



## **College of Engineering**

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ANNUAL  
REPORT



ROWAN UNIVERSITY  
COLLEGE OF ENGINEERING

# TABLE OF CONTENTS

- 
- 2 Message from the Dean
  - 3 The Clinic Experience
  - 5 Beyond the Classroom
  - 7 Excellence in Teaching
  - 9 Into the World
  - 11 Looking Ahead
  - 14 Message from the Chairperson,  
Dean's Advisory Council

**(On the front cover)** Students in Dr. John Chen's and Dr. Krishan Bhatia's freshman clinic class used a ball-pitching machine to fire soccer balls at the head of a crash test dummy as a way to assess the protection offered by various soccer helmets and related equipment. The sequence on the front cover shows shots taken by a high-speed camera as the ball impacts the dummy.

The National Academy of Engineering (NAE) and other organizations, institutions, corporations and individuals are examining how the United States prepares the next generation of students, the “Engineer of 2020,” as the NAE refers to it. In questioning how to enrich and broaden engineering education, they are seeking ways to ensure that technically grounded graduates will be better prepared to work in a constantly changing global economy.

This has been the goal of the Rowan University College of Engineering since its founding in 1995. We seek to reinvent engineering education by making the learning experience more meaningful to students. Our focus is on undergraduate education led by faculty who balance classroom studies with research. We seek to energize students during the undergraduate experience with an education that will enable them to start careers or pursue advanced learning in graduate school.

The engineering clinics – one of Rowan’s hallmarks – are key to the delivery of this educational experience. An eight-semester offering, engineering clinics start at the beginning of the freshman year. The freshman/sophomore clinics introduce students to the essence of engineering in an interdisciplinary mode early in the learning process. Supported by extensive external funding averaging more than \$3.5 million annually, the junior/senior clinics give students the opportunity to work in a small team environment to address real-world projects. Clinic projects cover a broad spectrum, ranging from design, government contracts, industrial research and development to entrepreneurial efforts supported by venture capital funds. Teams, usually of three to five students, work on more than 60 clinics each semester.

The engineering clinic concept of hands-on learning permeates the curriculum and is reflected in student achievement, teaching excellence and outreach to the community. This annual report explores our clinics and other opportunities at Rowan Engineering. We hope you enjoy learning more about our program.



**Dr. Dianne Dorland**  
**Dean**

# THE CLINIC EXPERIENCE

Concerns about her grandfather's well-being spurred Caitlin Terry (CE '05) to tackle an engineering project that may make a difference in the future for many people with physical limitations.

As part of a Rowan engineering clinic, Terry designed the Helping Hand, a mouse-like polymer device. Helping Hand enables her grandfather, who has nerve damage causing numbness in his fingers, and other people to write more easily by using motion in their forearms and shoulders to guide a pen.

Terry and a multidisciplinary engineering student team, along with business student Melissa Brewer, have constructed prototypes; completed a business plan; applied for a provisional patent; and met with professionals in the fields of business, occupational therapy and engineering manufacturing. The National Collegiate Inventors and Innovators Alliance (NCIIA) awarded Terry and Brewer a \$14,395 grant to pursue a patent and develop testing models, and the two hope to obtain a licensing agreement with a medical manufacturing and distribution company.

Like Terry, all Rowan engineering students have the opportunity to undertake innovative research or product development in the required clinic sequence that undergraduates begin in their first semester.

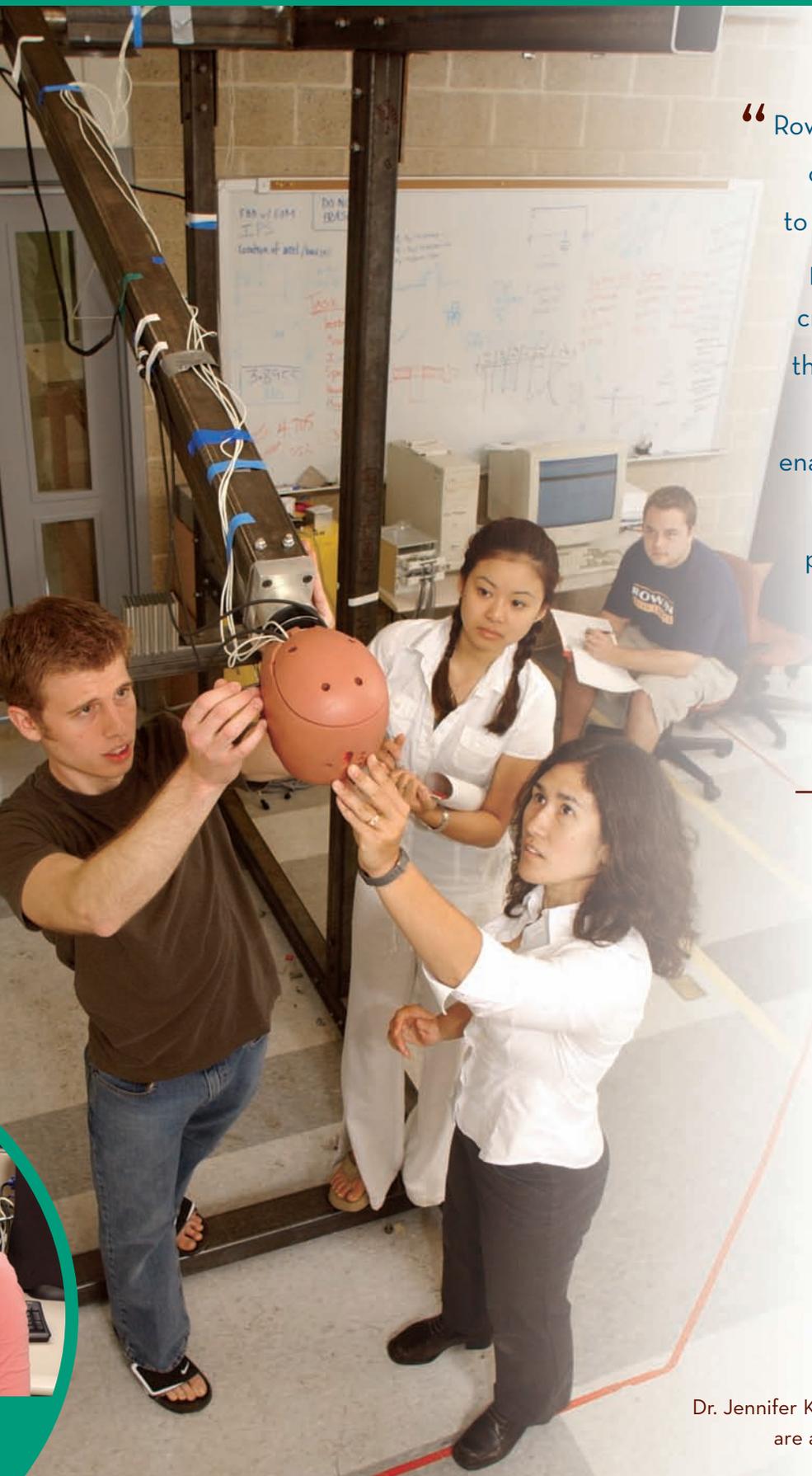
Another project this past year included ChemoTemp, an automatic fever detection device for cancer patients. The clinic team that designed ChemoTemp exhibited it at "March Madness for the Mind," an event sponsored by NCIIA that draws top student technology teams from around the country. Among other clinic activities this year, a team tested the effectiveness of various soccer helmets with the goal of alleviating the number of concussions that occur on the playing field. Another group worked with the Children's Hospital of Philadelphia to develop a better child-size crash-test dummy.

Clinic projects like the Helping Hand demonstrate that Rowan's hands-on approach to engineering education makes a difference. Rowan engineers consistently land meaningful internships, challenging jobs and high praise for their skills and accomplishments.

- Engineering clinics help students — from freshmen to seniors — learn how to solve problems by applying scientific and engineering concepts to a multitude of real-life, hands-on projects.
- Companies and government agencies that fund Rowan engineering clinic projects gain from the expertise found in the College; in turn, with the guidance of faculty members, students assume responsibility and enhance their skills.
- Clinics bring students with chemical, civil, environmental, electrical, computer and mechanical engineering skills together in collaborative multidisciplinary teams.
- Rowan Engineering offered 128 clinics this year, with typical teams ranging from three to five students.



Caitlin Terry (right), working with Melissa Brewer (left) and others, is developing a device that makes writing simpler for individuals with physical limitations.



“Rowan University’s hands-on, minds-on approach to engineering education provides students with critical experience from the start of their college careers. This method enables students to learn from textbooks and professors and, equally important, by ‘doing.’ This is an excellent way to help develop tomorrow’s engineers.”

1998 Nobel Prize winner  
Dr. Horst Stormer,  
Professor of physics and  
Applied physics at  
Columbia University and  
Adjunct physics research  
Vice president at Bell Labs

Dr. Jennifer Kadlowec (front) and students are analyzing crash test dummies.

# BEYOND THE CLASSROOM



Rowan students further their skills through participation in regional and national activities of professional societies, such as the Institute of Electrical and Electronics Engineers' Student Activities Conference hosted by Rowan in April.

- Rowan's Engineering program remains highly competitive: 570 students applied for the 120 seats open in the college for the fall of 2004.
- Rowan Engineering students continue to be successful. In 2004, 95 percent of Rowan Engineering graduates accepted jobs or attended graduate school.
- Recent graduate school choices by Rowan engineers include Clemson University, Penn State, the University of California-Irvine, the University of Medicine and Dentistry of New Jersey and Worcester Polytechnic Institute.

The "Dahminator" took first place when it stopped closest to the finish line at the spring ChemE car competition sponsored by the American Institute of Chemical Engineers (AIChE) Student Chapter, Mid-Atlantic Region, at Lafayette College in Easton, Pa. An eight-member Rowan team designed and tested "The Dahminator," a small vehicle powered by a chemical reaction and named for advisor Dr. Kevin Dahm, associate professor of chemical engineering.

The race is just one example of the activities that students enjoy when participating in Rowan chapters of professional societies.

"The chapter work reinforces and amplifies what is happening in the classroom, further emphasizing our hands-on, minds-on approach," said Dr. Steven Chin, associate dean of the College of Engineering.

Rowan also offers student chapters of the American Society of Civil Engineers (ASCE), the American Society of Mechanical Engineers (ASME), the Institute of Electrical and Electronics Engineers (IEEE), the Society of Automotive Engineers (SAE) and the Society of Women Engineers (SWE).

The groups' activities are wide ranging. This spring, students put their engineering, planning and organizational abilities to work on the IEEE 2005 Student Activities Conference (SAC). Chosen from 76 schools to host the SAC for the East Coast, Rowan welcomed about 200 students from 22 colleges and universities for a leadership training workshop; project showcase; and paper, hardware, robotics and ethics competitions. Among other projects, student groups built a concrete canoe for the ASCE races and designed and constructed a Mini-Baja™ vehicle for SAE regional trials.

Involvement in these organizations, Chin noted, enhances the close faculty-student relationships that characterize the College and provides added venues for students to further develop their engineering and interpersonal skills.



The team members who developed Rowan's ChemE car put their education to work to build a winner.



Rowan Engineering professors have a long history of winning professional awards. This year was no different, with faculty earning the Fahien Award, the Teetor Award and the Corcoran Award. The latest awards, like past ones, recognized Rowan Engineering professors for their dedication to teaching engineering as well as for their research.

The Chemical Engineering Division of the American Society for Engineering Education (ASEE) presented Dr. Kevin Dahm, associate professor of chemical engineering, with the 2005 Ray W. Fahien Award for his vision and contributions to engineering education.

Dahm said, “At Rowan, we’re all interested in engineering pedagogy, and I’m proud of the fact that I’m the fourth Rowan faculty member to win this award since 1999. It shows there are people outside Rowan who agree we’re doing something special here.”

The Society of Automotive Engineers honored Dr. Eric Constans, associate professor of mechanical engineering, with the Ralph R. Teetor Educational Award for preparing student engineers to meet the challenges of today’s world. The Teetor award recognized his contributions to teaching and curriculum development, research, leadership and participation in engineering society activities.

ASEE presented the 2005 William H. Corcoran Award for the paper titled “Developing Metacognitive Engineering Teams” to Dahm; Dr. Heidi Newell, assessment consultant for the College of Engineering; Dr. James Newell, professor of chemical engineering; and Dr. Roberta Harvey, assistant professor of composition and rhetoric in the College of Communication. The paper chronicled the professors’ investigations into engineering education. The award, which recognized the outstanding paper published in the journal *Chemical Engineering Education*, was particularly significant: it honored work that crossed traditional boundaries and featured input from multiple colleges at Rowan.

Rowan Engineering faculty members focus on both teaching and research, and the awards joined many others that honored their work in both areas.

- U.S. News & World Report ranked Rowan University 21st of “Best Undergraduate Engineering Programs” for the “Master’s Universities” category for 2005. The publication ranked Rowan’s Chemical Engineering program third, Mechanical Engineering 11th and Civil Engineering 12th among schools where the highest degree is a bachelor’s or master’s degree. And, in late-breaking news, Electrical Engineering ranked 14th in the publication for 2006.
- Of the Engineering faculty, 25 percent are women, higher than the national average.
- Research and sponsored projects by Rowan professors averaged \$3.5 million per year during the last three years.



Dr. Kauser Jahan (center) exemplifies the Rowan tradition of bringing leading-edge research to enhance student learning.



“ In all my experiences, what distinguishes Rowan professors is that they genuinely care. They always are going above and beyond to help you through a problem in class or in life. Rowan professors are constantly looking for ways to make topics exciting and stretch our ways of thinking to prepare us for the real world.”

Catherine Jeffries (ME, '00),  
Manager, Program Development  
for Coast Guard systems,  
Lockheed Martin Co.

Dr. Jim Newell (right, standing) brings his expertise to the table to train future engineers to work as part of a multidisciplinary team.

# INTO THE WORLD



A team under the leadership of Dr. Peter Jansson (rear) is working to install a photovoltaic system on campus.



Faculty and students traveled to Honduras, Bangladesh and Thailand (opposite page) to improve water systems.

A Rowan engineering faculty-and-student team chose an exotic place for spring break 2005, but it wasn't for a vacation. Instead, as volunteers with Engineers Without Borders™ (EWB), the team traveled to the Chiang Mai Province of Thailand to install a water distribution system to serve school children.

The additional water will help the Ban Pa Tung villagers realize their dreams of expanding their school and housing the boys and girls who travel long distances to attend class. To make that happen, the Rowan group worked for months to design the water distribution system, identify proper equipment to use for water-quality testing and surveying work, raise money for the trip and learn about the culture.

“The project helps the people, providing them with water, which they don't have in adequate supply,” said Dr. Yusuf Mehta, assis-

- Through a \$250,000 grant from the U.S. Environmental Protection Agency, faculty and students from the College of Engineering worked with the College of Liberal Arts & Sciences to develop educational activities and presentations about Camden County and Gloucester County watersheds for area schools
- For the past seven summers, the College has held Attracting Women Into Engineering (AWE). About 100 girls entering seventh and eighth grades in South Jersey attended the 2005 AWE program to explore various areas of engineering in a hands-on fashion, making everything from lip gloss to bottle rockets, and to learn the benefits of studying math and science.
- Each year, Rowan students work with Girl Scouts and 4-H groups on fun and educational projects to encourage participants to consider engineering studies for their college education.
- Students at the Academy for the Engineering Sciences, Williamstown, and the Salem County Arts, Science, and Technology High School's Chemical Engineering and Technology Academy gain valuable knowledge and experience through partnership activities with the College of Engineering. Qualified students also earn a seat in the Rowan Engineering program.

tant professor of civil and environmental engineering. Mehta said the Rowan group, along with the Columbia University EWB™ chapter, constructed a two-mile long pipe to supplement an existing water pipe.

Making a difference isn't new for Rowan engineers: faculty and students helped provide clean drinking water, wastewater management and irrigation through an EWB™ project in the Yoro District of Honduras, and a team from Engineering and the College of Liberal Arts & Sciences worked to remove arsenic from drinking water in Bangladesh. On campus, students have sited, designed and are obtaining permits for a photovoltaic system expected to be installed this autumn that will provide Rowan with a renewable energy source to help reduce campus greenhouse gases.

These projects and past and potential projects, including work on a Sioux reservation through the EWB™, reflect Rowan Engineering's commitment to assisting others.

“ I know that Engineers Without Borders™ will remain a defining point not only in my education at Rowan but also in my development as a socially conscious engineer and citizen. Putting what I've learned in class through the great professors at Rowan to work in the field has been rewarding. ”

Mason DeFrank (CE, '06)



Rowan engineers are putting a new fire extinguisher nozzle to the test to determine whether a plastic prototype performs as well as a metal model under a one-year contract awarded to the University by the Federal Aviation Administration's (FAA) William J. Hughes Technical Center, Pomona.

Tim Vaughn (ME '05), and Dan Stephens (ME '05), have been developing an alternative to a fire extinguisher nozzle patented by FAA chemist Bob Filipczak.

"This is a case where an FAA (staff member) designed a product to meet an aviation need, but the product may serve other purposes well beyond the realms of aviation," said Deborah Germak, FAA Technology Transfer program manager.

Rowan's project goal is to develop a disposable, less-expensive version of the brass-and-copper original, which takes two hours to manufacture by hand. As part of the project, Rowan MBA students have been determining what would make commercial manufacturing of the nozzle feasible and evaluating its possibilities for wider adoption and use in non-aviation applications.

Similar projects are envisioned for the future South Jersey Technology Park at Rowan University, for which ground is expected to be broken in the near future. The Technology Park will expand the research and learning environment of Rowan and will provide facilities for start-up and established companies to bring innovative technologies to the marketplace and promote social and economic growth for the region.

“The Technical Center’s partnership with Rowan University epitomizes the spirit of technology transfer legislation, as well as the President’s mandated R&D initiatives to support technological innovation; strengthen science, mathematics and engineering education; and strengthen partnerships.”

Deborah Germak, FAA Technology Transfer program manager

- Rowan will collaborate with The New Jersey MotorSports race track in Millville to test emissions from diesel vehicles and school buses at the facility as well as conduct trial runs with the Rowan Mini-Baja™ in the MotorSports' all-terrain vehicle area.

- The South Jersey Technology Park at Rowan University will provide new engineering clinic opportunities while fostering science and technology initiatives and promoting community development.

- The College of Engineering partners with Gloucester County to further economic growth and development. Rowan's academic core, with a high-tech focus expanding through the South Jersey Technology Park, complements the area's rich agri-business and strong industrial base.



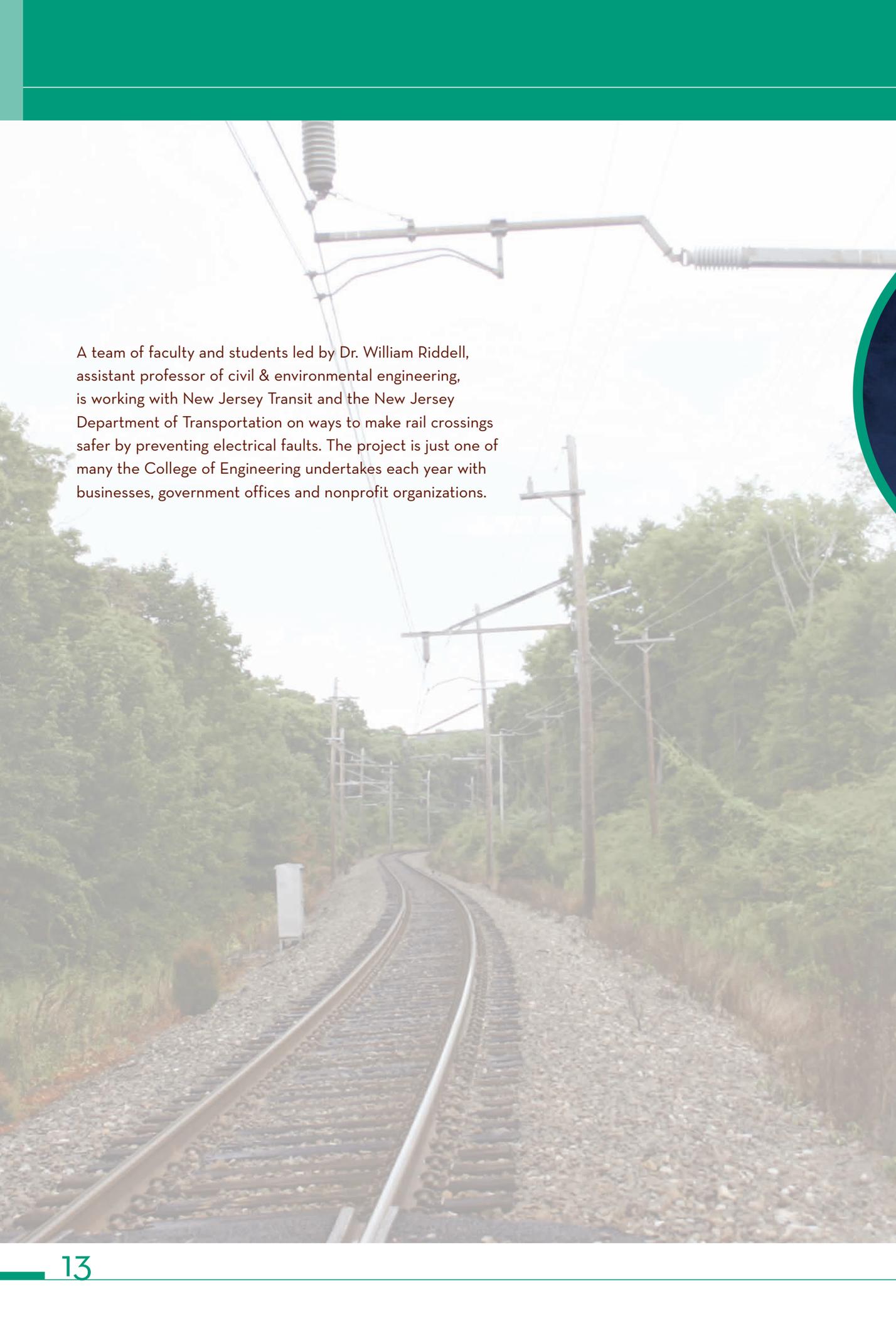
Tests prove the effectiveness of a new fire extinguisher nozzle.



Rowan is working with the FAA on a new fire extinguisher nozzle based on one developed by FAA chemist Bob Filipczak (left).

“ Working on the FAA project has provided me the opportunity to get my hands dirty with engineering that will save lives. It is a very rewarding project. It has been enriching to see a model’s journey from concept to working prototype, which has allowed me to handle not only the engineering aspect of product design but also the business side of bringing a product to market. ”

Dan Stephens (ME '05)



A team of faculty and students led by Dr. William Riddell, assistant professor of civil & environmental engineering, is working with New Jersey Transit and the New Jersey Department of Transportation on ways to make rail crossings safer by preventing electrical faults. The project is just one of many the College of Engineering undertakes each year with businesses, government offices and nonprofit organizations.

## DEAN'S ADVISORY COUNCIL



Finding and hiring exceptional engineers can be a daunting task, but southern New Jersey business and industry are fortunate to have candidates nearby who are ready to make an immediate contribution in the workplace. Rowan's College of Engineering prepares students with outstanding engineering skills – as well as excellent verbal and written communication skills – who upon graduation can walk into virtually any situation and collaborate in a team environment. These engineers have all the capabilities that most engineering recruiters say they want in a new employee.

The Rowan approach to engineering education, perhaps once thought of as novel or revolutionary, now is looked on by peer institutions and by industry as a model approach for preparing students to develop exactly the skills needed in today's world.

Rowan Engineering, through engineering clinics, lab projects and internships, gives students practical experience that provides better preparation for future jobs and eliminates the bewilderment that sometimes accompanies the start of employment following graduation. A Rowan graduate, who already may have served an internship with his or her new employer and who gained valuable hands-on experience during four years of clinics, labs and projects, often is better prepared than students from other institutions.

Rowan can be proud of its engineering graduates, and business and industry can be confident in hiring these fine young men and women.

**Chet Dawson**  
**Chairperson**  
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**Sony DADC**