

Industrial and Systems Engineering

P.C. Rossin College of Engineering and Applied Science

Chair's Message



To further enhance our undergraduate program, we created an Undergraduate Advisory Board to help guide our programs and shape our curriculums by integrating current activity and issues within the corporate world.

Another year has passed, and we continue to see a surge in interest and a heightened awareness about Industrial & Systems Engineering. Our focused efforts this year to expose and educate students and industry alike about the benefits and vast applicability of IE has made an impact. To begin with, we have seen our undergraduate enrollments (sophomore class) double to nearly 60 students when compared to the junior class. This has been due not only to departmental programs aimed at educating students about what an ISE career can be all about, but also through organized social events where upperclassmen have talked to freshmen about their positive experiences in ISE.

A relatively new course, Engineering 5, gives freshmen the ability to participate in two projects guided by a department. We have taken this opportunity to partner with industry and

have the freshmen work on meaningful problems – from truck routing for Coke and Pepsi to product planning for Cherrydale Farms (a chocolate manufacturer) to ambulance location and routing analysis for St. Luke's Hospital to facility location problems for UPS. This has paid off as the freshmen are excited about the projects and subsequently get excited about our majors.

To further enhance our undergraduate program, we created an Undergraduate Advisory Board to help guide our programs and shape our curriculums by integrating current activity and issues within the corporate world. More information on the Board can be found within this newsletter.

Faculty members continue to be recognized for their hard work and achievements. Professor Jeff Linderoth received an Early Career Award from the U.S. Department of Energy for work in large-scale numerical optimization problems characterized by high levels of uncertainty. In addition, Professor Ted Ralphs has three grants from the National Science Foundation to solve large-scale optimization problems while Professor Eugene Perevalov landed an exploratory research grant from NSF on information theory. And for their merit and accomplishments, Professor Aurelie

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Industrial & Systems Engineering Establishes Undergraduate Advisory Board

In the fall of this year, The Department of Industrial and Systems Engineering constituted its first Undergraduate Advisory Board. The Board is comprised of industrial, government, and academic members with vested interests in the graduates produced from the Department's undergraduate programs. The mission of the Board is to provide input and support for the Department's undergraduate programs, and will do so through the following:


- input and guidance on strategic plan
- input on curriculum in terms of majors, minors, courses, and course sequencing
- input into undergraduate activities and external coursework
- support in the form of internship and co-op opportunities, undergraduate research experiences, senior projects, and speakers
- support undergraduate membership through increased awareness of Industrial and Systems Engineering at Lehigh University

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Undergraduate Advisory Board

The very first meeting of the Board was held on October 6, 2006, and the Board will continue to meet twice a year. Current board members and their bios can be found below. In addition, ex-officio members include Lehigh University Provost, Lehigh University Dean of Engineering, Chair of the Lehigh University Industrial and Systems Engineering Department, and Board Secretary.

Undergraduate Advisory Board Members

Thomas K. Cassidy (Tom)

PricewaterhouseCoopers LLP –
Performance Improvement Advisory Services

Tom is an Experienced Manager in the Philadelphia Advisory Services group with nineteen years of experience in both industry and consulting. Tom is a recognized member of the engineering community with experience across multiple industries in technology applications, distribution and fulfillment, operations planning and consulting. He has successfully managed industrial engineering, consulting and operations teams on projects involving technology development and integration, facilities planning, Total Quality Management, Business Process Re-Engineering, Core Process Redesign, business continuity, crisis management, site location, warehousing and transportation operations. Prior to joining PricewaterhouseCoopers, Tom held management positions at United Parcel Service, Answerthink and Alliance Consulting.

Tom has a Master of Engineering degree from Penn State University and a Bachelor of Science degree in Industrial Engineering from Lehigh University. He is Six Sigma trained, a facilitator in the PwC Process Improvement Framework and has instructed as an Associate Professor of Industrial Engineering at Drexel University in Philadelphia. In 1999, Tom was named the “Delaware Valley Young Engineer of the Year”. In 2006 Tom was inducted into the “Order of the Engineer”.

Barry Wexler
Lockheed Martin
Commercial Space Systems



Barry is an Industrial Engineer with over twenty years experience in various organizational arenas. He currently holds the position of Project Engineer with Lockheed Martin - Commercial Space Systems, supporting Operations as a Lean Manufacturing Facilitator. Prior to this, he held a similar role in the Industrial Engineering Department of Lockheed Martin’s Maritime Systems & Sensors division located in New Jersey. Barry has also worked for Lucent Technologies /Agere Systems in Operational Engineering at their Optoelectronics facility

in Breinigsville, Pennsylvania. In addition to these two large corporations, he spent over twelve years with a medium-size manufacturing firm, Koh-I-Noor Inc., located in Bloomsbury, New Jersey. Here, he held a number of positions eventually leading up to Production Manager.

A native of the Lehigh Valley, Barry graduated with a B.S. in Industrial Engineering from Lehigh University and is currently pursuing a Masters Degree in Management from Stevens Institute of Technology. He now resides in Macungie, Pennsylvania with his wife and two daughters, and is active in the community.

Andrew Duffy
United Parcel Service



Andy started his career with UPS as a co-op in the Philadelphia area during his junior and senior years at Lehigh University. After graduation, Andy joined UPS full time as an Engineering Specialist. Andy worked on projects specializing in capital expenditures, and long-range facility planning. Promoted to supervisor in 2000, Andy worked as Facility Engineer in the Willow Grove Pennsylvania facility and was responsible for coordinating staffing needs, production goals, data management, job set-up and design, and forecasting. In 2002, Andy moved to Operations and was the direct supervisor for fifty full-time union drivers. In that capacity, he was in charge of the drivers’ quality, dispatch and routes, and accountability. In 2004, he was promoted to Industrial Engineering Manager for all pick-up and delivery operations in the Metro Philadelphia region. Andy also manages People Development for the UPS Management Trainee program, and is in charge of recruiting co-ops and interns, mainly recruiting from Lehigh and Cornell Universities.

Andy graduated from Lehigh University in 1998 with a B.S. in Industrial Engineering, and from Temple University in 2006 with an M.B.A. in General and Strategic Management. Andy is married to his wife Megan, and has three children: son Andrew who is two years old, and four-month-old twins, Nolan and Delaney. Andy and his family reside in Glenside, Pennsylvania, just outside of Philadelphia.



Deborah L. Halkins
Lehigh Valley Hospital and Health Network

As Director of Management Engineering at Lehigh Valley Hospital and Health Network, Deborah is responsible for developing recommendations to produce operational improvements and increase cost effectiveness of hospital activities by applying industrial engineering and business management techniques to problem-solving efforts. She and her team are also responsible for several hospital-wide programs, including the operational benchmarking effort, the “Balanced Scorecard” operational efficiency tool, and the related “Labor Budget Worksheet” tool. Over the last few years, she and her team were involved in the “Growing Organizational Capacity” project in which the objective was to improve resource utilization and efficiencies to handle increased bed demand prior to adding additional beds. Lean concepts such as creating a “pull system” and ongoing monitoring concepts such as creating a “capacity dashboard” were introduced. In addition, a Patient Logistics department was developed and is recognized by other hospitals as an innovative method for addressing capacity issues.

She has a Bachelor of Science in Industrial Engineering (BSIE) from The Pennsylvania State University, a Master of Science in Industrial Engineering (MSIE) from Lehigh University, and a Master’s Degree in Business Administration (MBA) from Lehigh University. Over the years, she has been actively involved with the local IIE chapter and its board. She has co-authored two published articles related to her work at Lehigh Valley Hospital. In addition, she traveled to China in 1993 with the Citizen Ambassador Program’s Materials Management Delegation to talk with businesses and government groups.

Prior to joining Lehigh Valley Hospital, Deborah spent over twenty years in manufacturing, gaining experiences in many different industries including steel operations (Bethlehem Steel Corporation), food processing (Alpo Petfoods), and industrial gases (Air Products and Chemicals). She contributed in positions of production management, materials management, purchasing, and of course, industrial engineering.

Chair’s Message

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Thiele was named a P.C. Rossin Assistant Professor and Professor Larry Snyder was named a Frank Hook Assistant Professor. Professor Groover published two books this year – one new and one a revision! Continue to read on in this newsletter for more details and mentions of faculty updates and honors.

Teachers are not the only ones receiving honors and awards. ISE student teams claimed victories in a supply chain management competition held at Rutgers University while undergraduates again placed at the annual IIE simulation competition. As always, our students are highly sought after upon graduation!

In looking forward to next year, our excitement right now is in developing a new lab with the money we recently received as a gift from an alumnus. This \$100,000 gift will enable us to implement a technology lab with computers for students and projection screens for instructors loaded with software to bring IE solutions to life. Currently, we are calling the project the COR@L Reef as the lab will showcase operations research tools and techniques while plugging into the computational power of the COR@L Lab. We believe, with creativity, we could bring this lab to life on the first floor of Mohler Lab in the 2007-08 timeframe.

As always, I want to hear from you – thoughts, ideas, or just reminiscents. Just drop me a note at jch6@lehigh.edu.

All the best,

Joseph C. Hartman
Department Chair



Stochastic optimization the best bet

Investors predicting the stock market, farmers fretting over the weather, security officials anticipating a terrorist attack – the amount of uncertainty in the world can seem daunting.

Not to Jeff Linderoth.

Linderoth, an assistant professor of industrial and systems engineering, marshals the world's most powerful computers to tackle problems with millions of variables and possible outcomes.

Last year he received an Early Career Award from the U.S. Department of Energy (DOE) to solve large-scale numerical optimization problems characterized by high levels of uncertainty.

Linderoth tackles these “stochastic optimization” problems by developing software programs that use computational grids – groups and networks of computers whose collective capacities are harnessed to solve large-scale problems that would overwhelm a single computer.

Stochastic optimization problems require engineers to take into account two classes of variables, says Linderoth. Decision variables can be controlled. Random variables cannot be.

One example of a stochastic optimization problem, says Linderoth, is the effort by the federal government to intercept illegal drugs flowing into the U.S.

“The government has a fixed budget to make it more difficult for drug smugglers to travel through the network, or border,” says Linderoth. “The uncertainty comes into play when, even if we choose to beef up a part of the network by installing sensors, we don't know if the sensors will detect the drugs. The goal is to design a system that is robust with respect to these failures, and will, in the long run, catch as many smugglers as possible.”

Linderoth will also help DOE with mixed-integer nonlinear programming problems (nonconvex optimization), which involve discrete, yes-or-no types of decisions as well as nonlinear elements that have a continuum of random values.

The design and installation of a gas pipeline network, says Linderoth, requires engineers to make both types of decisions. The location of pipes and compressors requires discrete decisions, while calculating the optimal flow of natural gas is a nonlinear problem.

All the software Linderoth develops will be made available via The Network-Enabled Optimization System (NEOS), a server established 10 years ago to help engineers, scientists, students and business people solve optimization problems remotely over the Internet.

Linderoth was a member of the Argonne and University of Iowa team that solved the nug30 Quadratic Assignment Problem, a complex facility-location problem that had been unsolved for over 30 years. The computation took one week of calendar time and 11 years of CPU time, as 653 machines participated.

Stochastic optimization problems require engineers to take into account two classes of variables.

...decision variables

...random variables

Prof. Ralphs finds satisfaction in making optimization accessible

The challenge facing schedulers at UPS and other major delivery companies is not too difficult for the average person to appreciate.

You must determine the most efficient routes for hundreds of trucks that are transporting products to a variety of locations and are operated by drivers who may work only a limited number of hours per day.

Fashioning an optimal solution to a complicated task in the face of multiple constraints makes the UPS scenario a classical optimization problem, says Ted Ralphs, assistant professor of industrial and systems engineering.

But the routing riddles that confront delivery companies represent only a small fraction of the potentially limitless problems tackled by optimization experts, he says.

Ralphs writes software to solve large-scale optimization problems, which can have thousands of variables or more and which sometimes must be solved by clusters of computers working in parallel. He has three active grants from the National Science Foundation, the most recent of which requires him to come up with algorithms, or sets of instructions, to solve large-scale problems in real time. An example of this type of problem is the need for software that can tell surgeons as they treat tumors, especially brain tumors, the optimal quantity of radiation, and the optimal location to deliver it, in order to destroy cancerous tissue without harming healthy tissue.

"I can basically find optimization problems anywhere I look," says Ralphs. "The scheduling of classes at Lehigh, for example, has to take into account conflicting factors – professors who teach at certain times, students who have to have certain courses, and the availability of rooms. It's an increasingly hard problem that the registrar's office is now using software to solve.

"The Internet is another example of optimization. You have to make sure data gets where it needs to go subject to numerous constraints, such as computer capacity and location of wireless base stations. That's what I find exciting about optimization – the problems are everywhere and they affect everyone."

Ralphs and his students have recently been asked to develop software that can fashion flexible solutions to optimization problems whose variables and constraints are not only many but shifting.

An example of this kind of problem is the challenge of determining the most efficient schedules for an airline's crews. The task of staffing hundreds of daily flights with crews who spend much of their time away from "home" and can spend only a limited amount of time in the air is tricky enough. It can be complicated immensely when storms or unexpected mechanical problems cause flight delays or cancellations, or when employees are too sick to work.



One challenge for optimization experts that Ralphs has embraced is to develop software programs that are "user-friendly"

"Sometimes you can spend lots of time solving a difficult optimization problem," says Ralphs, "only to find out either that your input data was not correct or that some of your variables have changed. The challenge then is to use the same information, the same solution method, to quickly resolve wrinkles that come up. Instead of going back to the beginning, in other words, you try to make a minor adjustment to a solution that you spent hours coming up with.

"To do this, you need to keep a record of all the steps you made in fashioning the solution and determine which can remain the same and which need to be reconsidered in a new solution."

One challenge for optimization experts that Ralphs has embraced is to develop software programs that are "user-friendly" for the growing number and variety of people seeking help with optimization problems.

Ralphs sits on the board of directors of the Computational Infrastructure for Operations Research, or COIN-OR Foundation, which is a non-profit organization that produces open-source software for optimization problems.

"It takes a lot of work to produce software," says Ralphs. "But there's no reward system for academics who make software easy to use. So a lot of software produced by academics ends up sitting on their computers without ever being used.

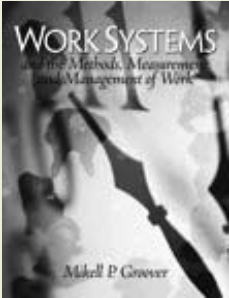
"The goal of COIN-OR is to make optimization software available to people in the real world. We try to maintain infrastructure that people can build on and use."

The endeavors to which his software can be applied can be surprising, Ralphs found out recently when he received an e-mail from a scientist working in bioinformatics.

New Textbooks Authored by Faculty Members

We are proud to say that two of our faculty members have published first edition textbooks this year.

Work Systems and the Methods, Measurement, and Management of Work, by Mikell Groover



-As the title indicates, this book is about work. The beginnings of IE can be traced to the study of work. The pioneers in this field included Frederick W. Taylor, and Frank and Lillian Gilbreth. Many of the modern industrial engineering techniques are focused on various aspects of work and the systems that perform it. We may not think of linear programming, queuing theory, and discrete-event simulation as work-related topics, but many of their applications involve systems that accomplish work.

In addition to the traditional topics in industrial engineering, the book also provides an introductory treatment of ergonomics, which considers work from a physiological and cognitive viewpoint, rather than from the vantage point of productivity and efficiency improvement. Finally, the text examines several more contemporary topics such as lean production, Six Sigma quality programs, service operations, and office work.

Faculty Updates...

John Adams...Our Professor Emeritus continues to teach engineering statistics and product quality.

Keith Gardiner...Directs the Center for Manufacturing Systems Engineering along with the associated cross-disciplinary Master of Science in Manufacturing Systems Engineering program. Continues to serve on the advisory board for the Future City Competition that engages approximately 35,000 7th and 8th graders throughout the United States.

Mike Groover...Published two books this year, the 1st edition of *Work Systems and the Methods, Measurement, and Management of Work*, and the 3rd edition of *Fundamentals of Modern Manufacturing*. Continues to direct the George E. Kane Manufacturing Technology Laboratory.

Joe Hartman...Published the 1st edition textbook, *Engineering Economy and the Decision-Making Process*. Won the 2005 Lehigh Valley Chapter Young Engineer of the Year Award from the Pennsylvania Society of Professional Engineers.

Jeff Linderoth...In 2005, received the Early Career Development Award from the U.S. Department of Energy, as well as the Faculty Partnership Award from

Engineering Economy and the Decision-Making Process, by Joseph C. Hartman



- This book deals with the concept of engineering economy (interest, the time value of money, and equivalence) and financial mathematics, and takes the student or practitioner through the entire decision-making process. After an introduction to the basics of engineering economy, the book elaborates on topics of estimation and analysis under risk, multicriteria, and uncertainty, with the ultimate goal of students becoming better decision makers.

Throughout its explicit walk through the entire decision-making process, the book uses examples that stem from real-world applications and integrates the use of computers and spreadsheets into the economic analysis. Decision making for both single project and multiple projects are examined, along with the importance of post-implementation analysis.

IBM Mathematical Sciences department. Wrote the feature article of work for the online newsletter of the National Center for Supercomputing Applications. Continues to co-direct the center for Computational Optimization Research @ Lehigh with Ted Ralphs.

Nick Odrey...Recent work considers coordination and control strategies for flexible systems and value chains based on multi-agent systems with embedded Petri nets for control and coordination. Named to "Marquis Who's Who in Science and Engineering, 8th Edition". Continues to direct the Automation and Robotics Laboratory.

Eugene Perevalov...Received two grants from the National Science Foundation, one pertaining to wireless ad hoc networks, and another on information theory approach to optimization under uncertainty.

Lou Plebani...Continues to perform research work in the areas of modeling of manufacturing processes, computational operations research, and automation and process control.



Faculty Updates...continued

Ted Ralphs....Received another National Science Foundation grant for research into duality and warm starting. Also two industry grants, one from the SAS Institute for research on advanced computational techniques for mixed-integer programming, and another from Scalable OR Solutions for parallel algorithms for route optimization. Continues to co-direct the center for Computational Optimization Research @ Lehigh with Jeff Linderoth.

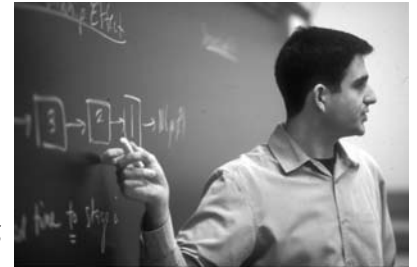
Larry Snyder....Won the prestigious Frank Hook Assistant Professorship, awarded to outstanding junior scholar-teachers who conduct scholarship at a high level and also foster personal interaction and mentoring relationships with students. Awarded grant from National Science Foundation for research on modeling and mitigating supply chain disruptions. Continues to direct the Center for Value Chain Research.

Bob Storer....Was a distinguished visiting scholar at Frontera University in Temuco, Chile. Won the Top Paper in Engineering Award at Lehigh University for "Disturbance Detection and Isolation by Dynamic Principal Component Analysis".

Aurelie Thiele....Received grant from the National Science Foundation for project entitled "Robustness and Performance in Data-driven Revenue Management". Named a P. C. Rossin Assistant Professor, an honor which recognizes outstanding individual merit and accomplishment by a faculty member.

Greg Tonkay....Received National Science Foundation grant for work entitled "Integrating the Engineering

Curriculum: Careers and Concentrations, Toolboxes and Technology". Continues to direct the Electrical and Electronics Manufacturing Laboratory.



George Wilson....Continues to teach in the subjects of production control, operations research, nonlinear programming, stochastic processes, scheduling, and dynamic programming.

David Wu.... Continues to serve as the Dean of the Engineering College. Still active with Ph.D. student advising, working with four doctoral students at the moment. He and his students are working on a National Science Foundation and Semiconductor Research Corporation (SRC) project that focus on demand characterization for short life-cycle technology products. He is also working on theoretical problems such as auction algorithms with multiple sourcing considerations, and a game theoretic problem arising between contract manufacturers and brand carriers in emerging markets.

Emory Zimmers, Jr.... Continues his role as site director for Lehigh's National Science Foundation-sponsored Center for Engineering Logistics and Distribution (CELDi), now entering its third year. Active participant in the National Coalition for Manufacturing Innovation (NCMI) and continues to serve as Principal Investigator on numerous projects under the Commonwealth's Agile Manufacturing initiative. Coordinated the development of the new Lehigh University Leadership Minor.

Prof. Ralphs

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The scientist, seeking to develop a medicine, needed to know the 3-D structure of a protein encoded by the DNA sequence of a certain bacteria. In order to "see" the protein in 3-D, the scientist needed to be able to predict the energy state of the protein in all of its possible chemical bond configurations.

The potential number of chemical bonds made the problem an optimization challenge. Ralphs referred the scientist to web sites containing his software, which helped the scientist solve his problem.

"It is very rewarding for me to get e-mail from someone who's using my software," says Ralphs. "I try to make things as easy to use as I can."

Ralphs, who developed a software called SYMPHONY to solve large-scale optimization problems, directs the Computational Optimization Research at Lehigh (COR@L) Laboratory, along with Rosemary Berger and Jeff Linderoth, two other assistant professors of industrial and systems engineering. He supervises seven Ph.D. candidates and chairs the university's High-Performance Computing Steering Committee.

George E. Kane Manufacturing Technology Laboratory

Led by Professor Keith Gardiner, the Engineering 5 “Toy Factory” opened this fall semester for first year engineering students. This project is aimed at developing creativity & problem solving by having groups of students define a problem and create a solution utilizing the resources available in the lab augmented by a small budget. Working within a set of constraints, chief among which is time available and a schedule to adhere to, student teams develop a ‘toy’ or a solution to a problem in which they make a prototype and provide a comprehensive report on their mission, budget and materials, processes, labor required, constraints, estimates on future costs, and lessons learned. Some examples of ‘toys’ developed include key ring bottle openers, a foot-operated toilet seat lifter, model catapults and trebuchets, spud guns and other interesting widgets. In addition, one team is assisting Lehigh’s library by coming up with ideas and a method for returning books to library shelves in the most efficient way possible after storage during renovation.



Center for Value Chain Research (CVCR)

The CVCR continues to direct a number of research projects with a variety of companies on value chain topics, including finding the optimal mix of capacity and inventory, integrating supply and demand, and developing effective performance metrics. More traditional supply chain topics continue to be explored as well between faculty and CVCR member companies such as inventory management and demand forecasting, transportation, supply chain security, and a wide range of global topics. Recent CVCR symposiums and seminars have accentuated these planning and development topics.

Enterprise Systems Center (ESC)

The ESC continues to excel in its dual role of enriching students’ education while working to make its clients in industry more efficient and increasingly competitive. This year the number of ESC clients increased to about forty manufacturing companies through the implementation of the very successful March 2006 CELDi workshop and other initiatives through the Northeast and Southeast PA Ben Franklins and the Pennsylvania Agile program. Similarly, the number of Lehigh students gaining valuable real-world work experience through the ESC reached thirty in 2006. The ESC has recently teamed up with the National Coalition of Manufacturing Innovation (NCMI) and we expect more activity in this area in 2007. For more information, please contact Emory Zimmers at esc@lehigh.edu or check the ESC website at www.lehigh.edu/~inesc.

Center for Engineering Logistics & Distribution (CELDi)

Our National Science Foundation Center for Engineering Logistics and Distribution (CELDi) has grown considerably in 2006. Highlights of the year include the very successful March 2006 Lehigh CELDi workshop led by Dr. Emory Zimmers which was attended by more than thirty companies and government representatives. We are pleased to report that the methodology for developing the workshop is being shared with the other schools in the CELDi Industry/University Cooperative Research Centers (I/UCRC) network. In November, the Executive Director of the CELDi I/UCRC, Donald Price from Florida, visited the Lehigh CELDi and spoke very highly of the center after meeting with Dr. Hartman, Dean Wu, and President Gast. “Lehigh is one of the strongest [CELDi] programs,” said Price. The year 2007 already looks very promising for Lehigh University’s CELDi program as well. In fact, Lehigh will be hosting the Fall 2007 National Conference on CELDi. For more information please contact Emory Zimmers at celdi@lehigh.edu and check the CELDi website, www.lehigh.edu/~inceldi, for updates.

Computational Optimization Research @ Lehigh

The Computational Optimization Research at Lehigh (COR@L) laboratory continues to be one of the most active research groups in the ISE department. COR@L currently supports fifteen graduate students, hosts a weekly seminar series, and maintains the ISE department’s computational infrastructure, which now includes six servers, a network of thirty Linux workstations, and a computational grid capable of utilizing almost one-thousand processors in facilities across Lehigh’s campus. COR@L faculty recently took eleven students from the lab to the Institute for Operations Research and Management Science (INFORMS) Annual Conference in Pittsburgh, PA. Six of these students presented papers at the conference, which is the largest operations research conference in the world.

ISE Students Take 2nd Place in Competition

Lehigh came out as runner-up as a group of ISE students participated in the Supply Chain Management case competition at Rutgers Business School, which was held on Friday, October 27 at Rutgers. This competition involved a case study that was provided to the students only three days ahead of time, on October 24. The group provided an analysis and recommendations on the case, and presented this to a panel of industry executives who judged the competition. In addition to Lehigh's team, other teams participating were New York University, New Jersey Institute of Technology, Rutgers School of Engineering, and Rutgers Business School.



Lehigh's group consisted of

- Michael Gyamfi, M.B.A. and M.S. student in Industrial Engineering
- Andres Pulido, M.B.A. and M.S. student in Industrial Engineering
- James Glynn, M.S. student in Information & Systems Engineering
- Muhannad Al Najjab, M.S. student in Information & Systems Engineering

The case presented involved the implementation/expansion of RFID technology at Metro, a German department store, and its suppliers. Currently, Metro uses RFID technology to track pallets of merchandise as it moves across the supply chain from a select few of Metro's suppliers to their retail stores. Metro was considering the expansion of the RFID technology to all of their suppliers or even the possibility of moving the technology to track individual cases of merchandise on each pallet. Using the information and data given, a recommendation of the next steps Metro should take, along with supporting analysis, were presented by the group to the judges.

The panel complimented our team for an outstanding job and providing excellent and distinguished representation for Lehigh. To celebrate everyone's success, a dinner and networking reception followed the presentation.

Students Compete in Simulation Contest Finals

At the IIE Conference in Orlando in spring of 2006, a group of Lehigh ISE students was one of five teams from around the world to compete in the finals of the "2006 IIE / Rockwell Automation Student Simulation Competition." The "Last Minute Team", as they called themselves, consisted of undergraduates Aneesh Varma, Ivana Pavleska, and Akshay Kilam, with their faculty advisor Dr. Robert Storer. This was sixth time since 1998 that a Lehigh team was so honored. The competition included teams from NC State, Florida International, the University of Toronto and the University of Arizona.

Other Student News....

Alpha Pi Mu, the Industrial Engineering Honors Society, inducted the following students this year: Dana Grimley, Lauren Chrencik, and Jordan Anderson, all in their senior year of undergraduate study.

The department awarded degrees this year to a total 42 undergraduates and 21 graduate students. These graduates are now working at a host of companies and organizations including firms such as United Airlines, Air Products, New York Institute of Technology, Merrill Lynch, JP Morgan Chase, PriceWaterhouse Coopers, GAF Materials, Lloyd Group, IBM Business Consulting, and Huron Consulting. Other graduates have chosen to pursue further graduate study, and three of our PhD graduates are going on to teach at Texas State University, the University of San Diego, and the University of Arkansas.

A student of the Baja SAE Team works on their mini car for the Baja Mini Car Competition. The team consists of Mechanical and Industrial Engineering students. For more information, refer to their website at www.lehigh.edu/~inlubaja.





Air Products Appoints Lehigh ISE Alumnus, John McGlade as President and COO

Air Products (NYSE:APD) announced in August the appointment of John E. McGlade to President and Chief Operating Officer by the Board of Directors, which took effect October 1, 2006. McGlade was previously group vice president of the Chemicals Division at Air Products.

John P. Jones, chairman and CEO, who previously also held the title of president, said, "Throughout his career, John has steered key strategic transformations such as establishing early partnerships in Asia and building our hydrogen franchises that have become a leadership position for the company. He has recently led our restructuring efforts in the Chemicals Group. His broad relationships and understanding of our businesses, customers and partners around the world will enable him to play a key leadership role in the continuing evolution of Air Products into a higher return and growth-oriented company."

McGlade, 52, joined Air Products in 1976 in the company's career development program and subsequently held various positions within its Gases business, including both domestic and international assignments. He was named general manager of the Chemical and Process Industries Division in 1994 and vice president of the division in 1996, where he led the growth of the company's premier position in hydrogen. In 2001, he became general manager and vice president of the Performance Materials Division. He assumed his current position as group vice president for the company's worldwide Chemicals Group in 2003. McGlade earned a B.S. degree in industrial engineering and an M.B.A. from Lehigh University.

Other Alumni Updates.....

Julio Asensio ...'98 B.S., owns and heads a wholesale candy distribution company in Guatemala.

Preston Crabill ...'76 B.S., is Director, Pension and Savings Plans at General Motors Corporation in Detroit, MI. Prior to that, he had been in other departments within General Motors such as Human Resources, Labor Relations, and Compensation & Employee Benefits in the U.S., Mexico, and Europe.

Bradley Fleming ...'98 B.S., is back in his hometown of Syracuse, NY working for Lockheed Martin as a Senior Business Planner with their Maritime Systems & Sensors division. He is attending Syracuse University for his MBA, looking to build on a concentration in supply chain management.

Travis Frick... '05 B.S., is working at GlaxoSmithKline as an Associate Manufacturing Expert, working on projects associated with the manufacture and production of biopharmaceuticals.

Jonathan Green ...'99 M. Eng., works in production engineering in retail inventory optimization at 4R Systems, Inc. in Wayne, PA. 4R Systems offers inventory optimization services to retail chains.

Steve Haekler ...'84 B.S., '91 M.S., is a Marketing Coordinator at ProModel Corporation.

Dennis Houser ...'76 B.S., is Manager of the corporate HR systems at B. Braun Medical in Bethlehem, PA. He is also Program Director of the Keystone Chapter of the Lehigh Valley Region of the Project Management Institute since 2001.

Glendy Lin ...is working at BAE Systems in Greenlawn, NY as an Operations Engineer.

Jane Loveless ...'81 B.S., is Vice President and CIO at Grand View Hospital in Sellersville, PA.

Kathleen McLaughlin ...'04 B.S., is working at JPMorgan Chase & Co. as a Financial Analyst in the Private Equity Funds Services Group.

Hillar Puskar ...'85 B.S., is a Systems Engineer at Lockheed Martin in King of Prussia, PA.

Lauren Ross ...'02 B.S., '03 M.S., is working at JPMorgan Chase in Manhattan on the Fixed Income and Derivatives Middle Office Control Team.

Alumnus Gift Allows for New Lab

Richard Spence ...'89, is a Global Logistics Manager for the Wound Management Division of Smith & Nephew plc. Smith & Nephew manufactures medical devices in northeast England.

....We're always looking to hear from our alumni. In addition to using the information internally within the department, we've also begun to post alumni names and places of employment on our website (<http://www.lehigh.edu/~inime/isealumni.html>), to show the versatility of an ISE education. If you would like to send us your update, or if you'd like your name to be included on the website, please email Jane Kline at jlk205@lehigh.edu.

A very generous monetary gift of \$100,000 made recently by an alumnus will enable the ISE Department to turn some of our current lab space into the envisioned "Operations Research Visualization Lab."

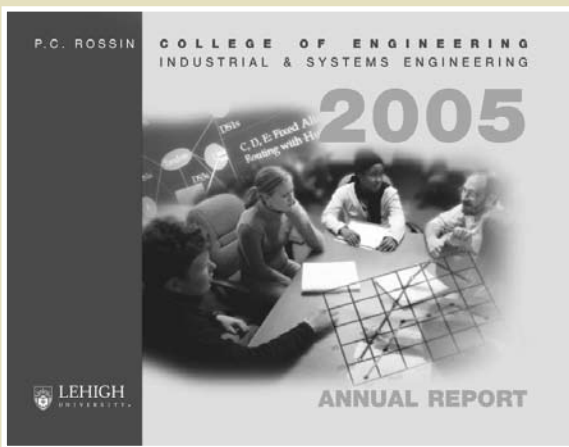
Anecdotally referred to as the COR@L Reef, it should be a stunning visual display of the work and teaching we perform in operations research – with software producing animated simulations, dynamic mapping of transportation solutions, graphical network designs, and colored decision trees, etc. The word COR@L comes from the fact that our COR@L Lab (Computational Optimization Research at Lehigh Lab) is producing world-class research in large-scale optimization. The term Reef refers to the fact that we want this to be a visually stunning lab that is full of life. The goal is to bring some of our research and classroom activities in this area, including applications in transportation and logistics, supply chain management, finance, health care, and production and manufacturing, to life!

Many people do not understand what operations researchers or industrial engineers do. When it comes to industrial engineering, manufacturing comes to mind – because it is visual. But Industrial Engineers do much more than manufacturing. The fact is, the lab for an IE is the outside world, because the tools developed in class (mathematical programming, stochastic processes, simulation, and IE methods) can be applied in numerous settings.

The technology lab, with computers for students and projection screens for instructors, will be loaded with software to bring solutions to life. This lab would:

- Help recruit potential students by displaying and illustrating the exciting work of IE and OR.
- Provide an exciting environment for learning software tools.
- Provide the means to display potential solutions to companies interested in research partnerships.
- Provide another outlet for students (graduate and undergraduate) to participate in research. This lab would tie directly into the computing power of COR@L.

Campus architects have already been to the department to see how to make this work with our current facilities, and we hope to start building come late spring 2007. Needless to say, the faculty is very excited and the students will benefit greatly.



Department Generates Annual Report

The ISE department published its first annual reports for 2004 and 2005, and will continue to do so each year in order to update the education community on our academic and professional endeavors and achievements. The reports summarize each year's activity regarding research grants, highlights of faculty honors and service recognition, faculty publications, and degrees awarded each year to undergraduate and graduate students. Each report also includes a letter from the chair highlighting important milestones within the department and a look ahead at future plans.

The report was emailed to all department heads and chairs of Industrial Engineering programs across the United States. You can view the annual reports on the ISE website at <http://www.lehigh.edu/~inime/alumninewsletter.html>.



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ISE Connections

The Industrial & Systems Engineering team continues its effort to know where our alumni are and where their ISE careers have taken them. Please share with us any new information on yourself, by emailing them to Jane Kline at jlk205@lehigh.edu, or fill out the form below and return via U.S. mail. Please include your name, a brief description of your professional work, where you are currently employed, and any other points of interest you may want to include. Also, if you know of anyone who might be interested in any of ISE's graduate programs, either locally or through distance learning, please indicate that as well.

Name _____

Professional Work/Position _____

Place of Employment _____

Other Info You'd Like to Share _____

For U.S. Mail, send to : Jane Kline, Lehigh University
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