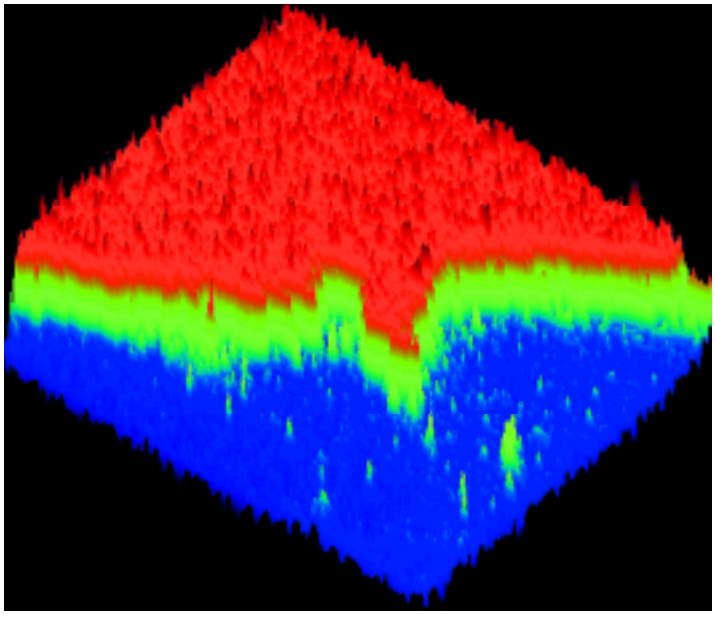
Georgetown Answers Industry's Call

The department of physics at Georgetown University in Washington, D.C., has redefined itself during the past decade by focusing much of its education program on industrial physics. Nine faculty members have been hired in the past seven years, all in applied industry-related fields. As the research focus of the department headed toward areas of interest to industry, the faculty decided to create a novel graduate program designed for students who aspire to industrial careers.

This joint program in physics and business, which aims to better train industrial physicists, will admit its first students in the fall of 2001. It is a response to calls from the physics and industrial communities to provide graduate training in both the technical skills and people skills that will help launch careers in industry. "Physicists are trained to solve problems and can readily see through the chaff for the wheat," says William Graver, a vice president of Science Applications International Corp. (SAIC). "Industry needs more independent problem solvers, and the industrial physicist is the obvious answer."

The new program will train students for traditional industrial physics careers, such as systems engineer, industrial scientist, and technical manager, as well as for administrative positions such as program manager; research positions at central research facilities; technical jobs in finance; and entrepreneurial roles at hi-tech start-ups. As Barbara Jones, manager of magnetic materials and phenomena at IBM's Almaden Research Center, says, "Students can go through a whole graduate and undergraduate education without knowing what industry is like. They may look at it just as a fallback. That's not good. Students need to be able to make informed decisions with regard to their careers. And we'd like the best students to look at industry first."

The five-year-long Ph.D. program is in three phases: 16 months of course work, a year-long industrial apprenticeship, and 30 months of dissertation research.



Jeff Urbach, chair of the department of physics at Georgetown University, and collaborators have imaged a magnetic domain-wall boundary in a Co-Pt multilayer with a polarizing microscope.

The course-work phase focuses on applied physics training and on business skills. The core curriculum is taught in a modular format—a module is half a semester—modeled on the master's of business administration (M.B.A.) program at Georgetown's business school. Each module consists of three or four six- to seven-week courses followed by a week-long session designed to integrate the subjects taught during the module using a unifying, coherent theme. For example, working in teams of three or four, students will examine quantum-well structures, determine their band structure, and analyze how to use them to generate coherent light with the goal of designing a quantum-well structure that will produce light of a particular frequency. The integrative experiences require both oral and written presentations of the team projects. Four sequences of modules and integrative experiences form the first nine months of classes.

During the summer, students take the "Gateway to Business" course, which is a broad introduction to the vocabulary and concepts used in the business world. They also take a six-week course called "Industrial Problems in Physics," which is designed to simulate the environment of industrial problem solving.

In the final semester of course work, students take two advanced physics modules and perform three team-based laboratory rotations. They also take two business courses, one in accounting and the other in either finance or marketing.

The course work is followed by a 12-month, on-site industrial apprenticeship with one of Georgetown's industrial partners. Students sign an agreement that gives the industrial partner full rights to the intellectual property developed at its site. The industrial partner pays a fee to Georgetown to host the student apprentice, who is the equivalent of a master's level physicist. The apprenticeship is designed to introduce students firsthand to the industrial environment, allow the industrial partner to have a year-long "interview" of the student, and permit the student to further develop his or her applied physics problem-solving skills.

Students then return to campus to do 30 months of dissertation research, which is similar to the Ph.D. research of more conventional applied-physics programs. During this time, students also complete an entrepreneurship module with M.B.A. students, in which they create a business plan for a hi-tech start-up company.

Participants in the Ph.D. program will receive stipends as teaching assistants during their 16 months of course work and from the university during their apprenticeship. During their final 30 months, students will

receive stipends from faculty research grants.

In addition to the new Ph.D. degree in physics, Georgetown will begin offering a master's degree in physics that can be completed in 16 months; a joint master's–M.B.A. program that takes 33 months to finish; and a joint Ph.D.–M.B.A. program, which can be completed in 6.5 years.

The program's industrial advisory board consists of leaders in industry who are interested in educating physicists for the industrial work force. The board includes Charles Duke, vice president of corporate research and technology and a senior research fellow at Xerox Corporation; Graver of SAIC; Jones of IBM; and William Frederick Lewis, president, chief executive officer, and founder of Prospect Technologies, a Washington-based Internet technology firm. Other members are Lynn Melton, professor of chemistry at the University of Texas at Dallas; Robert M. White, head of the electrical and computer engineering department at Carnegie Mellon University and former under secretary of commerce for technology; and Carl Widell, a Washington-area telecommunications venture capitalist who has had extensive financial experience in the private sector.

The Georgetown department has research expertise in several industry-related areas, including biomedical microelectromechanical systems for drug delivery and chemical sensing, magnetic storage, nonlinear optics, superconducting electronics, granular dynamics, nanotechnology, and large-scale computation and simulation.

Georgetown believes that its new industrial physics program represents the most significant overhaul of graduate physics training in the nation and that its graduates will be better prepared for jobs in industry. Widell describes how business savvy provides subtle benefits. "The industrial physicist will likely have a portion of his compensation in the form of stock options," he says. "His or her division might well be spun off from its parent, resulting in an offer of an equity stake, or the physicist might become a principal in a start-up. Knowledge of basic business structures and procedures can only benefit those individuals focused more on the laboratory than the corporate hierarchy."

Further information on the program can be found at http://www.physics.georgetown.edu/graduate.htm. Ω

James Freericks is director of graduate programs in physics at Georgetown University (freericks@physics.georgetown.edu), and he can provide enrollment information for companies interested in becoming industrial partners. The Forum department is initiated by the American Physical Society's Forum on Industrial and Applied Physics (FIAP). For more information about the Forum, please visit the FIAP Web site (http://www.aps.org/FIAP/index.html) or contact the chair, James Kaufman (kaufman@almaden.ibm.com).