ROWAN UNIVERSITY
EngineeringNews
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DEAN'S MESSAGE

Engineers not only make a difference today, they shape the future.

At Rowan, our perspective focuses on engineers as creative problem solvers, essential to health, happiness and safety. We showcase that perspective through our engineering clinics. In this issue we highlight clinics that engage students in current health issues. Moreover, these clinics provide valuable hands-on experience and a real sense of contribution to the world at large.

With the recent opening of the South Jersey Technology Park, we have gained an important resource for engineering clinic expansion and faculty research. The facility provides critical space for the virtual reality CAVE, funded through a National Science Foundation Major Research Instrumentation grant earned by our faculty. The Tech Park also supports our strong regional connections, the source of industrial projects that are so valuable for our student experience. I take great pride in this combination of industrial linkages and advanced technology that supports our premier educational delivery.

Regards,

Dianne Dorland

Dianne Dorland
Dean of Engineering

CAVE dwelling: new virtual reality system moves into South Jersey Technology Park

Virtual reality research at Rowan received a large facility upgrade this spring – in the form of a CAVE.

The National Science Foundation (NSF) awarded Rowan a $392,000 grant to acquire the Cave Automated Virtual Environment (CAVE), a room-sized cube equipped to create an immersive, navigable and interactive virtual reality experience.

Working with an Iowa-based company, Rowan's CAVE was "built to order" and brought to its new home in the South Jersey Technology Park's Virtual Reality Applications Center this spring.

Associate Professor and Electrical & Computer Engineering Chair Dr. Shreekanth Mandayam and his team will use the new device to continue research studies for both NASA and the U.S. Navy.

For the last six years, undergraduates have learned how to model virtual reality as part of the junior/senior clinic, using a smaller, semi-immersive virtual reality system with demonstrated success.

Mandayam, who helped secure the NSF funding, feels the College of Engineering's virtual reality track record and ideal location may have helped bring the state's first university-based CAVE to Rowan.

"I believe bringing cutting-edge technologies to the state made a compelling case for NSF to fund this research," said Mandayam. "And we're doing this in the South Jersey Technology Park, furthering technologies in southern New Jersey through this private/public partnership."

The CAVE, which measures 10'x10'x10', has screens on three walls and its floor. The cube is surrounded by mirrors and projectors, and its users wear 3D glasses.

"The combination of the glasses and projection will simulate three-dimensional objects for you to see," Mandayam explained. "As you move around, your perspective will change. There's room for up to four people to visualize images. What is seen on the walls of the CAVE depends on where a single person is standing and moving."

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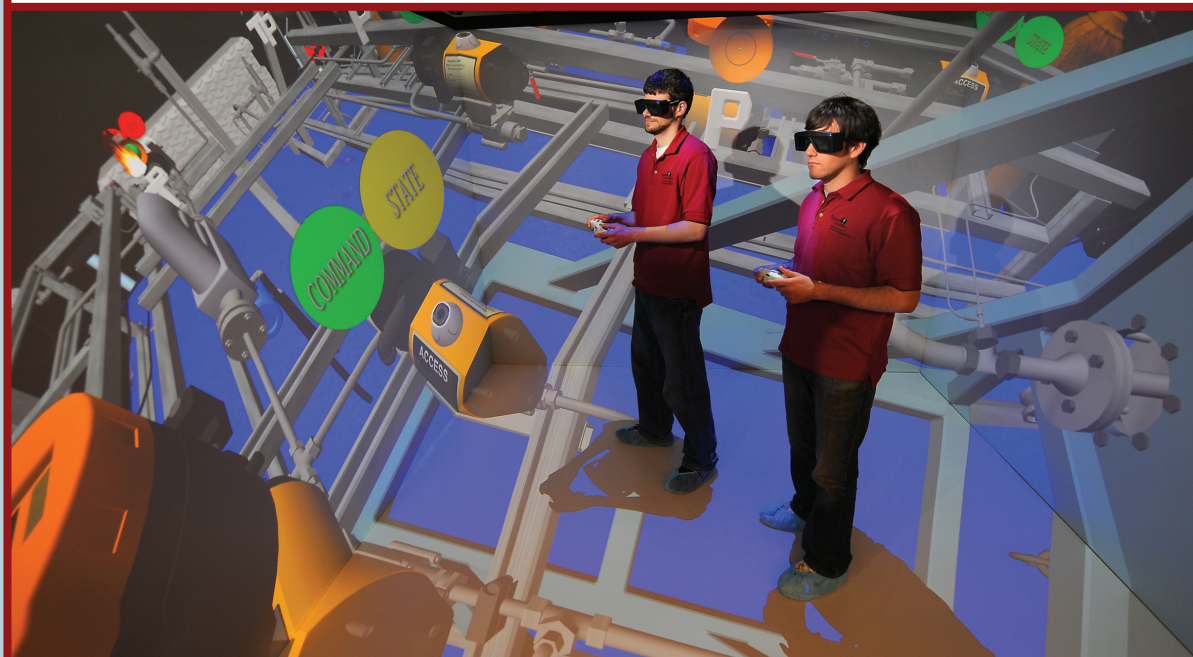
*Electrical & computer engineering graduate students **Michael Bloom** and **Michael Russell** conduct some of the University's first experiments in the Cave Automated Virtual Environment (CAVE).*



Mom's experience inspires feeding tube clinic

Dr. Stephanie Farrell's latest research hits close to home. The associate professor of chemical engineering journeyed more than 4,000 miles to help her daughter eat without the use of feeding tubes. Now, she is collaborating with those who helped her child to examine and mitigate tube clogging for other youngsters.

Farrell's personal experience with feeding tubes began soon after she and her husband, Peter, adopted 13-month old Phoebe from China. Health problems led to the toddler's tube feeding. While she did gain weight and develop well, Phoebe began showing less interest in eating food. Farrell and her husband also grappled with clogging in their daughter's feeding tube.

They began looking for programs that would support their goal to wean Phoebe off the feeding tube – with no success. "We found no alternatives to the behavioral approach that we were already using," Farrell said. "It's like when Dr. A gives you aspirin and Dr. B gives you aspirin, it's still aspirin."

Through a friend, however, they discovered a European program that uses an alternative approach. The Tube Weaning Clinic at the Medical University of Graz in Austria uses physical, occupational, speech and group play therapies, teaching children to connect the concept of hunger to food.

During this therapy, Graz medical staff cease using feeding tubes and ask parents not to comfort the children in other ways. "It's extremely hard, but it made a lot of sense," said Farrell, who traveled with Peter and Phoebe to the clinic in 2007.

Phoebe took her first bites of food three days into the program. "It was emotionally and physically draining, but we were excited," the professor said. Farrell discovered the Medical University of Graz, known for an exceptional success rate with its tube weaning program, does other work as well. She approached two doctors to team up on investigating ways to prevent tube clogging.

Last fall, Farrell and Rowan engineering students conducted lab studies exploring why tubes clog as part of an engineering clinic. While adults' tubes have been studied before, there is little information available on small tubes and formulas used with infants. "I suspect clogging is such a big problem with kids because the tubes are so small and the flow rate of the formula is low," said Farrell, who said an alarm – which she still "hears" at night – goes off when a tube clogs.

Dr. Stephanie Farrell *investigates factors that affect clogging in feeding tubes, which the professor and mom faced with her young daughter.*

The Rowan team hopes to reduce incidences of clogging through possible improvement in tube design or feeding protocols. Meanwhile, the Austrian physicians will conduct clinical work in conjunction with Farrell's lab work.

Farrell, who said her now five-year old daughter has become quite an adventurous eater, is pleased to be a part of the research. "My hope," she said, " is that I can make a difference for somebody else."

CAVE dwelling: new virtual reality system moves into SJTP

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NASA and the U.S. Navy secured additional funding for projects that Mandayam and a team of four graduate students conduct in the CAVE. Their research is incorporating integrated systems health management (ISHM), a process that predicts a system's health during its operational life.

"Virtual reality is a very cost-effective way to use ISHM because not only do you analyze diagnostics but also prognostics to predict the future," Mandayam said. "If something fails, what are the systems breakdowns this failure will cause?"

Rowan researchers are working with NASA's Mississippi-based Stennis Space Center, which tests engines before each shuttle launch, to simulate possible system failures using virtual reality.

"We can test the health of the rocket engine and the test stand itself," said Mandayam. "The rocket test stand is a fairly complicated infrastructure, and the stand has thousands of sensors. There could be errors in the test stand, and testing in the virtual reality system is a cost-effective way to address future conditions."

For the U.S. Navy, Mandayam's team is developing video sensors for naval vessels, which he explained may predict the health of Navy ships.

"Let's say a ship is in the Indian Ocean. There are lots of components on the ship. The Navy is using video to gather data and transmit that data to shore. We'd like to use that video data to analyze the condition on the ship, like leaks or other structural weaknesses," noted Mandayam.

Mandayam hopes the CAVE will foster a symbiotic relationship between science and area industry.

"This is a coup for us, allowing us to impact several other areas. Having the CAVE has added advanced visualization for biology, manufacturing, applications in construction and architecture and training of personnel. My long-term goal is to expand the application of the CAVE and provide this to industry in the area," said Mandayam.

The fact the CAVE is housed in the research and entrepreneurial hub known as the South Jersey Technology Park does not escape Mandayam in his vision for local virtual reality.

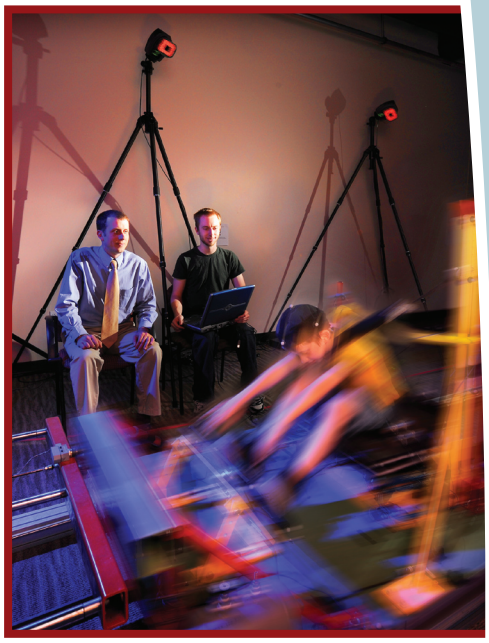
"Future business and consulting capabilities can begin here. They can hire our students. It's a fantastic employment opportunity," he said. "The potential is there for this high-tech capability in the state. It's a perfect opportunity to marry business and technology."

Bumper car inspiration leads to automotive safety for children

What seems like a small amusement park in Education Hall at Rowan University is actually a serious attempt to make cars safer for children.

Biomechanical research engineers from Children's Hospital of Philadelphia (CHOP) have asked Rowan to create a pneumatic sled that simulates frontal vehicular collisions in order to improve child-size crash test dummies, which traditionally have been modeled after adults.

"This is one of the first studies to use live child subjects in actual impact scenarios," said Terry Hopely, a Rowan mechanical engineering graduate student from Pennsville who is working on the project. "There have been several studies of the neck and spine under static conditions, but this is really a very novel experiment."



*In a controlled and safe environment, **Dr. Eric Constans,** chairman of Mechanical Engineering, and **Terry Hopely,** a graduate researcher, launch Constans' son, Nathan, backward on a 15-foot track.*

According to Dr. Eric Constans, chair of Mechanical Engineering, who is overseeing Hopely on this study, children are more flexible than adults. The data taken from traditional child-size crash test dummies, which are the same as adult models but smaller, are simply not accurate, he said.

"If you ever play with a child, you would know that it's almost like they're made of rubber. This flexibility isn't represented in current crash test dummies," Constans said.

In order to test the differences between adults and children in crash scenarios, Rowan engineering students built a 15-foot metal track. A child volunteer is seated in a sled the size of a bumper car and fastened with a car seat belt. Using air pressure, the sled is then fired backward on the track at 3.1 Gs (about three times the force of gravity), or approximately five miles per hour. Using an advanced hydraulic system, Hopely applies the brakes on the sled, simulating what happens in a frontal collision, only on a much gentler — and more fun — scale.

"Some of the kids are apprehensive at first," Hopely said. "You have to reassure them that the sled is completely safe — even less severe than what they would experience at the amusement park. And then there are kids who absolutely love it — they're really psyched to go for a ride."

Always under the supervision of their parents, the children need to be prepped before sitting on the sled. They are fastened with multiple luminous "dots" — similar to those used on actors in a computer-generated movie scene — which accurately indicate the body's movement through eight specialized cameras.

Hopely added that this project is one of the most important at Rowan, and the impetus for it has always been to save lives. "The fact that we're improving child safety has to be the biggest reward," he said.

Industry Day pairs business with research

From clean energy studies to biomedical advances, engineering faculty and students showcased their sponsored research projects to local business leaders at Industry Day in March.

The New Jersey Technology Council, the Southern New Jersey Development Council, the Gloucester County Department of Economic Development, the Entrepreneurs Forum of Southern New Jersey and the South Jersey Technology Park co-sponsored the inaugural event with the College of Engineering.

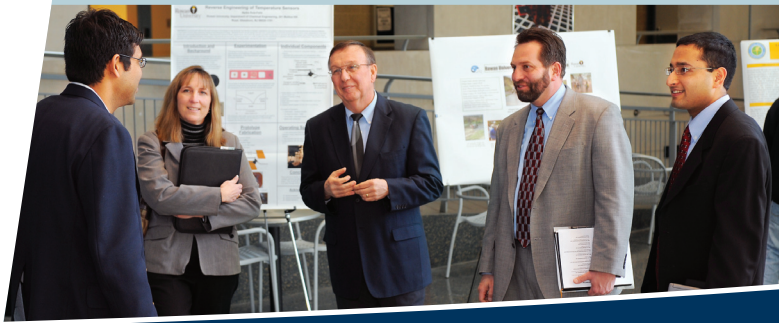
The all-day open house allowed regional businesses and government organizations an all-access pass into the college's labs and facilities at both Rowan Hall and the South Jersey Technology Park. Guests also learned more about the College of Engineering's acclaimed clinic program, where students and faculty members collaborate with regional organizations on more than 100 projects each year.

Industry professionals provided first-hand accounts of their experiences with Rowan clinics, including Timothy Klingensmith of the Naval Sea Systems Command (NAVSEA) in Philadelphia and Dr. Sriram Balasubramanian, from Children's Hospital of Philadelphia (CHOP).

NAVSEA is working on its third clinic project with Rowan, developing a video sensors laboratory protocol for managing shipboard systems. Klingensmith, its branch head, said two students from clinics now work for him. With the clinic experiences, he noted, "They're already up to speed on projects."

Engineering students and CHOP have collaborated on eight projects for the hospital's Center for Child Injury Prevention Studies, using biomechanics to further injury prevention in children. Balasubramanian remarked on the clinic experience, "It's like a gold mine in your backyard, at least that's what we have found at CHOP."

***Dr. Yusef Mehta** greets Industry Day panelists (left to right) **Susan Gresavage** of the New Jersey Department of Transportation, **Dr. Rich Gutowski** of Johnson Matthey, **Timothy Klingensmith** of NAVSEA and **Dr. Sriram Balasubramanian** of CHOP.*



Engineering outreach continues this summer

The College of Engineering will offer students and teachers a sampling of engineering education and real-world applications during the following summer programs.

RISE High School Engineering Workshop, July 7 to July 9, 2009
The RISE (Rowan's Introduction for Students to Engineering) three-day workshop will connect faculty and Rowan students with high school students to help them gain an understanding of engineering using hands-on projects, lab clinics and campus/industry tours.

High School Scholars Program, July 12 to July 16, 2009
Rising high school juniors and seniors will, through hands-on activities, seminars and field trips, get a better understanding of the excitement and challenges an engineering career provides during this program.

Engineering Clinics for Teachers (ECT), July 13 to July 16, 2009
This program will expose educators to engineering careers and give them strategies they can use to integrate engineering content into the classroom.

Project Lead the Way Teacher Training, July 19 to July 31, 2009
High school teachers selected to attend the program will be trained to implement project-based, pre-engineering curricula into their classrooms.

AWE Workshop for Middle School Girls, July 21 and July 22, 2009
The AWE (Attracting Women into Engineering) program will, in two single-day workshops, introduce engineering to girls going into seventh or eighth grade this fall.

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Engineering students learned about job opportunities from Massachusetts Electric Construction Company recruiters at the University's Career Fair held this spring.