

Decision Sciences & Engineering Systems



Rensselaer

Message from the Department Head, Charles Malmborg

It's a pleasure to report back to the alumni and friends of DSES on another exceptional year for our department. As we enter the second year of an ambitious five-year plan to grow the DSES faculty and build our research enterprise, we are enjoying considerable momentum. DSES faculty research expenditures in fiscal year 08 not only exceeded our goals for FY08, but also for all FY09. However, we've had little opportunity to reflect back on our results from the first year of the plan given the rising expectations that inevitably follow successful outcomes. Average annual research expenditures per faculty member in Rensselaer's School of Engineering exceeded \$500,000 in FY08. Very recent DSES awards illustrate how our research is making a positive difference for society as well as providing critical support for our doctoral students. An excellent example is our partnership in the Department of Homeland Security Center of Excellence for Natural Disasters, Coastal Infrastructure and Emergency Management (CNDCIEM). Please take time to read the article in this newsletter about this exciting collaboration between DSES and the University of North Carolina that will be led by Professor Wallace.

I've been particularly impressed this year in the way that all members of the DSES faculty and staff have made contributions to our department, the Institute, and the disciplines that we represent. Their willingness to contribute unselfishly to our shared vision is the primary reason that we have been successful in dramatically restructuring our research, academic

and administrative operations over the past two years. For example, Professor Embrechts recently took on the directorship of the DSES doctoral program and has led the implementation of a new vision of doctoral education focused on excellence in academic scholarship coupled with a model of research apprenticeship that places our graduates at the cutting edge of societal issues from energy development to counter-terrorism. Professor Hsu has taken on the leadership of our redesigned senior capstone experience for Industrial and Management Engineering which is now based in the O.T. Swanson Multidisciplinary Design Laboratory. He is directing interdisciplinary teams in solving problems funded by industry clients from all corners of the globe. Professor Willemain is returning from a one year sabbatical at the National Security Agency where he has been involved in the development of new statistical methodologies for processing the vast quantities of data obtained from our national intelligence infrastructure. Professor Grabowski continues to win major grant funding to study the risks associated with international maritime shipping for both oil tankers and containerized transport vessels. As described in this newsletter, she was recently appointed vice chair of the National Academy of Sciences' study committee to review the U.S. Tsunami Warning and Forecast System, and the nation's tsunami preparedness.

(continuation of the department head's message to appear on back cover)

why not change the world?

New Faculty to DSES



Jennifer Ryan, Associate Professor

DSES recently recruited new faculty members who joined the department in Fall 2008. Associate Professor Jennifer K. Ryan holds a B.A. in Mathematics and the Social Sciences from Dartmouth College and an M.S. and Ph.D. from the Department of Industrial Engineering and Management Sciences at Northwestern University. Prior to joining RPI, she served as a faculty member in the School of Business at the University College of Dublin (Ireland), the Mendoza College of Business at the University of Notre Dame and in the School of Industrial Engineering at Purdue University. Her research interests are in the areas of inventory and supply chain management with a particular focus on coping with uncertainty and the role of information and information sharing in supply chains. Her research has been published in *Management Science*, *Operations Research*, *Production and Operations Management*, *Naval Research Logistics* and *IIE Transactions*. She has received several National Science Foundation (USA) grants, including an NSF CAREER grant. She currently served as an associate editor for *Naval Research Logistics* and *IIE Transactions*. Dr. Ryan has taught a wide variety of courses at the undergraduate, graduate and executive levels, in both engineering and business environments, including supply chain management, operations management, probability and statistics, decision theory and engineering economics.

Assistant Professor Thomas Sharkey received his Ph.D. in Industrial and Systems Engineering from the University of Florida in August 2008, where he was supported by a National Science Foundation Graduate Research Fellowship. His dissertation focused on developing algorithms to solve several nonlinear supply chain optimization problems, with an emphasis on problems that integrate facility location and inventory planning decisions. Prior to his doctoral studies, Dr. Sharkey received his Bachelor's and Master's degrees in Mathematical Sciences from Johns Hopkins University in May 2004. He is the recipient of an Excellence in Research award from the Department of Industrial and Systems Engineering of the University of Florida in April 2007 and an Undergraduate Achievement award from the Department of Applied Mathematics and Statistics of Johns Hopkins University in May 2004. At Rensselaer, Dr. Sharkey will teach courses on the design, analysis, and implementation of algorithms for optimization problems. His research interests include nonlinear programming, combinatorial optimization, analysis of algorithms, and supply chain optimization. Dr. Sharkey plans on conducting research on optimization problems that arise in supply chain management and national defense.



Thomas Sharkey, Assistant Professor

Professor Wallace to Direct Rensselaer Based Projects in the Center for Natural Disasters, Coastal Infrastructure and Emergency Management (CNDCIEM)

Recently, Professor Al Wallace and colleagues at the University of North Carolina were selected as a university center of excellence by the Department of Homeland Security. The center will conduct innovative research on coastal hazard resilience and translate the knowledge developed to practice. Rensselaer will focus specifically on integrated infrastructure modeling through a six year, \$1.2 million dollar grant. This project will develop and implement decision support systems, models of the critical civil infrastructures (CCI), their interdependencies, their interactions with other components of the built environment and the natural environment, and the social systems supported by these infrastructures with the goal of defining a resilient CII system. It will integrate: 1) data on the built and natural environment under normal conditions, and immediately before, during and after the event occurs; 2) changes in natural and engineering land forms; and 3) new approaches to enhancing the resiliency of the built and natural environments. A unifying systems model will explore and conduct system-wide performance comparisons of alternative engineering design choices associated with CCI systems. By subjecting the integrated systems model to an array of simulated disaster events, the performance of different combinations of choices for CCI systems design and operation will be evaluated. The project will include outreach to providers of infrastructure services to gather "realistic" data and present these suppliers with modeling results for their review – prior to presentation to emergency management officials.



The major goals of the project include: 1) specification and illustration of a generic modeling framework; 2) description of system-wide performance evaluation criteria; 3) description/specification and demonstration of analytical and numerical procedures for integrated systems modeling and performance evaluation; 4) demonstration using unique case studies on the East Coast, Gulf Coast and West Coast; 5) identification and specification of design considerations and strategies for enhancing system-wide resilience and vulnerability under different scenarios; and 6) development of prototype decision support tools. In addition to continuing the case study applications, one of the aims of this work is to design resilient systems by finding effective methods to handle complexity through careful consideration of modeling techniques and appropriate scales of representation for individual systems through the use of scalable optimization techniques such as decomposition.

The DSES department recently celebrated another outstanding class. Here's a brief profile on a couple of 2008 graduates from each of our degree programs in their "own" words.

Elizabeth Rossetti, BS, IME

"In June, I will start with Johnson and Johnson in their Leadership Development Program. The program is a two year rotational program with three-month rotations throughout their operating companies. I will be working for McNeil Nutritionals in Fort Washington Pa, a suburb of Philadelphia. My initial role within the program will focus on eCommerce as well as digital Marketing"

Yoel Haile, BS, IME

"I will be working with Merrill Lynch as an analyst within their Global Markets and Investment Banking division. I was attracted to Merrill over other companies due to their renowned training program for new hires. Merrill's training program provides a series of four three-month rotational assignments in derivatives, trade processing, client services, valuations, corporate actions, settlements, and process management. I can't wait to apply skills learned during my time as a DSES undergraduate."

Shari Thompson, MEng, IME

"I am a Development Engineer/Scientist with IBM Storage Systems Division. Development engineers participate in various aspects of hardware development including circuit or logic design, verification, synthesis, physical design/ layout, simulation, performance modeling, chip integration, design methodology, power optimization, architecture, and mechanical design/ technology integration. I am very proud of DSES and feel very well prepared for the job based on the rigor of the program".

Rusty Lee, PhD, DSES

"I joined the faculty of the University of Maryland as an Assistant Professor where I teach graduate and undergraduate courses in transportation engineering, project management. I currently advise two Master's and one Ph.D. student. During this first year, I have submitted and been awarded five research proposals including studies of the preparedness of state agencies for emergencies involving evacuation, investment alternatives for freight, and resilience for freight shipments in the Boston to Norfolk corridor."

Pratik Mehta, MEng, IME

"I am a Global Market Technology Associate for Banc of America Securities LLC. My main roles revolve around assisting in coordination, development and execution of technical solutions for the global market technology teams. I focus on communicating with internal and external clients to assure understanding of product sets and business processes. I provide technology support services for pricing and risk management tools, and deliver cross product technology solutions to clients by enabling technologies such as Customer Relationship Management, Management Reporting, Reference and Market Data and Analytics"

Anuj Goel, PhD, DSES

"I am a Sr. Lead Security Analyst at Citigroup, Inc. I have responsibility for developing Information Security (IS) Policies and Standards, Key Operational Procedures, and Best Practices for Global Consumer Group North America (GCG-NA). I'm also involved in the development of GCG-NA's next generation IT Risk Metrics program and assisting Corporate Policy team in mapping Citi's IS Policies and Standards to the International Standards and Regulations."

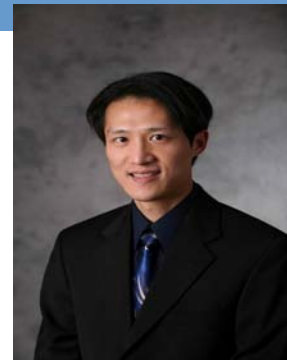
Professor Chan Directs Research on Management of the New York State Electric Power Grid



Our electric power system is one of the most complex in the world. It consists of interacting sub systems including hundreds of generators, thousands of miles of transmission lines, and imbedded

markets where generation, distribution, and transmission suppliers bid on market share in the presence of dynamically varying power demand influenced by weather as well as other non-predictable and predictable events. Issues associated with power storage add complexity. Once generated, electricity has to be consumed immediately or wasted—it cannot be stored cost effectively under normal operating conditions. More importantly, the reliability of the electric power system has to be ensured to continuously supply critical infrastructure and customers. Distributing the right amount of electricity at the right time to the right place while dealing with uncertainties and

ensuring a smoothly operating free market system is a daunting challenge faced by the New York Independent Systems Operators (NYISO). That's a key reason why NYISO has recruited DSES Professor Victor Chan to lead a team of researchers to create intelligent-agent simulation models of the power grid to develop rules for managing New York's electric power markets. Professor Chan's team is combining agent-based simulation, optimization, and statistical analysis to create a prototype model of the New York state electricity market to investigate rules ensuring a fair and stable electricity market that meets the needs of both consumers and suppliers.



Professor Martha Grabowski to Chair Key National Academy of Sciences Study Committee

DSES Research Professor Martha Grabowski has recently been appointed vice chair of the National Academy of Sciences' study committee to review the U.S. Tsunami Warning and Forecast System, and the nation's tsunami preparedness. This National Academy Committee of the Ocean Studies Board will review progress towards tsunami preparedness in response to "Tsunami Risk Reduction for the United States" published by the National Science and Technology Council (NSTC) in December 2005, and the Tsunami Warning and Education Act (P.L. 109-424, December 2006). The NSTC report, spurred by the 2004 Indian Ocean tsunami, called for a broad range of federal, state, and local efforts to reduce future losses from tsunamis in the United States. The P.L. 109-424 legislation authorized improvements to tsunami warning systems, community-based hazard mitigation programs, public education, scientific research, and international coordination. Dr. Grabowski is a weather-obsessed researcher and amateur weather observer who is sometimes referred to as 'weather.mom.' Her formal research interests include the impact of technology in safety-critical systems, human and organizational error, and risk in large-scale systems. The study committee, comprised of twelve maritime risk researchers from around the world, will meet in Washington, DC and in east Asia over the next two years before presenting findings, conclusions and recommendations to the National Academy of Sciences and Congress in December 2010.



Continued Message from the Department Head

New faculty members in DSES are also contributing to our growing research portfolio. Following up on his NSF CAREER award in 2007, Professor Chan has secured a series of grants from the New York State Independent System Operators (NYISO) to build intelligent agent-based simulation tools. These tools will study rules for managing New York's electric power grid to achieve reliable, efficient distribution of electric power in a managed market system that simultaneously meets the needs of customers and suppliers. We are also welcoming two outstanding new faculty members this year. They are Assistant Professor Thomas Sharkey who joins us from the University of Florida and Associate Professor Jennifer Ryan who joins us from the University of Dublin. More information on our two newest faculty members as well as Professor Chan's NYISO projects is provided in this newsletter.

DSES also produced another outstanding cadre of graduates in 2008 at the Bachelor's, Master's and Doctoral levels. Some of these graduates are profiled in this newsletter. While enrollment in the undergraduate program in Industrial and Management Engineering grew to

the highest level in its history in 2008, I'm especially pleased to note that graduates from the program continued to enjoy outstanding placement in industry with average starting salaries among the highest in the School of Engineering. Placements for our Master's and doctoral graduates have been equally impressive including faculty appointments at top ranked universities and prestigious national laboratories as well as private industry. The department is also launching an exciting new co-terminal Master's program in Systems Engineering and Technology Management (SETM) that will enable students to combine the undergraduate engineering degree with the SETM Master's in a 9-10 semester plan of study. We anticipate that this new program will attract students from a broad cross section of engineering disciplines. The DSES undergraduate committee has also been busy developing a new, portfolio-based learning assessment system through which all IME undergraduates will develop a detailed and comprehensive portfolio of their professional work in their four years at Rensselaer.

Charles J. Malmborg



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