

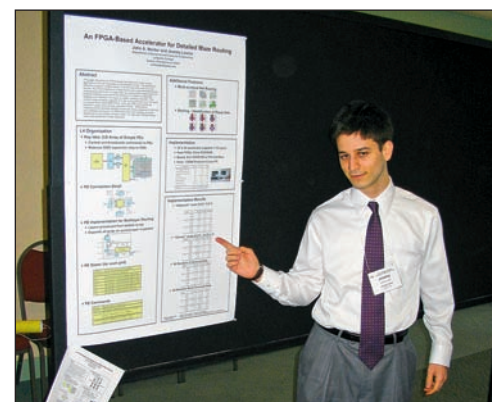
Lavine '07 Presents Research at Conference

Jeremy Lavine '07 and John Nestor, associate professor, presented a poster paper at the 15th ACM/SIGDA International Symposium on Field Programmable Gate Arrays (ISFPGA) in February 2007. ISFPGA is known as the premier conference for research into the design and application of Field Programmable Gate Arrays (FPGAs), which are large arrays of digital logic elements that can be programmed to perform complex logic functions.

The paper, "An FPGA-Based Accelerator for Detailed Maze Routing," described the use of an FPGA to accelerate the process of routing wires during integrated circuit design. By using the FPGA to realize a two-dimensional array of processing elements, a routing

algorithm can be performed 1-2 orders of magnitude faster than the same algorithm in software on a personal computer.

The paper was based in part on research Lavine performed as an EXCEL Scholar with Nestor during January 2006 interim session. Lavine continued this research in his honors thesis, "FPGA Hardware Router," which involved the applications of similar techniques to the problem of accelerating routing connections for FPGAs. Lavine received the Ebers Memorial Award from the department for his honors thesis. ■



Jeremy Lavine '07 presents a poster paper at the International Symposium on Field Programmable Gate Arrays with John Nestor, associate professor.

Juniors Design a Camera-Based Tracking System

The spring 2007 junior project for ECE 323 taught by Todd Wey, assistant professor, was an autonomous infrared tracking security camera. The students were given a development platform consisting of a black and white camera with analog RS-170 video output mounted onto a motorized pan and tilt mechanical assembly.



Daniel Sheehan '08 works on his ECE 323 group project to develop an autonomous infrared tracking security camera.

The challenge to the students was to place a set of crosshairs into the RS-170 video and to automatically track and hold an infrared target within their field of view. To accomplish this task, the students were required to understand and manipulate information from the RS-170 video format and to develop analog and digital signal processing circuits to implement their target tracking algorithms.

The projects were very successful given a tight schedule, with all groups demonstrating their systems in a design review. ■

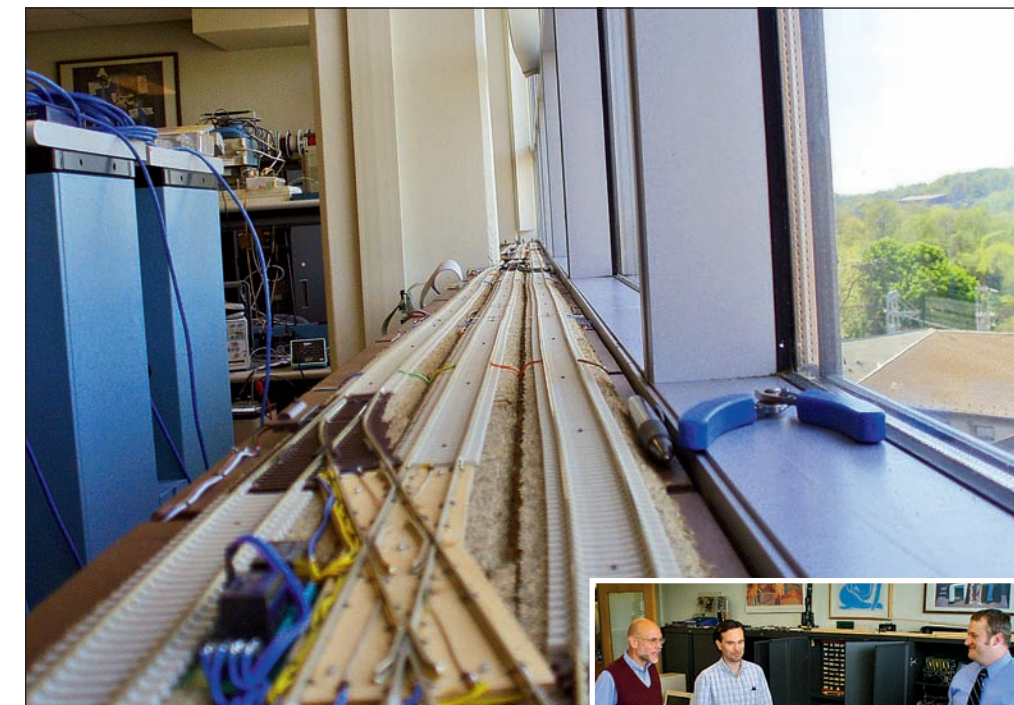
Nowlan '07 Wins Awards for Thesis

Sean Nowlan '07 won two awards for his honors thesis. He won the Lehigh Valley Instrumentation Society Award and placed third at the IEEE Region 2 Paper Competition held in Cincinnati, Ohio, in April 2007. Nowlan conducted his research and wrote his honors thesis, "Efficient Implementation of the AES-128 Encryption Algorithm on an FPGA," with John Nestor, associate professor, and John Greco, professor. ■

THE LAFAYETTE Experience

- Student-focused teaching and mentoring by an exceptionally qualified faculty, committed to each student's success.
- A small college environment with large college resources.
- A challenging, broad-based academic curriculum that offers strong programs in the liberal arts, sciences, and engineering.
- A friendly residential community offering an exciting social life with a broad spectrum of extracurricular activities.

Seniors Design Multi-Track Train Control System



Version 2 of the Lafayette Rapid Transit System was developed by students for their senior design project. Prof. John Greco (left), Richard Polley '07, and Karl Metzelaar '94 from the ECE Advisory Board discuss the project.

During the spring 2007 semester, seniors revived the Lafayette Rapid Transit System. Version 1 of that system was constructed in the digital circuits laboratory by Laurie Graham '82 and Scott Finley '82, both electrical engineering graduates, as part of their senior design project supervised by John Greco, professor of electrical and computer engineering. The system was interfaced to a microprocessor (a Z80 processor within a CP/M system) and used by students studying microprocessors in a senior elective. The system was later interfaced to a desktop computer and made available to first-year electrical engineering majors for an end-of-semester project in a C programming course.

Version 2 is considerably more complex than the original single microprocessor version; this past semester the seniors designed a distributed control system to coordinate movement within the system. The complete system consisted of five control nodes and a supervisor node, communicating via Ethernet packets. In addition to specifying the command structure for the system, students designed the architecture for each

control node, and then designed the circuitry for each node's subsystem.

Students designed this system under the guidance of Prof. Greco and Joel Elston, visiting assistant professor. The design included printed circuit boards fabricated off campus. All system software, for both the control nodes and the supervisor node, was written by the students. The control nodes were programmed in C for a processor that included embedded Ethernet hardware; the supervisor node, including a graphical user interface, was programmed in C++ on a Linux machine.

Karl Metzelaar '94, an electrical engineering graduate, served as an outside adviser for the project. He was impressed with both the technical results and the students' presentations of their work. The students themselves were proud of their accomplishment, and completed the project having more respect for the subtleties and unexpected issues that can arise in a large system. ■

Three Faculty Receive NSF Equipment Grant

William Jemison '85, associate professor of electrical and computer engineering, Andrew Kortyna, assistant professor of physics, and Todd Wey, assistant professor of electrical and computer engineering, recently obtained a \$257,762 major research instrumentation grant from the National Science Foundation (NSF). The grant will be used to purchase additional equipment to continue electronic and optical telecommunications research. The equipment will also be used for class demonstrations of measurement techniques.

"Electronic and optical telecommunications play a significant social and economic role in modern information-based societies," Jemison explains. "The development of novel techniques, circuits, and materials to support new telecommunications applications is critical to maintaining innovation in the telecommunications field, thereby allowing more people access to greater amounts of information."

Though Jemison has made significant leaps in his ongoing telecommunications research, he believes continued progress depends on the use of higher microwave frequencies and optical domain monitoring. He says that having the necessary equipment available at Lafayette will not only help to support and enhance his, Kortyna's, and Wey's research, but it will also allow them to continue involving students.

"This grant will enable us to train undergraduates in the use of advanced equipment and experimental methods and to prepare students for entry into outstanding graduate programs as well as the electronics and communications industry workforce," he says. "A significant part of mentoring is the integration of research and education through the involvement of undergraduates in a meaningful research experience. Experiences and achievements obtained through mentoring can open doors to outstanding graduate school, fellowship, and job opportunities."

Wey is planning to use the equipment for "performance measurements of timing generator systems such as crystal oscillators and phase-locked loops."

Kortyna has been working in the field of cold molecular collisions for more than a decade. He and his student research assistants are studying atomic collisions at low energies with the goal of better understanding molecular interactions. ■

Mission:

Our mission is to be one of the nation's premier undergraduate ECE departments. We are dedicated to providing students a thorough technical preparation, the continuous development of professional awareness, and a heightened sense of social responsibility.

This mission statement leads to three major goals:

(1) to bring together students of high ability and a faculty composed of teachers-scholars in the major fields of electrical and computer engineering for the purpose of learning through study, inquiry, discourse, and discovery—our people.

(2) to maintain a continuous evolution of curriculum, pedagogical practices, and resources to educate students in the guiding principles of the engineering profession and the best practices in both electrical and computer engineering—our program.

(3) to create an interactive environment between students and faculty which fosters a dedication to learning and an appreciation of both the history and future of the discipline—our learning environment.

OBJECTIVES

Graduates will have the ability to:

- educate themselves continually;
- adapt to changing job assignments/challenges;
- function in a team and provide leadership;
- apply their engineering education in solving a broad range of problems;
- be involved in professional/public/community service;
- excel in their chosen area of professional activity;
- communicate in a mature and effective manner; and
- appreciate business enterprise, technology management, and social and legal issues.

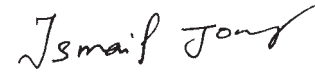
PROGRAM OUTCOMES

Upon graduation, students will:

- value life-long learning and understand contemporary issues;
- function in a multidisciplinary team;
- analyze data and communicate results;
- solve broad-based engineering problems in a socially conscious and ethical manner;
- be able to design, simulate, build, and test both complex analog and digital circuits;
- use mathematical technique and science knowledge to model and analyze communication and control systems;
- use modern engineering hardware and software tools;
- be able to formulate an engineering problem and solve it by creating, debugging, and testing a team-based solution;
- understand microscopic material properties and how they are used to develop modern electronic devices.

From the Department Head

Welcome to our annual newsletter highlighting some of our students' achievements and reporting on our faculty's latest teaching activities. We had a wonderful year of exciting projects, competitions, and awards. The department is pleased to announce that effective this academic year, a lab director position has been created to help enhance the hands-on design project experience of our students. We look forward to taking full advantage of Chris Nadovich's knowledge, resulting in more exciting projects and better lab experiences for our students. As usual we would love to hear from our alumni either by visiting our web site or by contacting me directly at (610) 330-5414, or via email at jounyi@lafayette.edu.



Ismail I. Jouny

Charles A. Dana Professor of Electrical and Computer Engineering and Head of the Department



Nadovich Hired as Lab Director

Christopher T. Nadovich joined the electrical and computer engineering department as director of ECE labs effective July 2007. He will conceive, design, and develop prototypes, and test potential projects for sophomores, juniors, and especially seniors majoring in electrical and computer engineering. Nadovich will teach some labs, but most of his efforts will be focused on strengthening the hands-on experiences of electrical and computer engineering students. He will effectively serve as a professor of practice in the department.

Nadovich has more than 25 years of rich design and implementation experiences, and has had his own company for some time. He designed and built 11 velodromes, including the velodrome for the 1996 Atlanta Olympic Games. He earned both master's and bachelor's degrees in electrical engineering from Rensselaer Polytechnic Institute. ■

Students Co-Author Research Papers

Two students who worked with Yih-Choung Yu, assistant professor of electrical and computer engineering, have had their research presented at conferences and a paper co-authored by one of the students has been accepted by a prestigious journal.

IEEE Transactions on Biomedical Engineering has accepted a paper written by Simon Mushi '06 and Yu, "Performance Prediction of a Percutaneous Ventricular-Assist System Using Nonlinear Circuit Analysis Techniques." Mushi's honors thesis also resulted in a paper, "Identification of Fluidic Element Models to Simulate the Short-Term Baroreflex," with Yu. The paper was presented by Yu at the 45th Conference on Decision and Control in December 2006.

Sriram Gopalakrishnan '09 presented a paper, "Evaluation of a Minimally Invasive Cardiac Function Estimator for Patients with Rotary VAD Support," at the 33rd Northeast Bioengineering Conference in March 2007. The paper was co-authored with Yu and Josh Porter '06. Gopalakrishnan's current Excel Scholar research with Yu deals with modeling and simulation of the pediatric cardiovascular system. ■



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Associated Staff: Nicolette Stavrovsky **Photography:** David W. Coulter, Joel Elston, Ismail Jouny, John Nestor

Hornfeck Takes Engineering Students to Bremen, Germany

Four months of study abroad preparations culminated in an overnight flight to Europe for 21 Lafayette engineering students. At the Newark (N.J.) Liberty Airport, students said goodbye to parents and friends. Four months later these students were saying *auf wiedersehen* to the people and experiences encountered at Jacobs University Bremen in Germany.

William Hornfeck, professor of electrical and computer engineering, supervised the spring 2007 study abroad program to Bremen, Germany. His student group included seven electrical and computer engineering majors and fourteen students from Lafayette's four other engineering majors. For most of these students, this was their first time to travel internationally. While many had an introductory level of German language skills, most had not mastered conversational German. The first lesson learned was the importance of verbal communication skills.

Students, in completing their semester at Jacobs University Bremen, are required to enroll in the German Politics and Culture course taught by JUB faculty. Associated with this course is an extensive program of related excursions within Germany and neighboring European Union countries. The student group visited Berlin, Dresden, and Munich, as well as Brussels and Copenhagen. The contrast in languages, currency, government, and cultures was a broadening experience.

The students lived in residence halls on the JUB campus; Hornfeck and his wife, Shirley, lived in the guesthouse on campus. Because JUB's student body is primarily an international group, Lafayette students were integrated with students from countries all over the world. In addition, virtually all students have host families from neighboring communities helping them to learn German social and cultural traditions.

Study abroad for second-year students at Lafayette is intended to be a transforming experience in terms of academic progress, breadth of experience, and personal and social growth. These students returned to America having been a part of a faculty-led study abroad program offered to Lafayette engineering majors to prepare them for the steady march toward globalization in their professional fields. They learned about European Parliament functions in Brussels, the history of a divided Berlin, the rebuilding of the German city of Dresden, the traditions associated with Bavaria, and the customs unique to Copenhagen and the Danish royalty. Students experienced a four-month period of intellectual and cultural enrichment, including the completion of one full semester of engineering course requirements. Plans are now underway for the next study abroad program at Jacobs University Bremen in Germany during spring semester 2008. ■



Professor William Hornfeck and his students pose in Bremen, Germany, at the statue of "Roland to Bremen," a symbol of civic freedom and independence in Bremen's marketplace.

Jemison Named IEEE Fellow

The Institute of Electrical and Electronics Engineers (IEEE) named William Jemison '85, associate professor, an IEEE Fellow "for contributions to microwave photonics for radar and communications." One of the most prestigious honors of the IEEE, the award is given to a limited number of senior members who have made outstanding contributions to the electrical and information technologies and sciences for the benefit of humanity and the profession.

For the last 20 years, Jemison has worked in the field of microwave photonics, which uses lightwaves for the transmission, signal generation, and/or signal processing of high frequency analog signals. Jemison focuses on applying fiber optics to distribute analog information.



He explores its uses in radar, satellite, and cable television as well as wireless signals such as those used in cellular telephony and wireless networks.

"I have worked on systems analysis, subsystem development, and circuit designs that incorporate microwave photonics in novel ways to exploit the synergy between microwaves, photonics, and digital communications," he says.

With the encouragement of Warren Guy, Charles A. Dana Professor Emeritus of Electrical Engineering, Jemison first joined IEEE as a student member in 1982. He has been the IEEE student branch counselor at Lafayette for 10 years, and received three Outstanding Branch Adviser awards from the Lehigh Valley section of IEEE.

"Fellow recognition reinforces my commitment to encourage our undergraduates to join the IEEE and stay involved throughout their careers," he says. "Such professional involvement by students both while they are here and after they leave should help to further their success, which is ultimately how the College's reputation is obtained."

Jemison serves on several IEEE Microwave Theory and Techniques Society (MTT-S) committees. He is associate editor for featured articles for *IEEE Microwave Magazine*, a member of the *IEEE Journal of Lightwave Technology* Steering Committee.

A dedicated teacher and mentor, Jemison has included 19 Lafayette students in his research, and has coauthored at least 16 publications with undergraduates. He is a past recipient of Lafayette's Carl R. and Ingeborg Beidman Research Award for excellence in applied research.

Among Jemison's peers who were selected as fellows this year was electrical engineering graduate Edward I. Ackerman '87, vice president of research and development at Photonic Systems, Inc. Ackerman was honored "for contributions to the optimization of analog optical links." Though the two did not know each other as undergraduates, they met while completing doctorate work at Drexel University and have kept in touch professionally since then. ■