yes, the ratings company), which all hired our students for the first time this year. While

STUDENT NEWS

HALL: ALWAYS SPEAKING FOR ISE

Looking for an inspirational speech on why you should become an Industrial and Systems Engineer? Just call Scott Hall. Just be sure to give him enough time – he has a lot to say.

“I first asked Scott to speak for a few minutes in the ‘Intro’ course about IIE and student organizations,” joked Joseph



Hartman, who oversees the course. “About 50 minutes later, I was asking him to wrap up as he had not finished his slide presentation.”

“The fact is, I asked him back the next semester,” said

Hartman. “His passion for the major is contagious.”

Hall may have flirted with electrical and civil engineering majors, but he claims that one week on the job at Walt Disney World was all he needed to assure industrial and systems engineering as his calling. After recently completing his fourth co-op stint at Disney, he landed a full-time job with the group.

Hall, a spring 2009 graduate, was a wonderful student and strong Department and IIE advocate. He sought leadership positions in organizations, including the IIE Chapter presidency in the spring of 2008 and an inaugural role in the Industrial & Systems Engineering Student Advisory Council.

He maintains the relationships he has

made over the years are just as valuable as the education. “College is not solely about getting a classroom education,” said Hall. It is about getting a life education. It is about gaining a network of support and a personal network of friends, whether they are classmates, faculty, advisers, or even department chairs.”

To conclude his remarkable run at Florida, Hall was named the national award winner of the Alpha Pi Mu 2009 Award of Excellence. □

COLLEGE IS NOT SOLELY ABOUT GETTING A CLASSROOM EDUCATION. IT IS ABOUT GETTING A LIFE EDUCATION.

STUDENT AWARDS

SCOTT HALL won Alpha Pi Mu 2009 Award of Excellence, a national award.

FRANK KRAEMER was named the male commencement speaker for spring of 2009.

MICHAEL MITCHELL was given the Spring 2009 Outstanding Leadership Award by the University of Florida.

GUILLERMO MORATORIA was named the University of Florida Four Year Scholar, winner of the Paslay and Cunningham scholarship and the William Cross award for creativity and leadership in addition to the IFC Greek Scholar award.

STUDENTS MOVING ON

Despite a lagging economy, graduates landed positions with Accenture, Johnson Controls, Northrop Grumman, Siemens, Raytheon and Tropicana. One student, Guillermo Moratorio, is headed to Africa with the Peace Corps. Another, Zachary Wetendorf, is headed to medical school. **Manisha Goswani** was the lone Ph.D. graduate in the Fall. She stayed in Gainesville for an extra semester to teach computer programming but is headed to South Bend, Ind., for a research position in the business school at Notre Dame.

BACHELOR OF SCIENCE

Kathryn Beers
Robert Bilus
Carlos Enrique Cateriano
Daniel Cho
Samantha Dacres
Jason Dampier
Simon De Los Rios
Jessica Dosio
Nicole Dutrell
Sarah Fedler
Dana Ferguson
Karl Flohr
Arnaldo Gasco
Keith Hardwick

Joseph Karlovich
Vincent Kong
Jessica Lee
Kelly Melton
Guillermo Moratorio
Sepehr Nasser
Shahin Nasser
Adam Orris
Stacy Smith
Vicente Soria
Shirlene Sze
Tam Wilson
Bryan Torseillo
Gregory Webb
Zachary Wetendorf

Shirish Jadhav
Nataraj Jambulingham
Karthik Jayakumar
Gulver Karamemis
Sekher Kothanath
Phani Koundinya
Parames Koyalmanam
Vinay Kunapuli
Ting-Chiao Liao
Prashant Mahadevan
Kunal Mehta
Anand Modi
Ankit Modi
Deepak Mohan
Megha Nagal
Justin Noggle
Asghari Nojavan
Munedra Parmar
Sanket Patil

Murali Pollachi
Hirak Pradhan
Manohar Pradhan
Sankalp Raviprolu
Enrique Sanchez
Houston Sewell
Mansavi Shah
Naitik Shah
Prashant Shah
Amanda Silvester
Munendra Sinha
Amit Sinha
Varun Sugandhi
Neela Thangaraj
Vighnarajend Topale
Kunal Trivedi
Vaibhav Vaidya
Chen-an Wu
Fangbin Wu
Xue Zhang

MASTER OF SCIENCE

Olawale Adeleye
Yami Al
Sezgin Ayabakan
Charles Bell
Christopher Canada
Abhijeet Chaudhary
Hsuan-Ying Chen
Ni Chen

Adam Danisovszky
Soham Desai
Avinash Deshpande
Joshua Empen
Vinay Gonela
Atul Gujar
Demir Guleryuz
Manuel Hurtado

MASTER OF ENGINEERING

Alan Colthrop
Michael Iames
Stephen McElroy

Sarah Quach
Nazli Turken

KELLER CONTINUES IIE STUDENT CHAPTER PRESIDENT DEDICATION

Get there early! For Gator Football tickets? Yes, but also for your bi-weekly IIE Student Chapter meeting. Due to programs that include interesting speakers, useful topics, potential employment, and yes, food, a typical meeting draws more than 100 students. This can be directly attributed to good leadership.



“Over the past two years I have seen our chapter grow significantly,” said Natalie Keller, past IIE President. “We have a dedicated group of officers and more active members than ever before who

participate in our professional development and social networking events.”

The junior has continued previous agendas to increase growth and opportunities for students.

Specifically, Keller is:

1. Increasing underclassmen involvement.
2. Promoting industry participation in our events.
3. Highlighting different ISE accomplishments.
4. Networking with other IIE chapters in the state.
5. Getting faculty involved.

The chapter sent nearly 30 students to Baton Rouge to participate in the IIE Regional Conference hosted by Louisiana State University. This has kept the Orlando native busy. But you'd never know it, as she has a perpetual smile on her face. This is partly attributed to her (happy) choice of a major.

“I think Industrial Engineering chose me. Coming into the

**I THINK
INDUSTRIAL
ENGINEERING
CHOSE ME.**

University of Florida, I really had no idea what I was getting myself into,” reflected Keller. “I knew I wanted to do engineering, but I didn't know which area to go into. I heard about the people interaction side and business application of IE, and I was sold.”

And she has sold it to others. During her two years as resident assistant in Beaty Towers, she recruited numerous students into the program. As IIE President, she has continued to reach out to numerous students to grow numbers in the department and IIE.

Although her presidency ended this spring, she'll continue to lead in other capacities, as she expects to graduate in

the spring of 2010. Her internships at Walt Disney World and Oldcastle Coastal in Tampa, along with her leadership skills, point to a wonderful future. □

RAINWATER: BACK TO BEING A RAZORBACK

Like many undergraduates, Chase Rainwater wasn't exactly sure what his future held. He knew he was interested in optimization and research; he won a “Best Paper” award at the 2004 Industrial Engineering Research Conference working with his advisers in reliability and selective maintenance.

“I was not sure whether I wanted to pursue industry or academia,” said Rainwater. “I was looking for an option that would provide strong career opportunities and greatly enhance my optimization skill set.”

And that's why he chose UF ISE. He first enrolled in the M.S. program and subsequently the Ph.D. program.

He successfully defended his dissertation this summer and will assume a tenure-track faculty position at his undergraduate institution, the University of Arkansas.

“There are a number of great ISE programs throughout the country.

However, I know of no other that better prepares its Ph.D. students to become academicians,” reflected Rainwater. “The history of students being hired at respected institutions speaks volumes to the quality of faculty advisers at UF.”

With his advisers, Joseph Geunes and Edwin Romeijn, Rainwater's research focused on solution approaches to production planning problems with flexible demand characteristics. A portion of this work recently appeared in *Discrete Applied Mathematics* with two additional papers under review. He has also published with Cole Smith and Barbara Fraticelli (Arkansas) a paper proposing a mixed-integer programming model to determine the NCAA Men's Basketball Tournament bracket with minimum expected team travel distance.

“The flexibility to work on such a wide variety of problems and applications helps make operations research an exciting field,” Rainwater said. In addition to continuing his production planning research, he plans to pursue avenues in which operations research can be applied to areas of public policy, such as infrastructure planning and alternative energy decision models.

Beyond research, Chase enjoys interacting with students in the classroom. He was a teaching assistant for the OEM program, most notably for Jack Elzinga's course “Total Quality Management and Business Process Reengineering.”

“Simply put, Chase was the best TA I ever had in over 40 years of teaching,” Elzinga said. “He and I worked together like an experienced team from the start. It was made easier because of Chase's superb organizational skills. He established rapport with the OEM students — many older than he — and his work with them was uniformly excellent.”

He was also the instructor for “Work Design and Human Factors” in fall 2008.

“It was my advisers that ultimately made me want to pursue a career in academia,” Rainwater said. “I am excited at the opportunity to take all the skills and experiences that I have been given and hopefully use those to make a positive impact on students' lives.”

He is married to Candace Zieleniuk-Rainwater. She is completing her Ph.D. in chemistry at UF. □

RESEARCH UPDATE

ISE MEDICINE

JOSEPH HARTMAN
PROFESSOR AND CHAIR,
INDUSTRIAL AND SYSTEMS ENGINEERING

THE UNITED STATES SPENT ROUGHLY **\$2.4** TRILLION, OR **\$7,200** PER PERSON, ON HEALTH CARE IN **2008**. THIS SPENDING TOTALED ROUGHLY **17%** OF GDP, THE HIGHEST SPENDING PER CAPITA IN THE WORLD, WITH ESTIMATES PROJECTING THIS TO RISE TO NEARLY **20%** BY **2015**. THERE ARE NUMEROUS REASONS FOR THE HIGH COSTS OF HEALTH CARE IN THE UNITED STATES AND THUS, NUMEROUS REMEDIES HAVE BEEN OFFERED TO COMBAT THESE COSTS.



In 2000 and 2001, the Institute of Medicine (IOM) published two reports, “To Err is Human” and “Crossing the Quality Chasm,” which described the rapid advance of medicine while the “task” of health care delivery was deteriorating considerably. This led to a further report, “Building a Better Delivery System,” developed by an alliance of IOM and the National Academy of Engineering (NAE) in 2005. The report brutally notes:

Relatively little technical talent or material resources have been devoted to improving or optimizing the operations or measuring the quality and productivity of the overall U.S. health care system. The costs of this collective inattention and the failure to take advantage of the tools, knowledge, and infrastructure that have yielded quality and productivity revolutions in many other sectors of the American economy have been enormous. [p. 1]

The report made a number of recommendations in which engineering and other administrative tools could be utilized to improve the delivery of health care services. The recommendations specifically centered on how systems engineering tools, including simulation, supply chain management, game theory, value-at-risk, optimization, and data mining, can be used to improve the delivery of health care services.

The Department of Industrial and Systems Engineering is rising to this challenge, with research in all phases of medicine and health care, including tools for diagnosis, treatment, planning and delivery. A number of these projects, many ongoing, are reported here. While these projects are research based and engage a number of graduate students, our undergraduates are also engaged through a number of senior design projects that have been sponsored by

hospitals, including North Florida Medical Hospital and Shands. You will also see that a number of our alumni have made a drastic impact on the field. One thing is certain, you can expect a lot more of that – impact – from our faculty, students, and alumni, in the future. □

FOR FURTHER READING

Keehan, S., et al., “Health Spending Projections Through 2017,” Health Affairs Web Exclusive, W146(21), February 2008.

Kohn, L.T., J.M. Corrigan, and M.S. Donaldson, (eds.), To Err is Human: Building a Safer Health System, Institute of Medicine, The National Academies Press, Washington, D.C., 2000.

Crossing the Quality Chasm: A New Health System for the 21st Century, Institute of Medicine, The National Academies Press, Washington, D.C., 2001.

Reid, P.P., W.D. Compton, J.H. Grossman, G. Fanjiang, G., (eds.), Building a Better Delivery System, National Academy of Engineering and Institute of Medicine, The National Academies Press, Washington, D.C., 2005.



OPTIMIZATION APPROACHES TO RADIATION THERAPY TREATMENT PLANNING PROBLEMS

RAVINDRA K. AHUJA
PROFESSOR, INDUSTRIAL & SYSTEMS ENGINEERING

EVERY YEAR, APPROXIMATELY 1.3 MILLION U.S. CITIZENS ARE NEWLY DIAGNOSED WITH CANCER, AND MORE THAN HALF OF THESE CANCER PATIENTS ARE TREATED BY SOME FORM OF RADIATION THERAPY.



multi-leaf collimator

Half of the patients with cancer may significantly benefit from radiation therapy. Many patients that are initially considered curable do in fact die of their disease, despite sophisticated treatment. Others may suffer unintended side effects from radiation therapy, sometimes severely reducing the quality of life. The major cause of this is radiation therapy treatments often deliver too little radiation dose to the targets, too much radiation dose to healthy organs, or both. Thus, the preservation of healthy or functional tissues, and hence the quality of a patient's life, must be balanced against the probability of the eradication of the patient's disease.

During radiation therapy, beams of radiation pass through a patient, depositing energy along the path of the beams. This radiation kills both cancerous and normal cells. Thus, the radiation therapy treatment must be carefully planned, so that a clinically prescribed dose is delivered to cancerous cells while sparing normal cells in nearby organs and tissues. Typically, there are several clinical targets we wish to irradiate, and there are several nearby organs, called

critical structures, we wish to spare. We usually treat targets that contain known tumors, as well as regions that contain the possibility of disease spread or account for patient motion. If we were to treat a patient with a single beam of radiation, it might be possible to kill all the cells in the targets. However, it would also risk damaging normal cells in critical structures located along the path of the beam. To avoid this, beams are delivered from a number of different orientations spaced around the patient so that the intersection of these beams includes the targets, which thus receive the highest radiation dose, whereas the critical structures receive doses from some, but not all, beams, and can thus be spared.

In conventional (conformal) radiation therapy, this usually means that from each beam direction we deliver a single beam with uniform intensity level whose shape conforms to the beam's eye view of the targets in the patient as seen from that beam. Recent technological advancements have led to rapid development and widespread clinical implementation of an external-beam radiation-delivery technique known as Intensity-Modulated Radiation Therapy. IMRT allows for the creation of very complex non-uniform dose distributions that enable the delivery of sufficiently high radiation doses to targets, while limiting the radiation dose delivered to healthy tissues. These dose distributions are obtained by dynamically blocking different parts of the beam. The application of optimization techniques is essential to enable physicians, and thereby patients, to fully benefit from the added flexibility that this technique promises.

Although IMRT is in widespread use, the clinical experience at the University of Florida has made us aware of severe

algorithmic limitations that exist in the available IMRT treatment planning systems. IMRT optimization problems are very large-scale mathematical programming problems that are not yet solved satisfactorily. We have developed highly effective and robust models and algorithms to solve optimization problems arising in IMRT in realistic computational time using state-of-the-art techniques available in the field of Operations Research. We have developed linear programming, column generation, heuristics, as well as network flow algorithms to solve several different optimization problems related to IMRT treatment planning. Our papers have appeared in prestigious journals including *Operations Research*, *SIAM Journal of Optimization*, *Journal of Global Optimization*, *Networks*, and *Physics in Medicine and Biology*. Some of this research has also found its way into commercial IMRT treatment planning systems. □

FOR FURTHER READING

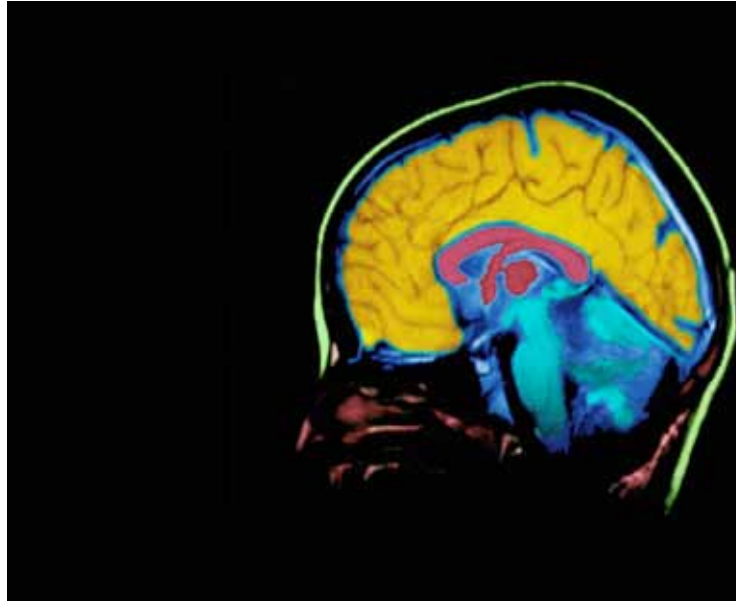
Drs. Ravi Ahuja, Cole Smith and J.P. Richard have worked extensively on this IMRT problem along with former ISE professor Dr. Edwin Romeijn. For additional (technical) reading, see:

- D. Aleman, A. Kumar, R.K. Ahuja, H.E. Romeijn, and J.F. Dempsey. 2008. Neighborhood search approaches to beam orientation optimization in intensity modulated radiation therapy treatment planning. *Journal of Global Optimization* 42, 769-784.
- H.E. Romeijn, R.K. Ahuja, J.F. Dempsey, and A. Kumar. 2006. A new linear programming approach to radiation therapy treatment planning problems. *Operations Research* 54, 201-216.
- R.K. Ahuja and H. Hamacher. 2005. A network flow algorithm to minimize beam-on time for unconstrained multileaf collimator problems in cancer radiation therapy. *Networks* 45, 36-41.
- H.E. Romeijn, R.K. Ahuja, J.F. Dempsey, and A. Kumar. 2005. A column generation approach to radiation therapy treatment planning using aperture modulation. *SIAM Journal on Optimization* 15, 838-862.
- H.E. Romeijn, R.K. Ahuja, J.F. Dempsey, A. Kumar, and J. Li. 2003. A novel linear programming approach to fluence map optimization for intensity modulated radiation therapy treatment planning. *Physics in Medicine and Biology* 48, 3521-3542.
- A.T. Tuncel, F. Preciado-Walters, R.L. Rardin, M. Langer and J.-P.P. Richard. "Strong Valid Inequalities for Fluence Map Optimization Problems Under Dose-Volume Restrictions," *Annals of Operations Research*, under review.
- Z.C. Taskin, J.C. Smith, H.E. Romeijn and J.F. Dempsey, "Optimal Multileaf Collimator Leaf Sequencing in IMRT Treatment Planning," *Operations Research*, under review.
- Z.C. Taskin, J.C. Smith and H.E. Romeijn, "Mixed-Integer Programming Techniques for Decomposing IMRT Fluence Maps Using Rectangular Apertures," *Annals of Operations Research*, under review.

+ MINING THE BRAIN FOR ANSWERS

PANOS PARDALOS
DISTINGUISHED PROFESSOR,
CENTER FOR APPLIED OPTIMIZATION,
INDUSTRIAL & SYSTEMS ENGINEERING

THE BRAIN
HAS A LOT OF
INFORMATION –
THE QUESTION IS
WHETHER WE CAN
UNDERSTAND
AND USE IT.



The Center for Applied Optimization and its partners in Neurology and the McKnight Brain Institute have been studying the brain for years now. Specifically, the CAO has been developing data mining techniques to better understand diseases and predict disturbances. Developments to date include:

- + A new automated spike and wave discharge (SWD) detection algorithm based on time frequency analysis and variance statistics. As clinically significant absence seizures are associated with SWD that last longer than three seconds, this algorithm is an attractive method for the automatic detection and quantification of epileptic seizures.
- + An extensive study led to the conclusion that cognitive-motor planning defects might be a major source of disability in Parkinson's Disease. Our recommendation is that in future clinical practice, gait tests should be used in order to quantify short-term planning ability in neurodegenerative diseases.
- + The change in severity of myoclonus as an outcome measure of antiepileptic drug (AED) treatment in patients with Unverricht-Lundborg Disease (ULD) has traditionally been estimated by utilizing the Unified Myoclonus Rating Scale (UMRS). In this study, we measure treatment effects through EEG analysis using mutual information approach to quantify

interdependence/coupling strength among different electrode sites. Our results indicate that the mutual information is significantly lower after taking the add-on AED for at least four weeks. This finding could lead to new insights into developing a new outcome measure for patient with ULD, where the traditional UMRS could potentially fail to detect a significant difference.

- + A data mining approach using consistent bi-clustering and logistic regression (LR), non-linear dynamics analysis, and support vector machines have been applied to the analysis of scalp electroencephalograms (EEG) obtained from epilepsy patients implanted with the vagus nerve stimulator (VNS) used in VNS Therapy. The approach allows us to see that signals from certain parts of the brain consistently change their characteristics when the VNS is switched on, and could provide a basis for desirable VNS stimulation parameters for future treatments.

This work has led to the following patents:

- + Multi-dimensional multi-parameter time series processing for seizure warning and prediction, (Panos Pardalos, Sackellares James Chris, Iasemidis Leonidas D., Shiao Deng-Shan, Dance Linda, and Chaovaitwongse Wanpracha), Patent 7,263,467 (Issued on August 28, 2007).
- + Optimization of multi-dimensional time series processing for seizure warning and prediction, (Panos Pardalos, Sackellares James

Chris, Iasemidis Leonidas D., Shiao Deng-Shan, Yatsenko Vitaliy, and Chaovaitwongse Wanpracha), Patent 7,373,199 (Issued on May 13, 2008).

- + Optimization of spatio-temporal pattern processing for seizure warning and prediction (Panos Pardalos, Sackellares James Chris, Iasemidis Leonidas D., Shiao Deng-Shan, and Chaovaitwongse Wanpracha), Patent 7,461,045 (Issued on December 2, 2008). □

FOR FURTHER READING

Optimization in Medicine, co-editors: Carlos Alves, P.M. Pardalos, Luis Nunes Vicente Springer, (2008).

Data Mining, Systems Analysis and Optimization in Biomedicine, co-editors: Onur Seref, O. Erhun Kundakcioglu, Panos Pardalos Springer, (2008).

Handbook of Optimization in Medicine, co-editors: Panos Pardalos and Edwin Romeijn Springer, (2009).

"Dynamical Approaches and Multi-Quadratic Integer Programming for Seizure Prediction," (with L. Iasemidis, D.-S. Shiao, J.C. Sackellares, and W. Chaovaitwongse), *Optimization Methods and Software* 20(3-4):383-394, 2005.

"Adaptive Epileptic Seizure Prediction System," (with L. Iasemidis, D.-S. Shiao, J.C. Sackellares, W. Chaovaitwongse, J.C. Principe, and P.R. Carney), *IEEE Transactions on Biomedical Engineering*, 2003.

"Prediction of Human Epileptic Seizures based on Optimization and Phase Changes of Brain Electrical Activity," (with L. Iasemidis, D.-S. Shiao, J.C. Sackellares, and W. Chaovaitwongse) *Optimization Methods and Software*, 18(1):81-104, 2003.

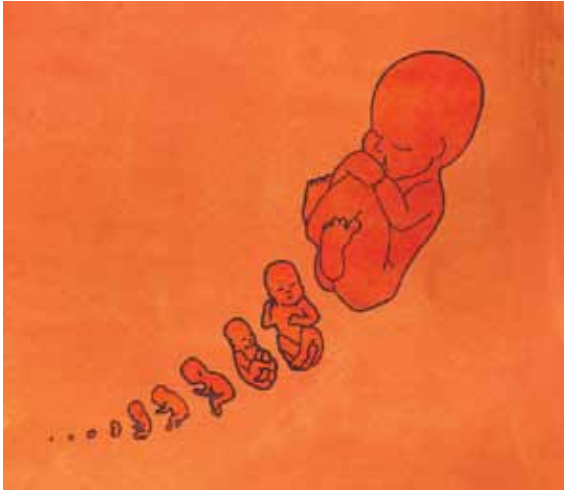
"Analysis of EGG data using optimization, statistics, and dynamical systems techniques," (with L. Iasemidis, D.-S. Shiao, J.C. Sackellares, V. Yatsenko, and W. Chaovaitwongse), *Computational Statistics and Data Analysis*, 41(1-2):391-408, 2003.



PREDICTING CESAREAN DELIVERIES

STAN URYASEV

PROFESSOR, RISK MANAGEMENT AND FINANCIAL ENGINEERING LABORATORY,
INDUSTRIAL AND SYSTEMS ENGINEERING



As part of large OBGYN practice, Dr. Tim Young and his partners were witness to countless births – both with and without complications. Out of curiosity, he started a database and collected data on the births. What ensued was a study that would help predict the probability of a mother-to-be “failing to progress” and whether this would lead to a cesarean, or C-section, birth. We found that the overall rate for the practice of cesareans was 21.7%, with 11.7% carried out due to a failure to progress, or cephalopelvic disproportion (CPD).

Specifically, we studied 3,355 women that were pregnant for the first time and delivered singleton births between 1993 and 2001. The data studied included age, height, initial body mass index, pregnancy weight gain, gestational age, and birth weight. A multivariable logistic

regression analysis was used to estimate the relationship between the probability of a cesarean delivery, and cesarean delivery being carried out for CPD, using the data. Formulas were also developed to predict the probability of cesarean and the probability of a cesarean caused by CPD.

What was the result? The probability of having a cesarean and having a cesarean for CPD is higher for shorter, older, more obese women with large pregnancy weight gains, larger fetal birth weights, and longer gestation ages. More specifically, given the input data, a probability could be assigned to a given patient, helping with planning procedures in a given practice. A decision-support tool was developed for the doctors such that they could input the necessary information and have the probabilities returned. □

Chen, G., Uryasev, S. and T. Young. On Prediction of the Cesarean Delivery Risk in a Large Private Practice, *American Journal of Obstetrics and Gynecologists*, 191(2):624-632, 2004.



BETTER HOSPITAL PLANNING

ELIF AKÇALI

ASSOCIATE PROFESSOR INDUSTRIAL AND SYSTEMS ENGINEERING.

The demand for health services is on the rise. Despite a growing array of outpatient options, limits on reimbursements and numerous medical advances, annual inpatient admissions in the United States are currently at levels not seen since the early 1980s. With decades of contraction and consolidation, this has strained the system and prioritized the need

for capacity planning.

We examine the problem of bed-capacity planning by developing a network flow model that incorporates facility performance, such as average customer waiting times, and budget constraints to determine optimal hospital bed capacity over a finite planning horizon. The model also allows for capacity change through shuttering as well as expansion. Under modest assumptions, we demonstrate that for realistic sized capacity planning problems, our network formulation is not computationally intensive, and allows us to obtain optimal bed

capacity plans quickly. This is critical when one wants to perform sensitivity analysis.

Our simplifying assumptions assume a generic view of a hospital in that demand (i.e., patient arrivals) and service (i.e., beds) are homogeneous. This is generally sufficient for an aggregate view of a hospital, but may not be sufficient for situations in which the patients and beds differ significantly. This represents future research – which is significant given the needs of our system. □

A network flow approach to optimizing hospital bed capacity decisions (with M.J. Cote and C.-I Lin) *Health Care Management Science*, 9(3): 391-404, 2006





A LIFE LESSON IN CRISIS MANAGEMENT

DON'T ASK RANDALL DEANE WHY HE LOOKS SO OLD, BECAUSE HE'S READY WITH AN ANSWER – ACTUALLY TWO. “ONE, I AM OLD,” HE TOLD ENGINEERING STUDENTS ATTENDING HIS SALES ENGINEERING LECTURE THIS PAST FALL, AND “SECOND, I HAVE HAD FIVE MID-LIFE CRISIS, ALSO KNOWN AS CAREER CHANGES.”

The 1963 industrial engineering graduate started his career with DuPont. After two years in engineering, he moved to area supervisor in manufacturing. He spent nights and weekends working on his MBA from the University of Tennessee. He also worked in the international department, with time in Europe, Central and South America.

Mid-life crisis 1: As Deane approached 10 years at DuPont, he had to make a choice: stay with DuPont forever, as 10 years defined the retirement benefits plan, or move on. He moved on, starting two firms: an engineering consulting firm named Unitex and an equipment leasing firm named Finco. He used his contacts from DuPont to get things rolling.

Mid-life crisis 2: Desiring to travel more, he sold both of his firms (at a profit) and started a travel agency, Trips and Tours Unlimited. This way he could justify his international travel, as “I was learning about my product,” Deane explained with a smile.

Mid-life crisis 3: Although not a drastic change, his fascination with travel led him to start the Professional Travel Academy where he could train future travel agents. More importantly, he hired the best for his own firm. As an industry leader, the academy allowed him to define corporate guidelines for travel.

Mid-life crisis 4: With airline deregulation looming, it was clear that profitability in travel would be harder. Again, he sold the businesses, and pursued a job selling insurance for National Insurance Company, a major customer of his travel business. He was thrust back into the corporate world as an area director.

It may seem odd to have a background in engineering and sell insurance, but Deane was a different kind of engineer – and very good at sales. “As engineers, we develop wonderful products or services,” he said, “but unless someone buys them, they are worthless.” The problem is that “engineers are very good at product knowledge, often to their detriment in selling.”

**AS ENGINEERS,
WE DEVELOP
WONDERFUL
PRODUCTS OR
SERVICES, BUT
UNLESS SOMEONE
BUYS THEM, THEY
ARE WORTHLESS.**

He went on to share sales techniques with the students, including the importance of listening to a customer and determining the need. But he also stressed to not “oversell.” “Potential buyers are busy people as well,” he said, and “they have short attention spans.” They have to see quickly that their problem can be solved. If it can, “stop your sales presentation right then” and close the deal.

Mid-life crisis 5 (still ongoing): After a few years, he decided to start his own agency, but he wanted to sell a wide range of financial products. So he studied and received all of the necessary certifications in financial planning and brokering and started his current firm, Lifetime Financial Services, Inc.

“How many jobs can you do with just a cellphone and a laptop computer?” he asked the students. With this flexibility, he is able to travel internationally again – often spending most of his summers in Europe. This is important to the proud Irishman!

While his business, along with most financial firms, is experiencing challenging times, Deane is a leader in the area. Barron's, a leading financial publication, selected his firm as one of the top 100 financial planning firms.

Deane left the students with one final thought: “Find a way to make a living that you really enjoy. Unless you are independently wealthy, you are going to have to work, so do something you enjoy.” Of course, by his example, if you don't find it in your first job, you can always try another. □

BRUCE LAVAL: FATHER OF DISNEY INDUSTRIAL ENGINEERING



IT SHOULD
HAVE BEEN
CLEAR FROM
THE START THAT
BRUCE LAVAL
WAS GOING TO
SUCCEED AT
DISNEY AFTER
BEING HIRED AS
AN INDUSTRIAL
ENGINEER IN 1971.

His first project was to justify the purchase of an additional monorail train to increase the system capacity and reduce customer wait times. He built a computer simulation to test the idea – borrowing computing power from General Electric in Orlando in order to get the results. His conclusion? Don't purchase the train. In fact, he recommended eliminating one train and running only four instead of five. The result? Capacity increased by 10 percent and wait times were cut in half. (Fewer trains could run faster because they did not clog the system and were not repeatedly shut down by the automated safety system which prevented trains from intruding into the zone occupied by the train in front.)

Of course, management did not believe him. After all, he was a fresh graduate using this “new computer tool” called simulation. But Laval did not back down, offering to test his theory with four trains on a given morning. In addition to predicting the increased capacity, the simulation predicted what the resulting “reduced” wait times would be. In the test run, his predicted

capacity and resulting wait times were so accurate that his skeptics turned into supporters and soon, if “anything moved, they wanted a simulation.”

In a later project, Laval again discouraged expansion – this time with the 20,000 Leagues Under the Sea exhibit because his simulation showed that the soon to be opened Space Mountain would eliminate the need for increased capacity. This did not sit well with then Disney World president Dick Nunis, who was in attendance at Laval's briefing. Nunis challenged Laval on his conclusion. Laval bet his job on it, without knowing he was the President. When told by the President that “we don't bet jobs here, only money,” Laval responded, “then I will bet my salary against yours.” Laval was again proved right, and kept his job (and salary).

Overconfidence? No, just good research. You have “to fight for what you believe in,” said Laval, “but be honest. When you have a project that is controversial, you never want to give them the choice of yes or no, because if it is controversial they will usually say no. Instead, propose a test.” It is always much easier for them to say yes to a test.

This was some of the advice that Laval shared with undergraduate students while lecturing in the “Introduction to Industrial and Systems Engineering” last fall. Laval earned his B.S. in industrial engineering in 1969 and an MBA in 1971.

**ALUMNI ROLL
CALL**
SPRING 2009
GUEST SPEAKERS

Tony Arvesu (BS '75)
Al Atkins (BS '65)
Olivier Cerf (BS '84)
Ronald Finch (BS '54)
Hunter Jones (BS '80)
Luana Gibbons (PhD '94)
Robert Menke (BS '56)
James Neff (BS '69)
Marc O'Connor (BS '90)



Given his initial success with simulation analysis, one would think that Laval only cared about numbers. “Numbers are fine,” he said, “but it takes people to accomplish it.” This thinking led him into more managerial roles as his career at Disney took off. He was promoted to manager of the industrial engineering department in 1973 and in 1976, he worked on the development team for Epcot. The design covered all aspects of the park, including program and capacity requirements for all public facilities, such as attractions, food and merchandise, as well as support facilities. This led to his subsequent position as Director of Administration/Planning of Walt Disney Imagineering. When Epcot opened in 1982, he was named General Manager.

Later, Laval oversaw the development of Disney-MGM Studios as Director of Project Development and in 1989 was named Vice President of Disney-MGM Studios with responsibility for all operations of the park.

Laval’s responsibilities expanded to cover all Orlando parks in 1994 when he was named Executive Vice President of Theme Parks and then Walt Disney World Operations. Laval was promoted to Executive Vice President of Operations Planning and Development for Walt Disney Parks and Resorts in 1998, the position from which he eventually retired. During this final stint, he designed, patented and implemented the FASTPASS system which

eliminates having to wait in long lines for popular attractions. Instead of standing in line, the system puts you in a “virtual queue” on the system’s computer and then projects when your position in the virtual queue will get to the front of the line. This time is then printed on your ticket as your “return time” -- which represents the time that you can return and enter the attraction with little or no wait. Therefore, instead of waiting in line you can use this previously unproductive time to leisurely visit other attractions or amenities within the park.

The invention merely followed his mantra of enhancing the guest experience, and led to his unwritten title in Disney lore as the “Father of Guestology,” a term he coined. He is also known as the “Father of Industrial Engineering at Disney” for growing the group from a mere three engineers in 1971 to, now, more than 60. He is immortalized with a window on Main Street U.S.A. (A sign hanging in the window states “B. Laval & Associates.”) This is a key feature in Disney’s industrial engineering recruiting video where Kathy Kilmer, the current director of Walt Disney World Industrial Engineering, notes that it was Laval who constantly stressed improving the customer’s experience with “solid analytical techniques.”

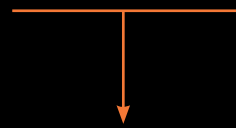
In his discussion with the students, Laval stressed that pitching and selling an idea was just as important as developing it. “Have a strategy for what you are trying to sell,” he said. “You’ve got to exceed their expectations.” Laval certainly would know.

Since retiring in 2001, Laval continues to work in the entertainment industry, selectively consulting for a wide array of entities from Augusta National Inc. (Masters Golf Tournament) and Coca Cola (World of Coca Cola) to the World Trade Center (Memorial Museum and Visitors Center), the Gettysburg Foundation (Visitors Center) and Colonial Williamsburg.

Given this amazing career, it is hard to imagine that it may not have even started. As noted earlier, he left Gainesville in the summer of 1971. While he had interviewed with Disney, he did not hear back from them until the following September. When they did call, he immediately left his consulting job outside of Atlanta to take the IE position. He was the second Industrial Engineer hired at Disney and started work on October 1, the day Disney World opened.

The rest, they say, is history. And as ISE junior Harrison Grove noted, “I only hope that I can match his success one day.” □

WALLACE EXPANDS DISNEY ROLE



Erin Wallace (ISE '80) was named Senior Vice President of Operations Integration/Line of Business for Walt Disney Parks and Resorts in February of 2009. Previously, she was the Senior Vice President of Operations for Disney World, focusing on operations in Orlando since 2006. Her new role will expand her oversight to operations in Anaheim, including merchandise development, entertainment and imaging, attractions, and lodging.

FACULTY UPDATES

RAVI AHUJA co-edited the November, 2008 Focused Issue on Railroad Applications for the INFORMS journal *Transportation Science*. He and co-authors Krishna C. Jha, Arvind Kumar, and James B. Orlin received the Koopman Prize for the outstanding contribution of the year in the field of Military Operations Research for their paper, "Exact and Heuristics Algorithms for the Weapon-Target Assignment Problem." The paper was published in *Operations Research* in 2007.

FARID AITSAHLIA is expected to publish *Optimizations on Extremes and Averages* with *World Scientific* this summer. The text analyzes a number of different types of financial products.

ELIF AKÇALI was promoted to associate professor this year. She plans to visit the Business Administration program at Özyegin University in Istanbul, Turkey during the 2009-10 academic year.

SHERMAN BAI continues to serve as the director of the Beijing Center. He is building new programs between UF and schools in China.

CRISTIÁN CÁRDENAS - LAILHACAR continues his work with the Industrial Assessment Center, which provides energy audits for manufacturing firms in northern Florida. He also continues to build the Energy Management program at the University.

JOE GEUNES was recently named an associate editor of the journal *OMEGA*. He also served as program co-chair (with Cole Smith) of the 2009 Industrial Engineering Research Conference and is a co-organizer of the third bi-annual POMS College of Supply Chain Management Conference. He continues to direct the OEM Program, which saw a second consecutive year with enrollment at capacity.

JOE HARTMAN delivered the Scott T. Poage Distinguished Lecture in the Department of Industrial Engineering at the University of Houston this past fall. His talk was entitled "Equipment Replacement under Uncertainties."

SERDAR KIRLI returned from his sabbatical and celebrated the birth of his first child. He continues to support the teaching of information technology related courses in the Department.

TOI LAWPHONGPANICH organized a stream of sessions on urban transportation at the 18th Triennial Conference for IFORS in Sandton, South Africa. He was also invited to present papers on congestion pricing at conferences in Athens and Amsterdam.

TIMOTHY MIDDELKOOP is leading a newly funded research project to optimize and control energy use in clean technologies with a Tampa-based company. He revamped the graduate WebDSS class to use the open source technologies MySQL, Apache and PHP and will be offering a new class this fall on computational optimization.

PANOS PARDALOS received a University of Florida Research Foundation Professorship in 2008. He co-edited a number of books this year, including *Optimization in Medicine and Data Mining*, *Systems Analysis and Optimization in Biomedicine* with Springer. He also hosted the Power Systems Modelling 2009 conference this spring on campus and is starting a new journal in energy systems.

JEAN-PHILIPPE RICHARD is a featured speaker at a three-day workshop in Belgium devoted to the state of the art in integer programming and its connections with disciplines in mathematics, engineering and computer science to be held this spring in honor of Laurence Wolsey.

AMAR SAPRA serves on the editorial review board for the journal *Production and Operations Management*, one of the top 20 premier journals as listed by *Business Week*.

DIANE SCHAUB has been enjoying her year-long sabbatical. She worked with the Southwest Research Institute in San Antonio, TX to help their Manufacturing Assistance Center as they launched their Lean Green Energy assessment program. She'll return to the classroom and the Industrial Assessment Center in the Fall.

J. COLE SMITH has been named to the editorial board of *Operations Research* and is now an area editor for *OMEGA* and departmental editor for *IIE Transactions*. His research continues to span multiple areas, including coordinating agents in networks for search-and-rescue as well as radiation therapy treatment problems, network design, and minimum risk problems in project planning.

R. KEITH STANFILL continues to grow the Integrated Product & Process Design program, now in its 14th year, as its director. The program featured 23 projects from 18 sponsoring companies and agencies this spring. Two UF-funded entrepreneurial projects involve the creation of an Optical Coherence Tomography probe for performing virtual biopsies and a self-sterilizing surgical device.

SULEYMAN TUFEKÇI continues his active participation in the IPPD program, coaching 25 projects thus far. His research in lean manufacturing and supply chain modeling in the electronics service industries are ongoing.

STAN URYASEV hosted the "Engineering Risk and Control" conference this past February in Gainesville. The conference featured keynote speakers from leading universities, including the University of Chicago, Georgia Tech, University of California, Davis, and Princeton University.

STAFF NEWS

MOCK TAKING ON NEW CHALLENGES



Originally from the small town of Edwardsville, Illinois, just outside of St. Louis, Michelle Mock moved with her now 7-year old son to Florida in 2002 "bound and determined to make a new life for myself and find a job at the University of Florida." She had worked for Southern Illinois University - Edwardsville and headed south for new opportunities at the University of Florida.

The doors opened to her at UF through the School of Music, where she started as Senior Secretary. After completing her associate's degree

from Sante Fe Community College in 2006, she moved up to the role of office manager for the Linguistics Program in the College of Liberal Arts and Sciences in March of 2007. This proved to be a busy year. In addition to the new job, she married her fiancé of three years and moved into a new home. Furthermore, she enrolled in the business school at the University of Florida, finishing her bachelor's degree in December of 2008.

The new degree helped land her the office manager position in Industrial and Systems Engineering, vacated by Terry Moore when she left to pursue an opportunity in the College of Medicine.

"I gladly accepted the position in ISE because I really wanted to be able to continue to expand on my knowledge and use the degrees I have worked so hard to earn," said Mock. "I have been in the position for about three weeks and am loving every minute of it."

She is also continuing her education pursuits, having recently been accepted into the MBA program at Saint Leo University. That is, of course, assuming her newborn son (born mid March) doesn't keep her up all night! □

SENIOR PROJECTS: SPONSORED SUCCESS

THE CONCEPT OF EIN 4335, SENIOR DESIGN, HAS NOT CHANGED OVER THE YEARS: TEAMS OF INDUSTRIAL AND SYSTEMS ENGINEERS WORK TO SOLVE A PROBLEM POSED BY INDUSTRY.

What has changed in the past 12 months is that students no longer solicit projects. Rather, the department engages industry for a potential project for a given semester. Student teams are matched to projects based on project needs, student interests (type of industry) and student skill sets.

With that, the Department would like to thank its sponsors for the past year. Here are brief highlights of a few projects from the past year:

COCA COLA ENTERPRISES: Improved energy management and production scheduling at Jacksonville and Orlando bottling plants.

HOSPITAL CORPORATION OF AMERICA: Reduction of emergency room patient wait times.

NIELSEN: Analysis and improvement of the customer interface for an online analytical tool.

NORTHROP GRUMMAN: Facilities layout and process flow for E-2C Hawkeye aircraft.

PARKSON: Facilities layout, process flow and quality control design for new aeration system production facility.



Northrop Grumman presented a check to the student team improving operations in St. Augustine. Pictured are: Alex Chao, Joseph Janusz, Lars Gastavson, Richard Matthews (Northrop Grumman VP), Elif Akçali (professor), Erik Hartmann (Northrop Grumman IE and alumna) Justin Roberson and Tiffany Hoadley.

ROCKWELL COLLINS: Design and implementation of load-leveling tool in avionics production.

SOLICORE: Quality control program design and implementation for battery production.

UNITED STATES AIR FORCE: Tail performance predictions for smart weapons and sensors.

VCOM3D: Design, testing and optimization of new product release procedures.

WALT DISNEY WORLD: Design and implementation of inventory control tool for multiple warehouses.

WINN DIXIE: Pharmaceutical operations process design and improvement.

The above companies have donated funds and software to the department in support of the Senior Design program.

However, the department has also reached out to a number of non-profit groups.

CHILD ADVOCACY CENTER: The center coordinates a multidisciplinary approach to identification, investigation, management, treatment and prosecution of child abuse. An organizational process was designed and improved to increase case through out, earning the team kudos on the "Gators Caught in the Act" Web

site, posted by Dr. Nancy Hardt of the College of Medicine.

FAMILY MEDICINE AT HAMPTON OAKS: Reduction of patient wait times and increased throughput.

HEALTHY FAMILIES: The goal of the program is to prevent the first instance of child abuse through home visits for at-risk women who are pregnant or have small children. Processes were designed and improved with hopes of identifying potential cases sooner.

RADIATION ONCOLOGY, SHANDS HOSPITAL: Improved nurse and patient scheduling procedures.

VETERANS ADMINISTRATION HOSPITAL: Reduction of prescription-filling wait times. □

For more details on the projects and sponsorship opportunities, please visit our Web site or contact us.

www.ise.ufl.edu/corPartners/partner.asp

Joseph C. Hartman
Professor and Chair
Industrial and Systems Engineering
University of Florida
303 Weil Hall
P.O. Box 116595
Gainesville, FL 32611-6595

Phone: 352-392-1464
Fax: 352-392-3537
hartman@ise.ufl.edu

ALUMNI UPDATES

JOSE M. OTERO (BS '69) retired in July 2008 after 32 years at IBM. He celebrated his 39th wedding anniversary in December. His son, daughter and their respective spouses all received bachelor and graduate degrees from UF. He has five grandchildren.

ROBIN A. CORSIGLIA (BS '71) retired on Dec. 31, 2008 after 37 years with Lockheed Martin. The last 30 years were spent estimating labor cost negotiating price to build electronic assemblies for missiles and sensors in the Ocala plant. His wife has a master's degree from FSU. His son graduated from UF in 2002. Both kids moved to New York and were both married in October 2008. He will now enjoy hobbies of shooting, trains, travel, collecting old German Stationary Toy Steam Engines.

ERIC GIES (BS '86) works for Neuberger Berman, a wealth management business. He lives in Rye, NY, and commutes into the city by train (a first for this Florida boy). He's been married for more than 18 years to K.C. and has four children: Sarah, 11, Katie, 8, Stephen, 6, and Tommy, 3.

W. ANDREW MCGRAW (MS '94) is a Logistics Distribution Analyst at Caterpillar, Inc. in East Peoria, Illinois, working in the inventory management and logistics side of the service parts business of Caterpillar parts. His projects include

multi-echelon inventory management, office process automation, and computer science for data analysis applications.

BECKY [FIERLE] HACHENBURG (MS '95) works for MWH, an international environmental consulting firm headquartered in Broomfield, Co. She is finishing a 4-year assignment as technical manager with the South Florida Water Management District's Everglades restoration program and has accepted a position as office manager of the Palm Beach office.

DEREK [GANG] CHEN (PHD '03) is a Vice President in MBS Strategy at Barclays Capital in New York City.

ROBERT PITTARD (BS '03) works for Florida Power and Light in northwest Palm Beach County. He is very happy with his job, wife and three children.

MARISSA SHOSHANAH SCHEIN (BS '06) is an Operations LDP at Lockheed Martin.

KERRI LYNN MARSH (BS '08) is a consulting analyst at Accenture in Atlanta.

JONATHAN FERNALD (BS '08) is working as a Field Engineer for PCL Civil Constructors Inc. in Tampa.

ALUMNI PASSING ON

GEORGE P. KALAF (BIE '50) Port Charlotte FL 4/19/2008

JOHN RIDOUT (BS '56) Melbourne FL 6/26/2007

FRANCIS L. MANNION, JR. (BS '59) Miami FL 6/18/2004

DEE D. LOUCKS, JR. (BS '62) Mustang OK 6/14/2005

HAL RICHMOND (BS '66) Quincy FL 8/8/2007

JOHN E. BAURES (BIE '68) 7/4/2008

DANIEL ARGUELLES (BIE '69) Miami FL 5/1/1999

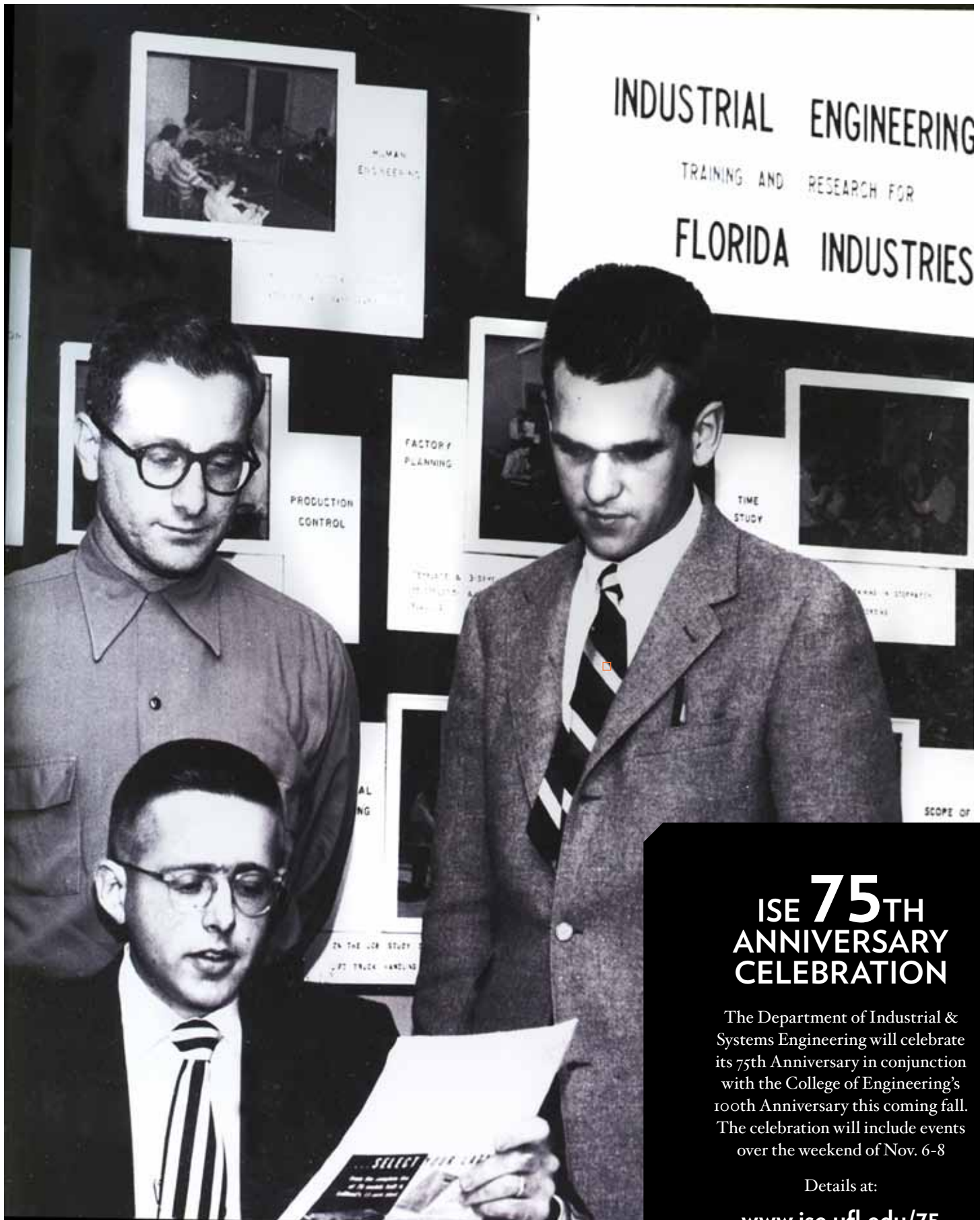
RICHARD V. DZWONKIEWICZ (IE '71) Miami FL 5/15/2008

JAMES V. MUSE (IE '72) Orange Park FL 11/29/2008

CHRISTIAN J. AVILES (ISE '91) Charlotte NC 5/10/2008

SHORT INTERVIEWS WITH CARLOS M. DEL SOL (BS '72), LINDA HUDSON (BS SE '72), AND CAROL WIDEMAN (M.S. ISE '79) CAN BE FOUND IN THE SPRING 2009 ISSUE OF THE FLORIDA ENGINEER.





ISE 75TH ANNIVERSARY CELEBRATION

The Department of Industrial & Systems Engineering will celebrate its 75th Anniversary in conjunction with the College of Engineering's 100th Anniversary this coming fall. The celebration will include events over the weekend of Nov. 6-8

Details at:

www.ise.ufl.edu/75



DEPARTMENT OF INDUSTRIAL &
SYSTEMS ENGINEERING
303 Weil Hall
P.O. Box 116595
Gainesville, FL 32611-6595

NON-PROFIT ORG
US POSTAGE
PAID
PERMIT NO. 230
PANAMA CITY, FL

BECOME EVEN MORE VALUABLE.

With complete online delivery from UF EDGE, you can continue your Gator Engineering education without disrupting your current career.

**SYSTEMS ENGINEERING
CERTIFICATE** *Five classes*

UF | College of Engineering
UNIVERSITY of FLORIDA

www.ufedge.ufl.edu