

# Stimulating Collegiate Inventiveness

**T**he National Collegiate Inventors and Innovators Alliance (NCIIA) is an educational organization with an uncommon mission: to promote the teaching of technological innovation, invention, and entrepreneurship in American colleges and universities. It is sponsored by the Lemelson Foundation, a private philanthropy founded by one of the country's most prolific inventors, Jerome Lemelson (1923–1997).

Lemelson averaged about one patent a month over a 40-year period and is credited with inventing, among other things, the drive mechanism for the audio-cassette player and key components in the bar-code reader, cordless telephone, and industrial robotics. He and his wife Dorothy founded the Lemelson Foundation, which supports several initiatives, including a center at the Smithsonian Institution in Washington, D.C., dedicated to interactive exhibits on science and innovation in American life. The foundation also awards the annual \$500,000 Lemelson-MIT prize, the world's single largest award given for technological invention and innovation. Many of Lemelson's most ardent admirers believe that his greatest contribution was his lifelong educational crusade to instill a spirit of technological creativity and inventiveness in America's youth.

The NCIIA, based at Hampshire College in Amherst, Massachusetts, was founded in 1995. Its goal is to promote a learning approach that goes beyond that found in a standard science or engineering curriculum by funding programs that nurture a spirit of inventiveness and creativity in students. NCIIA's educational philosophy echoes a much-quoted view of Albert Einstein, who once wrote, "Imagination is more important than knowledge." The organization makes grants to faculty and students on campuses around the country to develop programs with the curricula, networking opportunities, educational resources, and "E-teams" ("E" for excellence and entrepreneurship) necessary to encourage inventiveness and innovation.

E-teams are interdisciplinary student invention teams in which students work

together under the tutelage of a faculty member or professional mentor to identify and solve real-world technological problems, commercialize the innovations developed in the course of their work, and sometimes even create their own corporations. The E-team strategy aims to address current technological problems and develop creative solutions

that have the potential for commercial development, the generation of new



jobs, and other social benefits. In this way, students learn to conceive ideas of their own and to follow through on them—and in the process, to uncover their inherent talents and interests. They also learn something about the complex process of bringing technological innovations into the commercial marketplace.

"The program brings a new dimension to technical and engineering education," says Philip Weilerstein, NCIIA's executive director. "Some of the teams will succeed in creating a product that will enter the marketplace or start a business venture. Moreover, the training that students receive as E-team members gives them an important edge when it comes time for them to find jobs after graduation. By operating essentially as teams of entrepreneurs, they have the opportunity to develop the confidence and skills needed to succeed as technological innovators in the real world. They work in a self-directed team, manage a budget, work against a product schedule, deal with recalcitrant suppliers, and make

business decisions. When they get on the job, they already have some experience with how the business world works and know how to make things happen."

Since 1996, NCIIA has awarded grants totaling \$1.27 million to more than 70 institutions, including Stanford University, Columbia University, the University of Virginia, Amherst College, Lehigh University, and Springfield Community Technical College in Springfield, Massachusetts. Grants range from \$1,000 to \$20,000. In choosing grant recipients, NCIIA looks for an innovative application that has a team of students, faculty, and industrial mentors who can successfully carry out the project. "A potential E-team member should be a self-directed, motivated, creative, and entrepreneurial thinker who is eager to apply himself or herself to a problem of his or her own creation," Weilerstein says.

Among the student projects that have won grants are a novel photovoltaic device for use as a back-up power source to fossil-fueled heating plants during power outages, a protective firewall that provides security against unauthorized use of computer resources on the Internet, a new suction device that removes unwanted body fluids during surgery, a bicycle attachment that opens up into a high-capacity cargo carrier with pull-down racks and large folding cargo bags useful for transportation in developing countries, a device that instantly chills beverages by spraying them with a cold fluid while they rotate, and a solar-powered blimp capable of continuous flight that could be used for surveillance, atmospheric observations, and aerial photography.

Additional grants have paid the costs of developing courses or curricula that embody the NCIIA philosophy of hands-on innovation. These grant-winning courses include "New Product Development" at James Madison University (Harrisonburg, VA), which teams up engineers and business students to learn about developing new products; "Engineering and Entrepreneurship" at Cooper Union (New York); "The Technology of the Commercialization Process" at Illinois Institute of Technolo-

gy (Chicago); "Invention and Entrepreneurship with Toys" at Michigan State University (East Lansing); and "Turning Students into Inventors" at the University of Virginia (Charlottesville).

Some E-team members have gone on to found their own companies centered on their inventions. For example, an E-team at the University of Virginia has created an "inventor's notebook," an electronic notebook and project management tool to aid inventors throughout the entire invention process.

"One of the keys to Alexander Graham Bell's success was the great detail that went into the way he documented inventions, which served him in court depositions, in patenting, and as a source for ideas and innovation. Our electronic notebook will serve the same purpose," says team sponsor Michael Gorman, associate professor of technology, culture, and communications and systems engineering. "It will be in both electronic and paper versions, and an inventor can assemble the notes it contains into a rough draft for a patent, an article, or even a Ph.D. thesis." One member of the E-team has created a new company, HiTech Solutions, Inc. (Annandale, VA), which will pursue a patent for the notebook and ready it for entry into the commercial market.

Another E-team at Rensselaer Polytechnic Institute (Troy, NY) has invented a device called a differential permeameter, which measures differences in permeability across materials such as paper, fabric, or filter cloth in order to find potential product defects. The permeameter is being patented and will then be licensed and marketed.

The NCIIA grants have become coveted. "Interest in this program from students and faculty has been growing, creating a need for experienced scientists and engineers from industry to act as E-team mentors and grants reviewers," Weilerstein says.

More detailed information about NCIIA and its grants program is available at <http://hampshire.edu/nciia>. Anyone interested in participating as a grant reviewer or mentor should contact Philip Weilerstein at [nciia@hampshire.edu](mailto:nciia@hampshire.edu). 