

# Physics and Entrepreneurship

Although some argue that entrepreneurship can't be taught, the physics department at Case Western Reserve University (CWRU) is betting otherwise. Last fall, in conjunction with CWRU's Weatherhead School of Management, it launched a two-year master of science program called Physics and Entrepreneurship (PEP) that combines training in physics, business, and entrepreneurship. PEP enrolled five students in its first class, each of whom received full tuition and a stipend paid from an endowment, and the program plans to accept five or more students in the fall of 2001.

PEP aims to train students with a background in physics and an interest in technological innovation so that they can use their skills and experience to develop and launch a new product or start a high-tech business. "What Stanford is to Silicon Valley, and MIT and other area universities are to the Boston technology corridor, we hope we can be—the seed for creating a high-tech culture in northeast Ohio," says Lawrence Krauss, chair of CWRU's physics department and PEP's deputy director.

Cyrus Taylor, professor of physics, directs the PEP program, and Robert D. Hisrich, a professor of entrepreneurial studies at the Weatherhead School, teaches the management school's side of the program. Assisting the three is CWRU physics professor Robert Brown, whose years of involvement in industrial physics proved invaluable in formulating the program's curriculum.

PEP's evolution is an interesting story in itself. Since his appointment as physics department chair in 1993, Krauss has modernized the department's curriculum, renovated facilities, and created a new bachelor's degree in physics and mathematics. As a result of these efforts, the number of undergraduates majoring in physics at CWRU tripled to about 30 each year.

In the mid-1990s, Taylor and Krauss talked regularly with CWRU physics alumni who had pursued successful business careers, and with physics majors who had opted out of physics graduate training because of a desire to work outside academe. Informal discussions with industrial



**The new Physics and Entrepreneurship Program at Case Western Reserve University is housed in the historic Rockefeller Building; Lawrence Krauss captains the physics department and is PEP's deputy director.**

physicists, they thought, would help them guide their students in making career choices. Although a physics graduate education can provide excellent training and the problem-solving skills needed to prosper in high-tech businesses, the undergraduates most eager to strike out on their own in an innovative business venture were the least likely to enter graduate school.

Krauss and Taylor organized a committee to explore the implications of this situation, and began talking with local businesses. Fostering closer ties between the physics department and industry could benefit both, the group concluded. In addition, the late Robert Steiglitz, a CWRU alumnus and successful businessman, gave a substantial endowment to the department to fund a seminar series in physics entrepreneurship, which began in 1998. The series, now incorporated into PEP, brings physicists-turned-entrepreneurs to the campus to talk.

During the early seminars, the committee held lengthy discussions with the speakers to gather ideas on how best to train students in entrepreneurship and help them get launched. Backed by an additional \$1.6 million bequeathed by Stei-

glitz in 1999, the committee put together a university-approved curriculum; PEP was officially founded in February 2000.

The PEP program has two core groups of courses. The one in the physics department includes a two-semester course, "Modern Physics for Innovation," and a technical elective in physics. In the management school, students take two required courses, "New Venture Creation" and "Technology Entrepreneurship," and an elective from the graduate curriculum in science, engineering, or management. Graduation requires a total of 27 credit hours and a master's thesis.

In addition, the PEP seminar series brings experts to campus to discuss startups, venture capital, marketing, technology transfer, intellectual property, and other issues. The seminars provide a network to help students get started in their ventures after graduation. They also enable the speakers to try out ideas on students and faculty, such as asking for input on a particular experimental device.

PEP has assembled an advisory board that includes Christopher M. Coburn, a vice president of Battelle Memorial Institute; Joseph P. Keithley, chairman of Keith-

ley Instruments, Inc.; and Frank F. Mosier, a former president of Standard Oil Co. and BP America.

The five students currently enrolled in PEP were chosen for their potential as entrepreneurs. One, Marc Umeno, has a Ph.D. in physics from American University. After fin-

ishing a postdoctoral position, he spent several years as an Army medical staff officer and then worked for a defense contractor. At his last job, says Umeno, "I recognized my desire to play a leadership role, and that I needed to learn more about business to be successful. I was originally interested in

an MBA program, because I thought that was the only option, and then I discovered PEP. PEP offers people from technical backgrounds the opportunity to learn how to bring innovative technology to the marketplace, which interested me."

Jun Ding, a native of Shanghai, China, entered PEP with a degree in nuclear physics that he earned in China and a master's degree in the same field from the University of Cincinnati. "What attracted me to PEP was its emphasis on entrepreneurship," says Ding, who thinks the program has already taught him to recognize his own potential to succeed in business. After graduation, he would like to start a global education service that would operate both in Cleveland and Shanghai.

Another PEP student, Fraser Hewson, started working as a software test engineer at Motorola after receiving bachelor of science degrees in electrical engineering and computer science. In the course of his work, he took the initiative to redesign a project in which he was involved, but he was disappointed when management hired someone else to direct the new effort.

Hewson left Motorola to travel for a year, and returned to work at another large corporation. Again, he felt frustrated. When he chanced to read about PEP the program seemed ideal for him. After receiving his PEP degree, Hewson wants to start his own company or find employment where he can exercise his creativity and his need to problem-solve by creating something new. He plans to seek opportunities through the contacts he makes in PEP.

In the end, the career paths students choose and their success will attest to PEP's value. Its founders hope the program will serve as a new model for graduate science education. They think that many students with a physics background would thrive in programs such as PEP, and Umeno concurs. "The success stories of the new economy have largely been based on innovations that started with physics and physicists," he says. "It is time we empower ourselves to be the decision-makers in today's technology-based marketplace."

More information about PEP is available at <http://pep.cwru.edu>. 