



2006-2007 Annual Report

Rowan University College of Engineering

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COVER: **Dhaval Kumar Naik**, a mechanical engineering major, prepares to analyze airflow over a tennis ball positioned in front of a wind tunnel.

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Engineers use scientific knowledge to solve real-world problems.

Throughout the past century, engineering has matured as an academic discipline with tightly focused approaches in areas such as chemical, civil, electrical and mechanical engineering. As we address the challenges of the future, our educational structure must ensure that all engineers are able to work and communicate effectively with colleagues in other fields – including those outside engineering, such as the sciences, business and marketing. Because these challenges know no borders, our engineers must be able to seamlessly respond globally, ready to understand cultural differences and technical requirements on an international scale.

At Rowan, we work to ensure that students acquire core knowledge, combining their perspective with others to solve constantly evolving problems. There are countless areas emerging – materials science, wireless networks, bio- and nanotechnologies, imaging and transportation – that require tomorrow’s knowledge and interaction to be built on today’s abilities.

A signature strength of our College is the innate collegiality among our faculty, not only within Engineering, but throughout the University. Our engineering clinics play a critical role in promoting this strength through interdisciplinary relationships that extend beyond University boundaries. These collaborations are firmly grounded in our industrial partnerships.

Annually, we pause to consider the year’s activities. This report reflects highlights that mirror some of the outstanding work showcased by our engineering clinics. I believe that the clinics provide the best preparation for our students for the world of the 21st century.

Dianne Dorland

Dianne Dorland
Dean of Engineering



Rowan Engineering graduate students **David Martinez** and **Mark Wessel** (ME '06) and **Timothy Vaughn** (ME-BS '05, MS '06) (left to right) review school bus air quality data.



“They work in teams every semester and learn skills by ‘doing’ engineering.”

– Dr. Robert Hesketh

RIGHT: The Rowan blimp team entry won a Greater Philadelphia regional collegiate competition this spring.

Clinics Open Doors for Engineering Students

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If there was something in the air in New Jersey school buses, Rowan engineering researchers were committed to finding it.

In response to a request from the state, students in a clinic team led by Dr. Robert Hesketh, professor and chair of Chemical Engineering; Dr. Anthony Marchese, associate professor and chair of Mechanical Engineering; and Dr. Krishan Bhatia, assistant professor of mechanical engineering, measured the pollutants found inside a bus as well as the effectiveness of crankcase and tailpipe filters to reduce them. Using Rowan-developed methodology, researchers simulated 39 bus runs on a special track at the Aberdeen Testing Center in Maryland.

“Test results from the Rowan study will be used by the state to determine whether tailpipe or crankcase retrofits would significantly reduce a child’s exposure to and associated health risks from pollutants,” Marchese said.

This project is just one of the 148 clinics the College conducted during the past year on such diverse topics as developing alternate energy sources, assessing water quality and building a blimp. “Right from freshman year students have clinic project experience,” Hesketh said. “They work in teams every semester and learn skills by ‘doing’ engineering.”

“There is a breadth of experience that a student gets in a clinic,” Hesketh added. “The clinic provides the vehicle for students to work in areas that excite them and will lead to a job after graduation.”



Earlier diagnosis and treatment of Alzheimer's disease may result from research by Rowan's College of Engineering in collaboration with the University of Pennsylvania School of Medicine and Drexel University.

In a \$1.1-million study funded by the National Institute on Aging of the National Institutes of Health, the team determined that early Alzheimer's could be diagnosed with a high rate of accuracy through evaluating electroencephalogram (EEG) signals.

Dr. Robi Polikar, associate professor of electrical and computer engineering, and his students analyzed EEG data to study cerebral markers previously not associated with Alzheimer's. Though Alzheimer's cannot be confirmed until a patient has died and the brain examined, the EEGs of 71 patients provided results 82 percent of the time that matched more complex, long-term procedures used at world-class university and research hospitals.

That is good news for people who are evaluated at community hospitals and clinics, where the diagnostic accuracy is estimated to be around 75 percent. The results are even more significant considering the EEG-based diagnosis is made from a single evaluation instead of the long-term monitoring more typically required.

The Alzheimer's project joins other research efforts in the College, including ongoing pavement analysis for the Federal Aviation Administration in Pomona, N.J., and catalytic converter recycling work for Johnson Matthey, an international specialty chemical company with local offices in West Deptford, N.J.

Dr. Steven Chin, associate dean of engineering, said, "Rowan Engineering faculty members routinely collaborate on research with other organizations to contribute to experiential learning, which is a hallmark of a Rowan engineering education."

Tarah Coward, a civil and environmental engineering major (left), measures the maximum specific gravity of hot mix asphalt, which is used in roadways, with **Dr. Yusuf Mehta**, associate professor of civil and environmental engineering.



An Engineering team analyzed patient electroencephalogram signals previously not associated with Alzheimer's disease. Graduate student **Brian Balut** (ECE '06); **Joseph DePasquale** (ECE '07); **Anthony Furiato**, chemical engineering major; **Dr. Robi Polikar**, associate professor of electrical and computer engineering; **Matthew Karnick** (ECE '07); and **Michael Bell** (ECE '07) (clockwise from lower left) participated in the project.



“Rowan Engineering faculty members routinely collaborate on research with other organizations to contribute to experiential learning, which is a hallmark of a Rowan engineering education.”

- Dr. Steven Chin



Electric ATD Neck Biofidelity
for Development

Ligamentous C-Spine
Experiments From
Literature

Active Cervical Range of
Motion (CHOP)



Model - No
Muscle
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Lawrence Greco, a mechanical engineering student, studies the cervical range of motion in children and adults using a crash dummy to simulate the effects of an actual automobile accident.

What effect do dimples have on the lift and drag of a golf ball? Where is the sweet spot on a tennis racket?

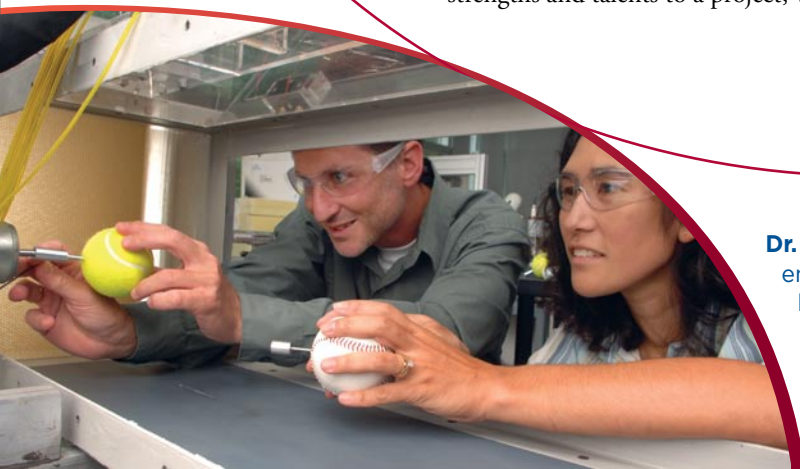
Through a three-year, \$175,000 grant from the National Science Foundation, Dr. Jennifer Kadlowec, associate professor of mechanical engineering, and her colleagues at Drexel University, Gloucester County (N.J.) College and Rowan are using the answers to these questions and others to develop new teaching modules and, at the same time, invigorate engineering education at the collaborating institutions.

All three schools will use the engineering modules resulting from the effort. “We’re developing laboratory experiments, handouts and teacher guides that we are sharing,” Kadlowec said.

At Rowan, the collaboration will contribute to freshman clinic and senior elective courses. The work also is benefiting younger students: Kadlowec presented a module on the physics of tennis to the South Jersey middle school science and math teachers who attended Rowan’s Engineering Clinics for Teachers, which assists educators in introducing engineering concepts to their students.

The collaboration is just one of many by the College. Other efforts by Engineering faculty include work with the Children’s Hospital of Philadelphia to study the mechanical behavior of the necks of child-size crash test dummies and with the National Institutes of Health and the University of Pennsylvania on Parkinson’s disease diagnosis.

“There are advantages in working with other universities and with county colleges,” said Dr. Dianne Dorland, dean of the College of Engineering. “We all bring different strengths and talents to a project, which results in better engineering education.”



Dr. Jennifer Kadlowec, associate professor of mechanical engineering (right), sets up an experiment to determine lift and drag forces on a tennis ball with collaborator **Dr. Howard Pearlman**, associate professor of mechanical engineering, Drexel University.

Engineering Partners to Advance Industry Processes

This spring, Dr. Brian Lefebvre, assistant professor of chemical engineering, led a faculty-student team seeking a more efficient process to remove heavy metals from mixtures used for pharmaceutical production. Novartis Pharmaceuticals Corp., East Hanover, N.J., funded the project, which uses a fixed bed absorption column to increase recovery of palladium from drug substances and reduce contaminated environmental waste.

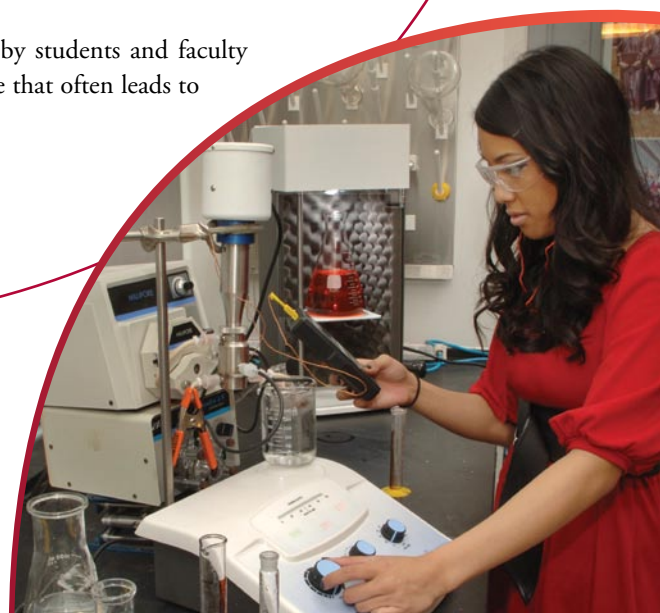
Rowan Engineering is continuing the work for Novartis this fall and also is adding a new, related project to investigate the best method to apply the column approach to other manufacturing processes. The new effort is funded by a grant from the U.S. Environmental Protection Agency.


As with the other projects undertaken by the College of Engineering in concert with its more than 260 industrial affiliates and partners – such as fog chamber development work for RL Associates in Chester, Pa., and a cell culture dispensing system for the Coriell Institute for Medical Research in Camden – professors and students worked on the pharmaceutical project in Rowan labs, held in-person meetings on campus or at the company site and discussed progress via regular teleconferences, Lefebvre said.

“In these real-world projects, students see the application of chemical engineering research in a tangible way and see how their work can impact real-world processes,” he said.

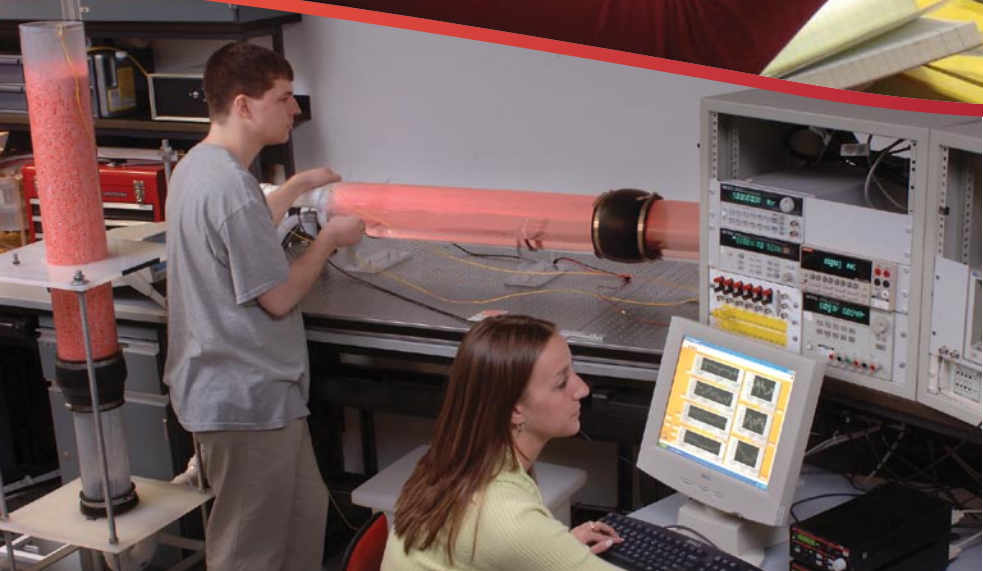
Lefebvre added that industry benefits from the involvement by students and faculty members, and students gain the kind of application experience that often leads to internships and jobs.

Amy Beronilla, a chemical engineering student, uses a sonicator, which breaks up particles and particle aggregates using sound waves, to extract materials from inside a cell.





Dr. Brian Lefebvre, assistant professor of chemical engineering (above), and **Sonia Berberena** (ChE '07) examine a sample from a reaction used in the pharmaceutical industry.



Matthew Costill, a chemical engineering major (left), adjusts the airflow in a fog chamber while **Ashley Wiedemer**, a civil and environmental engineering major, monitors the chamber's data collection system. The chamber tests how well an imaging system works in firefighting conditions.



During spring break, a team of Rowan Engineering students and faculty traveled to Senegal to work on a water project through Engineers Without Borders-USA™. The Rowan team included **Dr. Joshua Wyrick**, assistant professor of civil and environmental engineering, with students **Paul Russo**, civil and environmental engineering; **Michael Berry**, civil and environmental engineering; **Christy Walker**, electrical and computer engineering (back row, left to right) and **Megan Brown**, civil and environmental engineering (front row, second from right).

“Our outreach also helps encourage students, either directly or indirectly through their teachers, to consider engineering careers.”

– Dr. Dianne Dorland

RIGHT: Middle school girls watch the launching of a bottle rocket they built during the summer program, Attracting Women to Engineering, held on campus.

A Rowan team traveled to Africa to help others over spring break and began work on a new water system in Ngonine, Senegal, through Engineers Without Borders-USA™ (EWB-USA™).

Team member Paul Russo, a junior civil and environmental engineering major from Middletown, N.J., helped gather information for the system, which will reduce the two-mile distance Ngonine villagers must walk to get water. “The experience was great,” Russo said. “This had an added reward because we met the people and saw the difference the project will make.”

In addition to EWB-USA™ projects, Rowan Engineering reaches out in many ways. For almost a decade, the Attracting Women to Engineering program has introduced middle school girls to engineering disciplines through such hands-on activities as building bottle rockets and making lip gloss. Engineering Clinics for Teachers, funded by a three-year, \$326,000 grant from the Edison Venture Fund, helps middle school teachers incorporate engineering activities into existing curricula. And, as the New Jersey Project Lead the Way affiliate, the College supports the national organization in its work to promote educational opportunities in middle school and high school curricula for tomorrow’s engineers.

“Through our outreach efforts, we show that engineering positively impacts people and society around the world,” said Dr. Dianne Dorland, dean of the College of Engineering. “Our outreach also helps encourage students, either directly or indirectly through their teachers, to consider engineering careers.”



Joseph Lopez credits Rowan engineering clinics with jump-starting his engineering career. “The clinic projects put you in a leadership role, and that’s the best preparation for being a leader,” the 2007 graduate said. “You have to step up and do what needs to be done. Public speaking, writing and presenting are all part of it.”

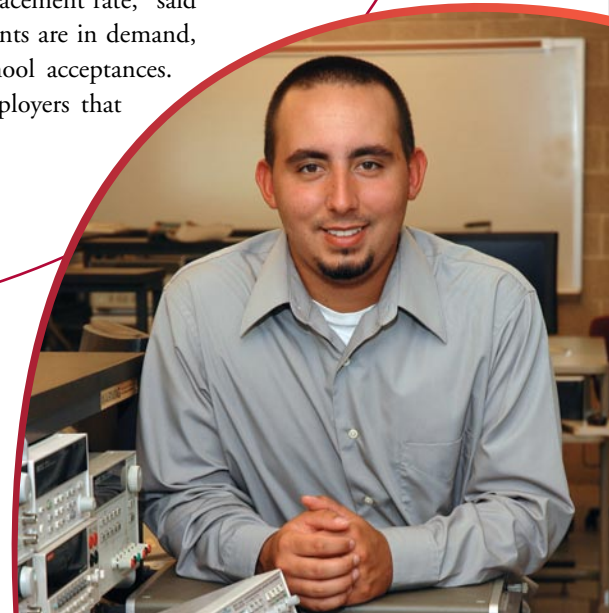
The electrical and computer engineering graduate embarked on his career this summer at the Naval Surface Warfare Center in Philadelphia, where he previously interned. He plans to earn a master’s degree, and he aspires to be a senior engineering manager.

This past year, Lopez honed his engineering skills on real-world clinic projects, including one that evaluated superconductors in extreme conditions. He also managed volunteers for a Hurricane Katrina-related rebuilding effort and volunteered after graduation for the Williamstown High School Engineering Academy Summer Seminar, which introduced students to hands-on engineering experiences.

Like Lopez, this year’s 91 engineering graduates are prepared for their next step, thanks to the College’s hands-on, multidisciplinary team approach. Some have accepted positions at DuPont, Lockheed Martin and the Naval Air Systems Command, among other organizations, while others have been accepted to law school or graduate school.

“Placement rates have been consistent since our first graduating class in 2000. This year’s placement is on track to match last year’s 99-percent placement rate,” said Melanie Basantis, director of outreach. “Rowan Engineering students are in demand, and many have had several career opportunities or graduate school acceptances. In addition, the College has received positive feedback from employers that Rowan alumni are efficient employees who get the job done.”

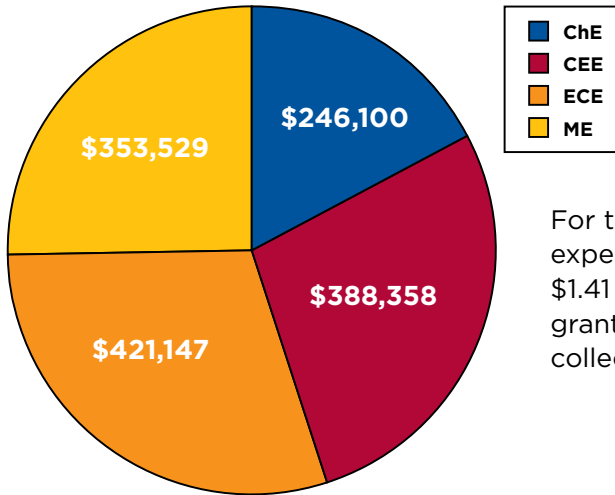
Joseph Lopez (ECE '07) kicked off his career with a position at the Naval Surface Warfare Center in Philadelphia this summer.





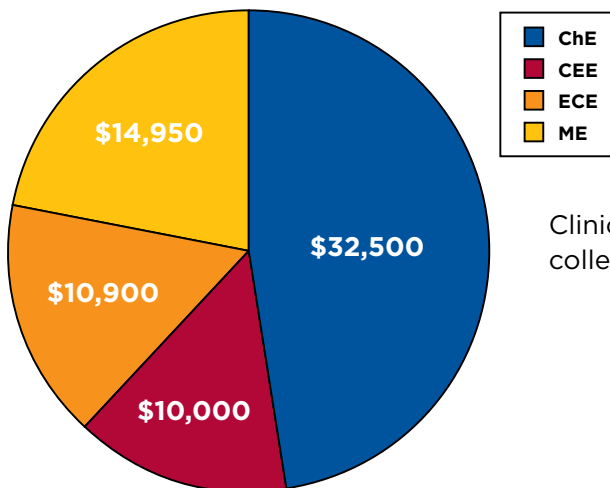
Mechanical engineering majors **James Kostic** (left) and **Christopher Rakus** interned at the Naval Surface Warfare Center in Philadelphia, where the completed superconductor testing apparatus is installed.

Research Expenditures by Discipline



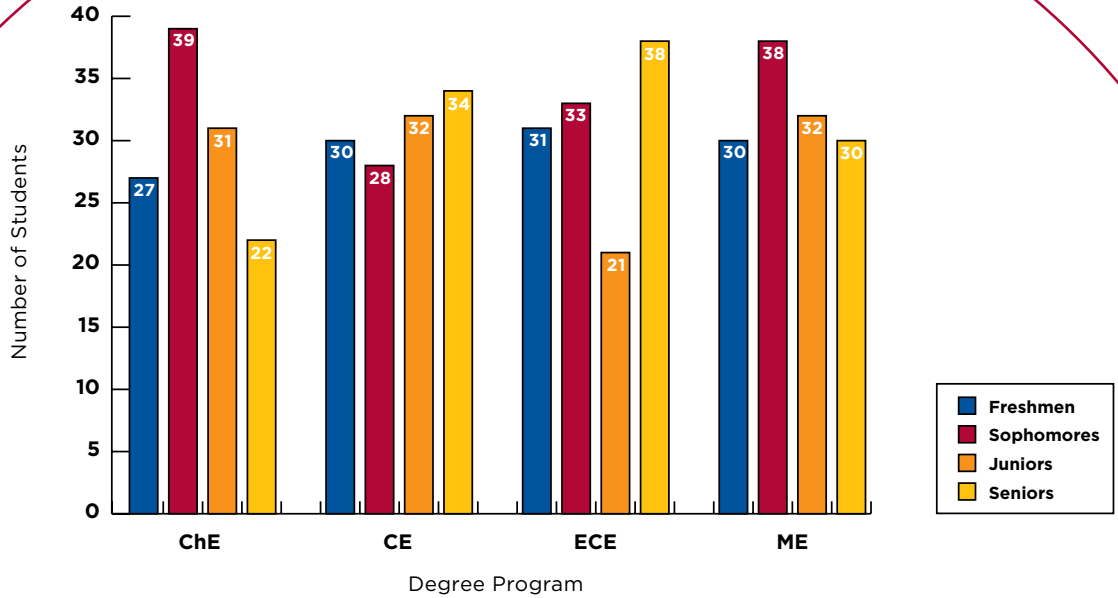
For the fiscal year, research expenditures collectively totaled \$1.41 million, and government grants and contract awards collectively totaled \$1.25 million.

Clinic Affiliate Funding



Clinic affiliate funding collectively totaled \$68,350.

Class Year and Program



Incoming Freshman Profile, Fall 2006*

SAT Score (Critical Reading)	592
SAT Score (Mathematics)	662
High School Class Rank	Top 13%
Grade Point Average	3.78

*Average statistics of students accepted into engineering program.

Letter from the Chairperson, Dean's Advisory Council

The business world continues to expand rapidly, and to be successful, companies must adopt a global perspective.

Many countries outside the United States recognize that, in addition to their technical skills, engineers need to understand the customs and traditions of various nations in order to conduct business. Engineers from these countries are very knowledgeable about American history, geography and habits. In China, for example, many major universities now require new students to pass an English competency exam. Our country's future engineers will be at a disadvantage if they are not similarly prepared to conduct business in foreign countries.

Rowan's College of Engineering already prepares engineers to be successful in the business world through the College's clinic sequence that begins in a student's freshman year. Students develop and refine their problem-solving, writing and public speaking skills through real-world projects and learn to work in multidisciplinary, collaborative teams.

We on the Dean's Advisory Council are happy to see that the College also is committed to its students being successful in a global marketplace. The College is taking the next step to prepare its students for today's expanding business world through such projects as studying sand particle crushing with colleagues at the University of Western Australia and the University of Sydney, and attending the 5th annual conference of the Latin American and Caribbean Consortium of Engineering Institutions in Tampico, Mexico.

Through this approach, graduating Rowan engineers are ready to take a global view as they enter an international marketplace.

Sincerely,



Chester A. Dawson

Chairperson, Dean's Advisory Council
Director Site and Environmental Engineering
Sony DADC Americas Region
Sony DADC

Chester A. Dawson, chairperson of the Dean's Advisory Council (right), speaks at the group's recent meeting.



Engineering Earns High Ranking

U.S. News & World Report has once again ranked Rowan's College of Engineering a standout. In the 2008 edition of "America's Best Colleges," the College ranked 16th among the nation's undergraduate engineering programs (172 institutions) whose highest degree is a bachelor's or master's. Within the discipline areas, the individual Rowan engineering programs ranked as follows:

Chemical Engineering	2nd
Civil and Environmental Engineering	11th
Electrical and Computer Engineering	8th
Mechanical Engineering	9th

Graduate student **Matthew DeNafo** (left) and **Danielle Scrivani** (CEE '07) take part in a clinic project that uses the Chinese brake fern to remove arsenic from water. Clinic projects form an integral part of an education in Rowan's College of Engineering, which has received recognition again as one of America's Best Colleges by U.S. News & World Report.





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