

SPREADING OUR WINGS



2017 ANNUAL REPORT

HENRY M. ROWAN COLLEGE OF ENGINEERING

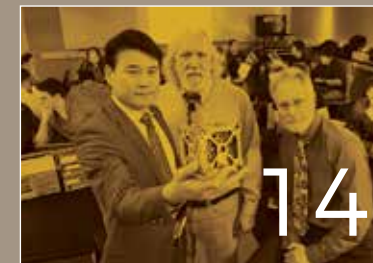


RowanUniversity

HENRY M. ROWAN
COLLEGE OF ENGINEERING

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Message From the Dean

It's appropriate that the design of our new engineering complex is called wingspread – a term that evokes strength, energy and expansion.

During the last year, the Henry M. Rowan College of Engineering reflected all of those traits and more. Not only did we open the doors to Engineering Hall – our new state-of-the-art building – but we also began fully renovating our original home, Rowan Hall, and unveiled our new transportation research facility, the Center for Research and Education in Advanced Transportation Engineering Systems (CREATEs).

Additionally, we increased our full-time faculty by 20 percent and served a record number of undergraduate and graduate students. We witnessed increases in our research awards in areas such as diversity, engineering entrepreneurship, biomedical devices and materials, transportation and sustainability. *U.S News & World Report* recently ranked our college 19th in our category – moving us up 18 places in just five years.

The recent growth and accolades are merely a snapshot of the continued trajectory and momentum of this college. Yes, “wingspread” is relevant for our college, which indeed has grown and continues to spread its wings. Our students will continue to benefit as we enhance our programs, invest in our facilities and further our research. Our legacy has been and our mission remains to graduate engineers equipped to handle the demands of their fields and lead us in innovation. We are proud of that legacy and are now better positioned than ever before to deliver on that mission.

Anthony Lowman, Ph.D.
Dean



Breaking New Ground in Engineering Diversity



Beena Sukumaran has a bold goal: Enhancing diversity and inclusion in engineering education.

Sukumaran and her team will conduct research and implement strategies aimed at improving the representation of women, minorities and other underserved groups in engineering. The ambitious five-year project – “RevED” (Revolutionizing Engineering Diversity) – was jumpstarted by a \$1.92 million grant from the National Science Foundation (NSF), the largest NSF grant ever awarded to a Rowan professor.

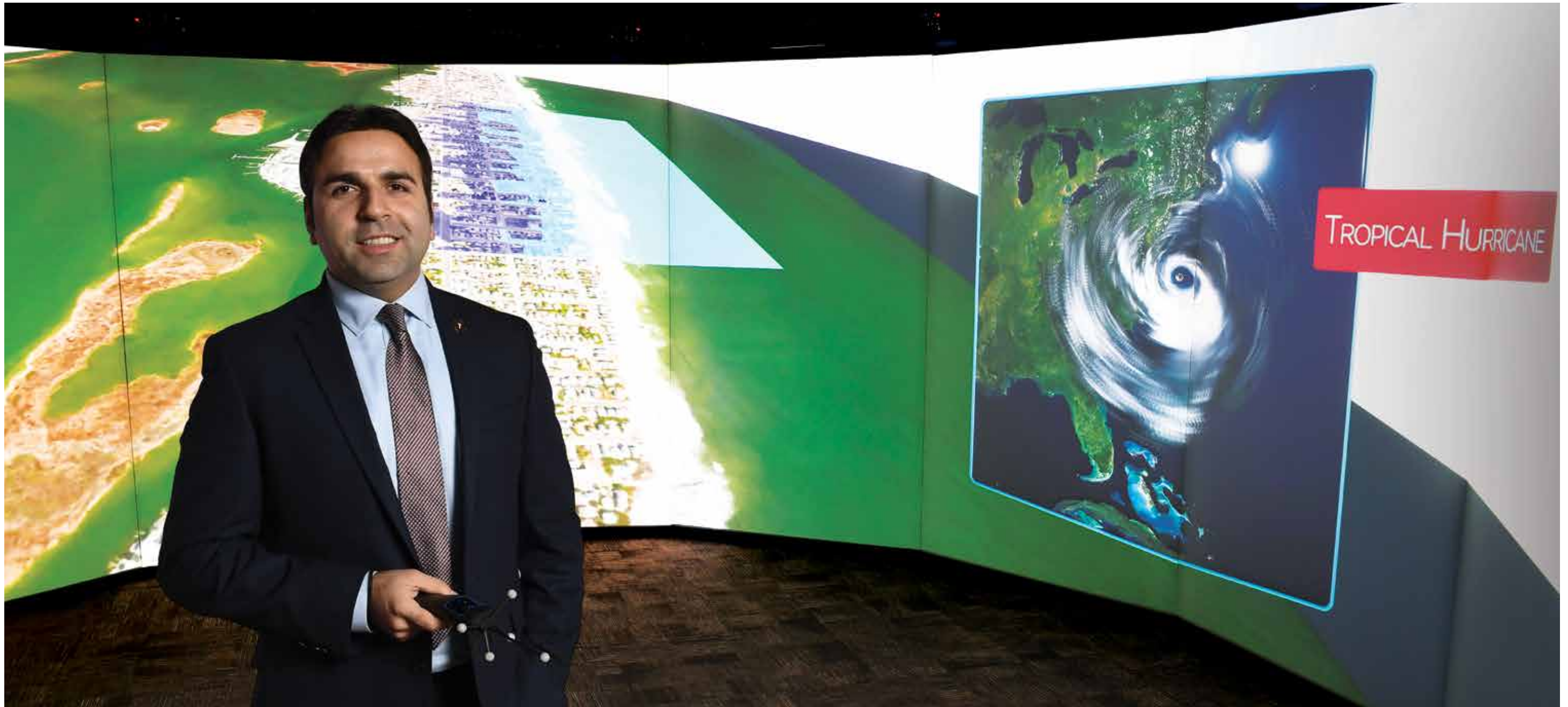
RevED utilizes a multi-faceted approach aimed at promoting greater inclusiveness in areas such as engineering admissions, curriculum design and teaching pedagogy. The team is focusing initial efforts on drawing more women and underrepresented populations to the Civil and Environmental Engineering Department at Rowan. Sukumaran and her team plan to expand the initiative to other departments in the Henry M. Rowan College of Engineering and to other universities as well.

“Our hope is that this effort results in something that is truly groundbreaking in advancing diversity,” said Sukumaran, professor of civil and environmental engineering. “When we bring together a diverse group of students, we enhance every student’s academic experience and better prepare our future engineers.”

Dr. Beena Sukumaran, president’s fellow and professor of civil and environmental engineering, helps students develop inclusive lab experiments as part of Rowan’s engineering diversity initiative.

Reducing the Impact of Extreme Weather

Dr. Rouzbeh Nazari, assistant professor of civil and environmental engineering, shows a hydrodynamic model, developed in Rowan's Virtual Reality Center, that displays flooding scenarios along the coast of New Jersey during extreme weather.



Researchers at the Henry M. Rowan College of Engineering are turning storm management into a science for New Jersey communities.

In collaboration with the New Jersey Department of Community Affairs, Rowan is developing a resiliency hub that will feature hydrodynamic mapping of the entire state, enabling municipalities to improve their storm-

planning efforts via access to the most up-to-date information available. The core of the hub will be an advanced computer model that will allow users to visualize weather data, run simulations of possible storm outcomes and pinpoint response activities for specific neighborhoods.

"Our goal is to help the State improve storm-related decision making before, during and after major weather

events," said Rouzbeh Nazari, assistant professor of civil and environmental engineering, who is spearheading the development of the hub.

Nazari and his team are collecting data for the web-based model. It will include such details as the baseline of the ocean and river levels and statewide topographical statistics. Rowan's Virtual Reality Center, located at the

South Jersey Technology Park, is supporting the development of the model, providing the capabilities that will enable users to plug in variables and simulate weather situations.

"We're aiming to eliminate the guesswork in storm planning and response," added Nazari.



Improving the Nation's Infrastructure

A hangar at the South Jersey Technology Park is the site of transportation research that is poised to enhance the nation's roadways and runways. The 50-foot by 90-foot structure is the home of the Center for Research and Education in Advanced Transportation Engineering systems (CREATEs), which opened last fall.

At the facility, teams of Rowan faculty and students partner with public entities and manufacturers to improve construction materials and pavement technologies. Aiding their efforts is a Heavy Vehicle Simulator (HVS), which can mimic a decade's worth of traffic on roadways and airport runways in less than a year. With the HVS, researchers can gain quicker answers to how materials will perform in a range of conditions, reducing the time needed to perfect new pavement surfaces from years to months. Rowan is the only college or university in the Northeast to house an HVS.

The State of New Jersey, the U.S. Army Corps of Engineers and the New Jersey Department of Transportation invested \$5 million to help launch CREATEs.

Yusuf Mehta, professor of civil and environmental engineering and director of CREATEs, said the facility is a powerful example of public and private sector collaboration. "CREATEs combines federal and state support with a premier academic program to conduct the practical research that will help solve real challenges in our transportation infrastructure," Mehta said.

Left: Dr. Yusuf Mehta, professor of civil and environmental engineering and director of the Center for Research and Education in Advanced Transportation Engineering systems (CREATEs).

Middle: CREATEs employees Ayman Ali, manager (left), and Ian Sennstrom, lab coordinator, work at the center's data acquisition system.

Right: The Heavy Vehicle Simulator (HVS) significantly reduces the time needed to test and develop new pavement materials. Rowan is the only college or university in the Northeast to house an HVS.

Opening the Doors to a Bright Future

With the opening of Engineering Hall, Rowan Engineering continues to fulfill the vision of Henry M. Rowan to create “great engineers.”

“Educating the students here to be great engineers is just what we are doing,” said Virginia Rowan Smith, a member of the Rowan University Board of Trustees, echoing her late father’s sentiments at the grand opening in January 2017 of the new Engineering Hall. “(My father) wanted our program to be exceptional, and it truly is.”

The building enables the Henry M. Rowan College of Engineering to increase its enrollment to 2,000 undergraduate and graduate students by 2023; expand its programs; and grow its collaborations with business, industry and government agencies. The State of New Jersey funded \$46 million of the \$70.6 million, 88,000-square-foot structure through the 2012

New Jersey Building Our Future Bond Act.

Symbolic of the College’s continued growth and expansion, the design of Engineering Hall is dubbed “wingspread.” The facility triples the College’s usable space and provides dedicated infrastructure for expanded research and education missions. Among other amenities, it houses wireless communication, water and hydrology, and cell culture labs; dedicated STEM outreach facilities; and a sustainability wing.

Along with the College’s original Rowan Hall – to which it is joined by a third-floor pedestrian bridge – Engineering Hall is a gateway to the campus.



Creating the Next Generation of Entrepreneurs



Dr. Stephanie Farrell, professor and founding chair of the Experiential Engineering Education Department.

The Henry M. Rowan College of Engineering developed innovative programs to train a future generation of entrepreneurial engineering leaders and was accepted as a partner in the Kern Entrepreneurial Engineering Network (KEEN) in fall 2016.

The College launched the Experiential Engineering Education Department (ExEED) to provide a home for Rowan's signature freshman and sophomore clinics as well as the umbrella for the Engineering Entrepreneurship major, which offers a flexible curriculum and personalized learning experiences. Coupled with course work from the William G. Rohrer College of Business, this new program provides students with the knowledge, critical-thinking skills and business acumen needed for leadership roles in their careers.

"The program incorporates experiential and technical learning opportunities to help develop an entrepreneurial mindset," said Stephanie Farrell, ExEED chair. "Our acceptance into the KEEN network will further help link engineering and entrepreneurship."

After ExEED launched, Rowan Engineering applied for membership into KEEN's network. KEEN's mission is to "unleash engineering" by supporting learning environments where creativity flourishes and fostering a network of academic collaborations between high-performing engineering programs. The College shares KEEN's vision that entrepreneurship and engineering will become synonymous.

"The Engineering Entrepreneurship major also will bring together Rowan's Engineering and Business colleges, KEEN and industrial partners, further exposing students to industry stakeholders and opportunities," Farrell said.



Dr. Vince Beachley in the Biomedical Engineering lab.

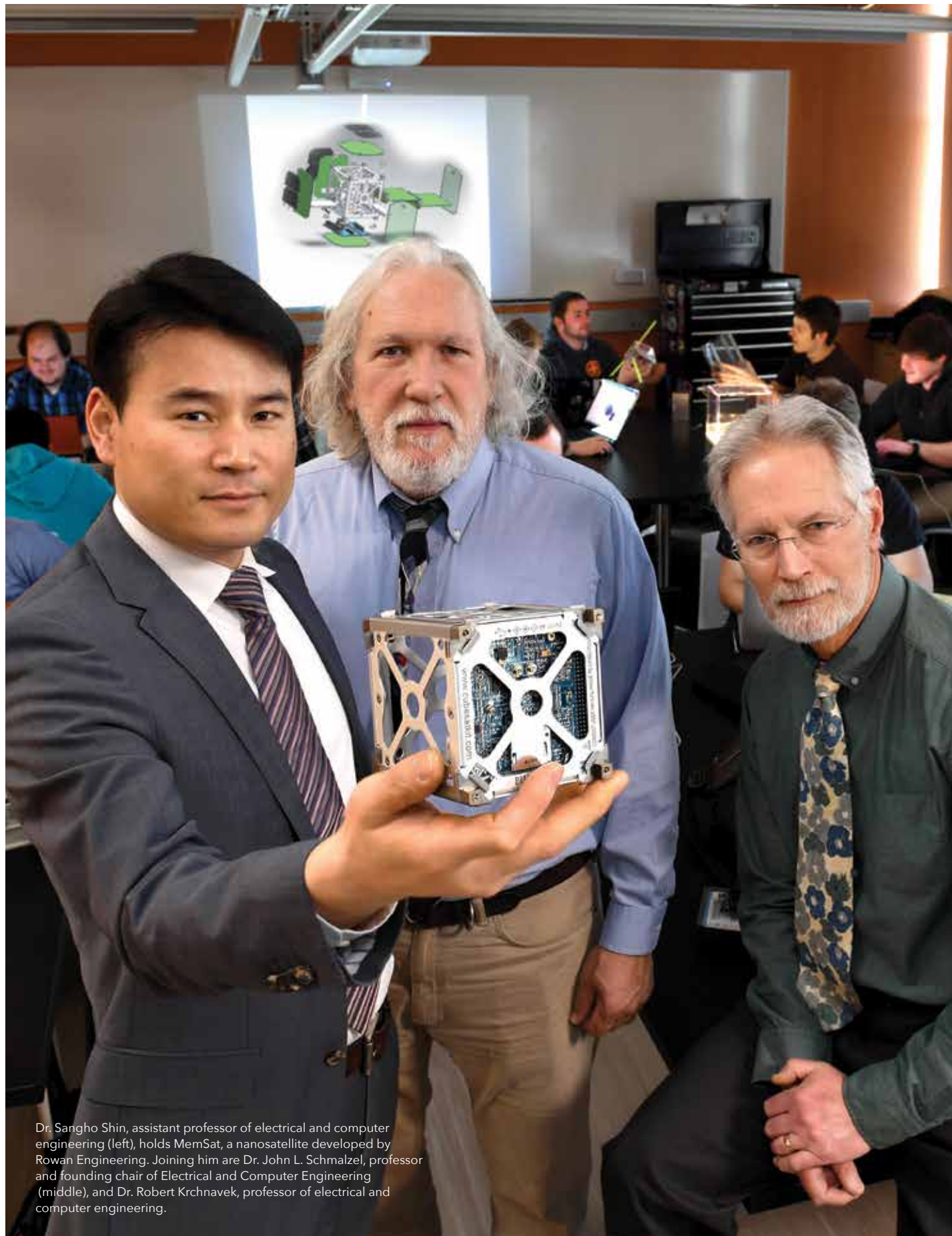
Building a Firm Foundation for a Lifetime of Innovation

The National Science Foundation (NSF) recently presented Vince Beachley, assistant professor of biomedical engineering, with a \$500,000 CAREER grant – among the highest honors the organization awards to young faculty.

Beachley's research focuses on enhancing the mechanical strength of polymer nanofibers through a processing method known as post drawing. Post drawing elongates the fibers to several times their initial length and causes long molecules to align inside the fiber, increasing its strength. The materials can be used in applications as diverse as biomedical implants and aircraft components.

The NSF's Faculty Early Career Development Program offers this prestigious award in support of early-career faculty who have the potential to serve as academic role models in both research and education.

Beachley, with three patents related to the work, said, "We've already shown that we can make much stronger nanofibers with these processes. The research funded by the CAREER award will be focused on discovering how that works and just how far we can push the technology. Given the broad applications of strong lightweight materials, the potential impact could be immense."



Dr. Sangho Shin, assistant professor of electrical and computer engineering (left), holds MemSat, a nanosatellite developed by Rowan Engineering. Joining him are Dr. John L. Schmalzel, professor and founding chair of Electrical and Computer Engineering (middle), and Dr. Robert Krchnavek, professor of electrical and computer engineering.

Researching the Final Frontier

A cube-shaped nanosatellite, only four inches on each side, will help Rowan Engineering make its mark in space.

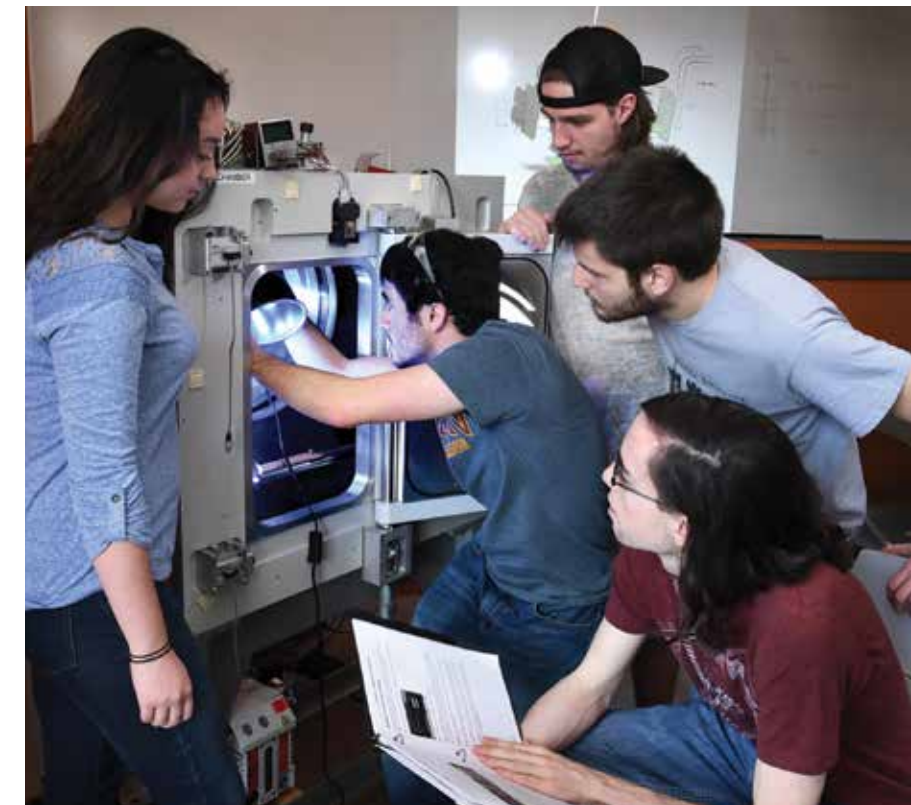
The Rowan satellite, called MemSat, is being prepped by three electrical and computer engineering professors and a team of students. It is scheduled to fly as an auxiliary payload aboard a resupply mission to the International Space System in early 2018. The CubeSat Launch Initiative is part of NASA's Launch Services Program's Educational Launch of Nanosatellite Missions. CubeSats conduct technology demonstrations, educational research or science missions. Rowan is the first New Jersey-based university to be selected by the agency to participate in the initiative.

Sangho Shin, assistant professor of electrical and computer engineering, is leading the development of

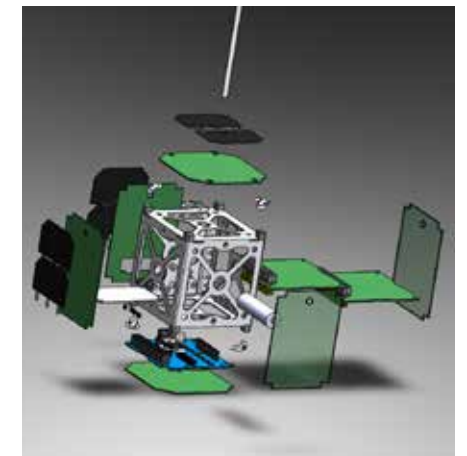
MemSat. Supporting him are John L. Schmalzel, professor and founding chair of Electrical and Computer Engineering; Robert Krchnavek, professor of electrical and computer engineering; 30 Rowan Engineering Clinic students; and six engineering graduate students.

MemSat will characterize and compare the behavior of memristor-based memory devices against silicon-based technologies to determine if memristors have improved performance for space applications. Memristors are electronic devices in which information is stored in the resistance state of the device and can be retained during power-off modes, allowing for energy-efficient power shutoff as well as system resiliency during power failures.

"This project underscores the type of innovative technologies under development in the Rowan Engineering pipeline," said Schmalzel.

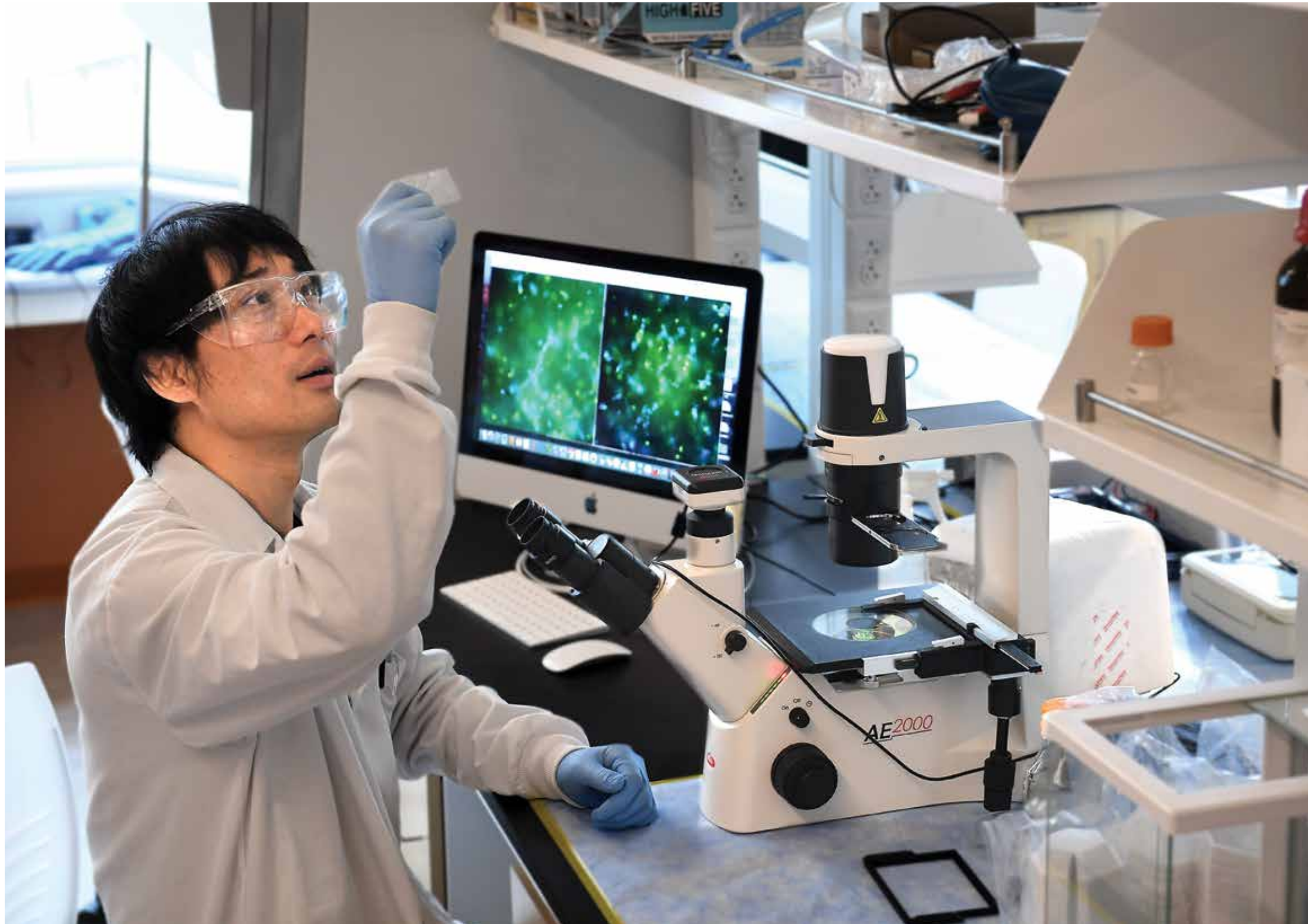


MemSat is scheduled to fly aboard a resupply mission to the International Space System in early 2018. Assisting with the development of the nanosatellite are (from left to right) engineering majors Ariel Barber '17, Jeremy Zuccarello '17, Justin Widener '18 (top right), Justin Ruegg '17 and Michael McKendry '17 (bottom right).



The 4"x4"x4" MemSat nanosatellite is composed of six physical satellite subsystems: CubeSat frame and antenna, central command and control, power generation and distribution, wireless communication, attitude control, and memristor experiment payload.

Building Relationships from Glassboro to Tokyo



Sekisui Chemical is one of the leading chemical companies in Japan, with a diverse business portfolio through its group of more than 200 companies worldwide. Sekisui has supported research at Rowan since 2015, and in June 2017 that partnership expanded with a formal agreement that supports faculty research and provides a pathway for the exchange of ideas and expertise.

"We are always trying to stay ahead of the curve when it comes to innovation, and we are excited about what is happening at Rowan and about the work of Rowan faculty," said William Clark, senior advisor to the president at Sekisui and a member of the Henry M. Rowan College of Engineering Advisory Council.

At Rowan, the Japanese firm is investing in the research and development of green technologies that have the potential to address environmental issues for the global community. Visiting researchers from Sekisui are working in Rowan's materials lab through 2018, and Sekisui has provided internships in Japan for Rowan University students. Moving forward, Rowan Engineering and Sekisui Chemical expect to engage in numerous research and education projects.

"Working with Sekisui underscores the goals of the University and the legacy of the Henry M. Rowan College of Engineering to conduct real-world, applied research," said Anthony Lowman, dean. "This partnership has been incredibly fruitful for the College, providing our faculty and students with opportunities to meet the research needs of an industry leader."

Visiting researcher Tomoaki Katagiri works in Engineering Hall.

Recognizing Excellence in Engineering Education

The Henry M. Rowan College of Engineering is on the move, not only to its newest building, but also up the rankings of the top engineering schools nationwide.

In its 2018 rankings, *U.S. News & World Report* scored the Henry M. Rowan College of Engineering 19th out of more than 200 programs nationwide where the highest degree offered is a Master's degree. Rowan's ranking, which is based on surveys of engineering deans and senior faculty at other accredited engineering programs, has moved up 18 places in the last five years.

"This recognition reflects the continued growth of our College and our ongoing efforts to offer an exceptional, minds-on, hands-on engineering program," said Anthony Lowman, dean. "Each year,

we continue to revitalize engineering education, offering new novel academic offerings, adding distinguished scholars to our world-class faculty and increasing our innovative collaborations with government and industry partners in groundbreaking sponsored research. Our commitment to producing great engineers has never been stronger."



Students come together to collaborate in Engineering Hall.

INVESTING IN OUR *future dreams* WHILE ACHIEVING YOUR



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