

Goodwin Hall opens with new labs, classrooms, and an airplane engine

150,000-square-foot building named in honor of Bill and Alice Goodwin

In fall 2011, ground was broken for the Signature Engineering Building, a dream project of current engineering Dean **Richard C. Benson** and Virginia Tech President Emeritus and former College of Engineering Dean **Paul Torgersen**. After three years of construction, the Hokie-stone-adorned, \$95.2 million structure opened in August 2014 to welcome students to new classes (See Page 8) and weeks later was renamed to honor the philanthropy of longtime Virginia Tech supporters **Alice and Bill Goodwin**.

Goodwin Hall features much-needed new lab space and offices for engineering faculty, staff, and graduate students, in addition to classrooms not only for engineering students, but students across the university. Among the standouts in the new building: A 14,000-pound Rolls-Royce Trent 1000 engine that hangs from the ceiling over the main atrium, and two model ships donated by Newport News Shipbuilding. (NNS also donated \$500,000 toward the building.)

The Goodwins, of Richmond, committed the larg-

est single donation – \$25 million – in Virginia Tech history to help fund construction of the building, which first opened in June to allow faculty and staff to move in. Alum Bill Goodwin graduated with a bachelor's degree in mechanical engineering in 1962.

"The mechanical engineering degree I earned from Virginia Tech helped me, and I believe in giving back."

~ Bill Goodwin, alumnus and donor

"I want to thank the Goodwins for their leadership gift on this project, and to also thank each and every one of the more than 150 donors whose generosity helped us make this spectacular building a reality," said Benson.

The Goodwins initially made their gift anonymously.

Without donations and support from scores of College of Engineering alums, Goodwin Hall would have had a longer, tougher path to reality, said Benson. Among the notable gifts: The Quillen Family Auditorium, located on the first floor, was named in recognition of a \$3 million gift by alumni **Mike Quillen** and the Quillen Family.

Goodwin Hall also is part of an innovative experiment by mechanical engineering faculty and students in measuring vibrations. Under the direction of **Pablo Tarazaga** and **Mary Kasarda**, 240 accelerometers are attached to 136 sensor mounts throughout the building, designed to track movement of occupants and exterior forces from high winds or earthquakes.

BY THE NUMBERS:

- 150,000: Total square feet
- 40: Instructional and research labs
- 150: Offices for faculty, staff, and students
- 756: New classroom seats in total
- 46,000: Estimated square footage of Hokie stone



Virginia Tech President Timothy D. Sands, with Bill and Alice Goodwin at the Oct. 24, 2014, dedication of Goodwin Hall.



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College of Engineering Dean Richard C. Benson (right) stands with Bill and Alice Goodwin and Virginia Tech President Timothy D. Sands (left) at the Goodwin Hall dedication.

dean's MESSAGE

A new building and new president help bring in an amazing year, with more greatness to come



The past year has brought remarkable change to the College of Engineering and Virginia Tech as a whole, setting 2015 up for what will be a remarkable year.

Goodwin Hall is a marvel, from its design and layout to the large, two-story meeting space that hangs over the atrium and the nearby Rolls Royce Trent 1000 engine. It is truly unlike any building in the world. It was a pleasure to be in the building on the first day of classes as hundreds of students arrived for the first time. It is a rare sight to see students stop and take cell phone photos and videos of their 8 a.m. classroom, but we saw just that play out dozens of times.

Our construction plans are not idle. Already we are looking toward the renovation and expansion of Holden and Randolph halls. Pending university approval, we will make every effort to persuade members of the Virginia General Assembly and the Governor's Office of these critical projects.

In 2014 we saw the retirement of Virginia Tech President **Charles Steger** and the arrival of President **Timothy D. Sands**. An engineer himself who already has guest-lectured in several of our classes, President Sands is embarking on a bold program of growth for the university, planning to enroll 500 more freshmen each year beginning this fall, with the majority of that growth in the College of Engineering.

We already have seen in recent years a great increase in students wanting to be Hokie engineers, be they high school graduates or transferees from other colleges. With the growth, we will set a freshman engineering class target of 1,650, versus 1,400 we have enrolled in years past; itself a jump from 1,200 engineering freshmen prior to 2010.

With the growth in students, we also will grow our faculty, and the Office of the President and the Office of the Provost are helping us do just that.

President Sands further challenged us to be among the Top 10 of all engineering colleges in the United States. We are close. We are indeed among the Top 10 of all engineering colleges at public universities, and also have risen to the ninth position in the National Science Foundation's report on engineering schools' research expenditures, with \$214.5 million in 2013.

These numbers represent our investment in the future and the education of the leaders of tomorrow. It is truly a great time to be part of the Virginia Tech College of Engineering. Go Hokies!

Sincerely,

Richard C. Benson

Richard C. Benson
Dean of Engineering
Torgersen Chair

Paul Torgersen, university leader, engineering champion, remembered

As we were about to go to press on this issue, we received heartbreaking word that **Paul Torgersen** – professor, department head of industrial and systems engineering, dean of the College of Engineering for two decades, university president for six years, and inspiration to thousands of students – died at the age of 83 following a long illness. Torgersen's death follows that of his beloved wife, Dorothy, who is also remembered in this publication.

Torgersen died on March 29. Reaction was instant on social media with scores of tributes pouring in. One alumnae recalled Torgersen offering her a ride to band practice while she was a student late for practice. By phone, longtime friend and former Virginia Tech Board of Visitors Rector **W.S. "Pete" White Jr.**, an alumnus of the College of Engineering, recalled Torgersen as "a great teacher. He was born with that ability and he certainly used that ability at Virginia Tech for a very, very long time."

Under Torgersen's leadership, Virginia Tech made major headway in its national profile in academics and in athletics. The Virginia-Maryland College of Veterinary Medicine received full accreditation and *U.S. News & World Report* ranked our engineering program among the nation's top 50. During Torgersen's time as dean, it emerged from the bottom 10 percent in rankings for research to join the top 10 percent. His tenure as president saw a dramatic increase in fundraising for the university, including \$337 million raised in The Campaign for Virginia Tech: Making a World of Difference. Also under Torgersen's watch, the university's endowment nearly doubled.

Torgersen's presidency saw milestones in the representation of women and minorities in leadership posts at Virginia Tech. Through athletic excellence, including multiple post-season bowl victories in football -- and a loss in the 2000 national football championship game -- Virginia Tech's name grew within the national spotlight. Torgersen also became the namesake of two prominent campus structures, Torgersen Hall and the Torgersen Bridge. All the while, he continued teaching classes for an astonishing 58 years.

Torgersen taught his last class in May 2014, dedicating that final hour to teaching students how to be leaders in life and the profession. Among his last notes of advice: "Enjoy your blessings and be thankful: If, across the world, individuals and their blessings were arranged from the most to the least, everyone in this class would be in the top 1 percent." Thank you, Professor Torgersen, for being among the most.



College breaks into Top 9 in National Science Foundation funds

The Virginia Tech College of Engineering has climbed to its highest ever ranking in the National Science Foundation's (NSF) report on engineering schools' research expenditures. The 2015 survey, reporting on figures for fiscal year 2013, shows the college at ninth place with \$214.5 million in research expenditures. This number is more than double the typical spending levels before 2005.

The college had placed 10th in the six years prior to fiscal year 2013.

At the university level, Virginia Tech climbed to 38th in the annual survey. With more than \$496 million in research and development activity for fiscal year 2013, the college's expenditures are 43 percent of the total for the university. Virginia Tech maintains the largest research portfolio for a university in Virginia, and is the only one ranked in the top 50 according to NSF numbers.

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Students make history with shipboard firefighting robot

The Office of Naval Research foresees a future where robots are used to fight fires aboard ships.

Virginia Tech is helping realize that dream.

Five months after successfully demoing that an adult-sized robot can locate and put out fires aboard a U.S. Navy ship, student members of the combined Terrestrial Robotics Engineering and Controls Lab (TREC) and Extreme Environments, Robotics & Materials Laboratory (ExtReMe) within the College of Engineering are already working on improving the self-built humanoid that has wowed the Navy.

The robot is named SAFFiR -- short for Shipboard Autonomous Firefighting Robot. It stands 5 foot 10 inches tall and weighs about 140 pounds. In November 2014 aboard the decommissioned, World War II-era USS Shadwell, the robot walked down a hallway, took a hose in his hand, turned and located a burning fire via thermal imaging just a few yards away, and blasted the flames with water.

SAFFiR is part of a new program by the U.S. Office of Naval Research (ONR) to create new, high-tech tools for sailors to fight fires aboard ships where dangers are many fold: Weapons, ammunition, ordinance, and tight and crowded spaces. Plus this bewildering notion: Unlike a building fire, one cannot go down to escape.

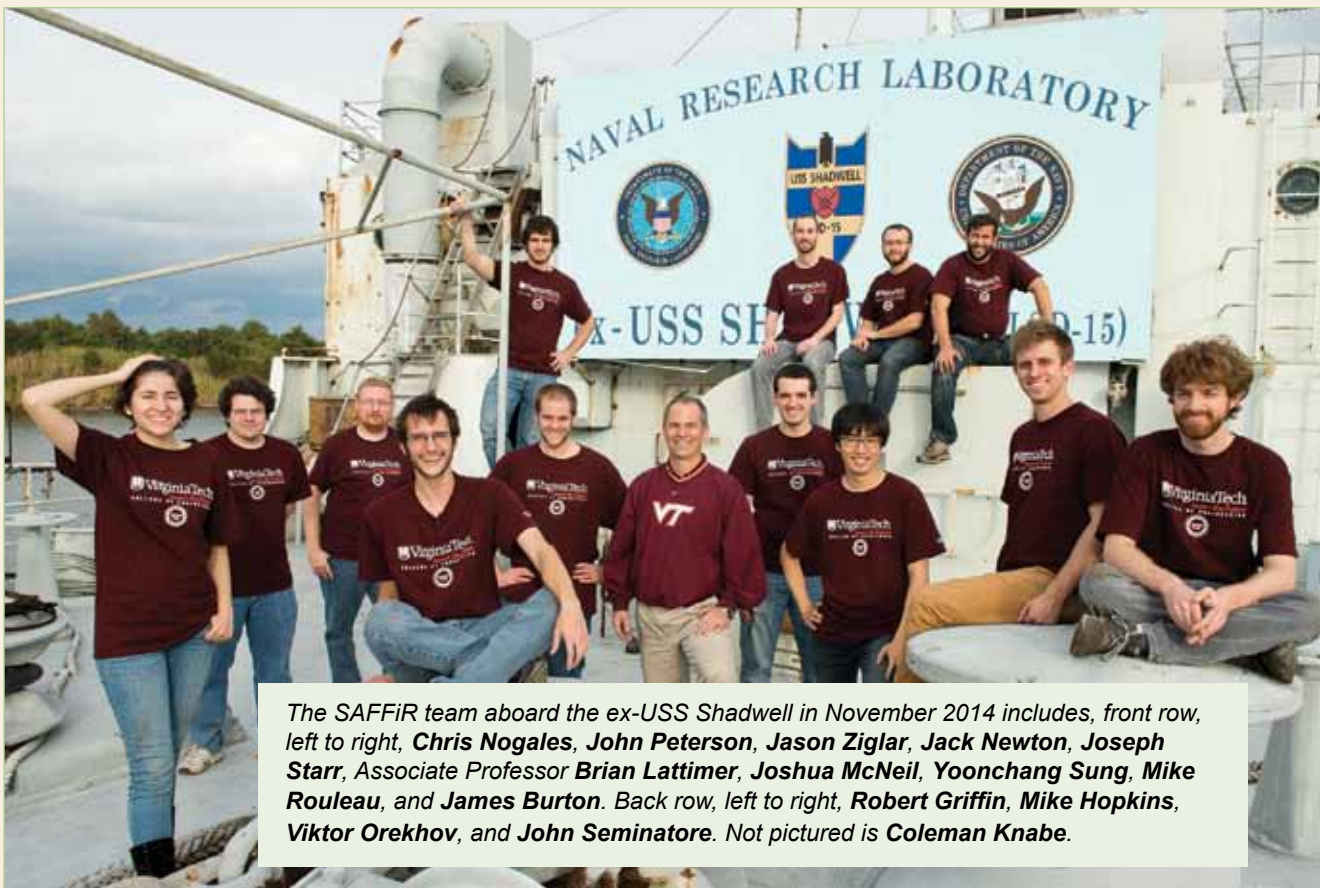
They must go up. Heat rises, too.

The ONR already has spent \$4.5 million on the Virginia Tech project and will increase funding as new, improved incarnations of the robot are built. SAFFiR will gain keener intelligence and visual recognition cues, and stronger more versatile legs, along with plating to protect him from heat, soot, and water.

"It's not going to replace Navy firefighters, it's going to assist Navy firefighters," said TREC member **Viktor Orekhov**, who finished a doctorate in mechanical engineering in December.

The effort aboard the Shadwell took patience and improvisation. This isn't Hollywood. Getting a robot to walk upright along a straight and even floor is challenging. The ship created maddening obstacles: Heat from test fires have buckled its floors. The floor where SAFFiR walked slanted away at a sharp decline.

The project was led at Virginia Tech by **Brian Lattimer**, an associate professor of mechanical engineering who took over the project after another faculty member left for a new job. "I have so much pride and respect for these students whose passion, hard work, and intellect produced an awesome robot that is like something out of science fiction," said Lattimer. "I know it's an achievement they'll never forget."



The SAFFiR team aboard the ex-USS Shadwell in November 2014 includes, front row, left to right, **Chris Nogales, John Peterson, Jason Ziglar, Jack Newton, Joseph Starr, Associate Professor Brian Lattimer, Joshua McNeil, Yoonchang Sung, Mike Rouleau, and James Burton.** Back row, left to right, **Robert Griffin, Mike Hopkins, Viktor Orekhov, and John Seminatore.** Not pictured is **Coleman Knabe.**

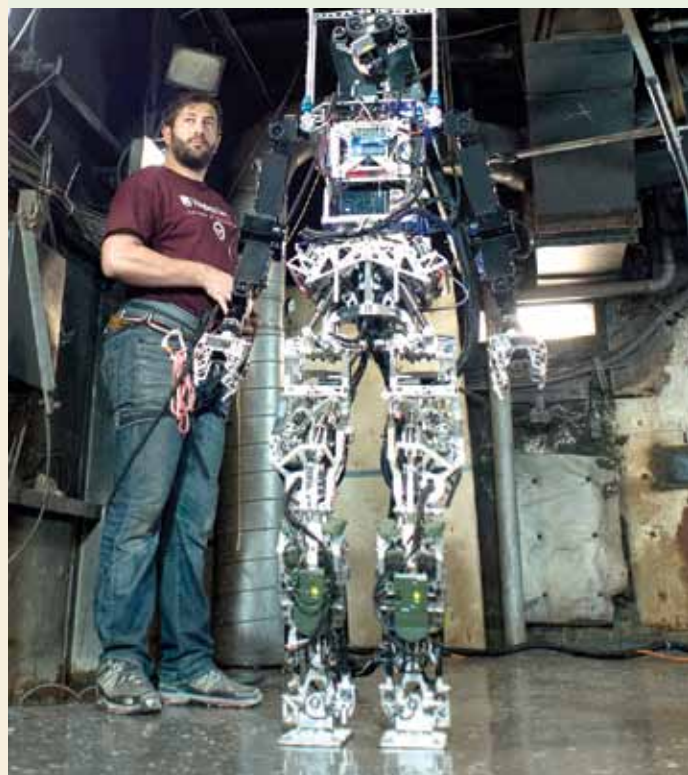


SAFFiR blasts water at an onboard fire.



SAFFiR grips and holds a firehose blasting water.

ME student **John Seminatore** stands by SAFFiR.



Tech leads study of unmanned aircraft as news-gathering tool

Leaders with the Mid-Atlantic Aviation Partnership at Virginia Tech have outlined a research plan to study how news reporters could use small, unmanned aircraft to gather media content.

Among media members working in the effort: The Associated Press, Gannett Co. Inc., Getty Images, NBCUniversal, The E.W. Scripps Company, *The New York Times* Co., and *The Washington Post*. "This coalition represents signifi-

cant media organizations," said **Rose Mooney**, executive director of the Mid-Atlantic Aviation Partnership at the Institute of Critical Technology and Applied Science (ICTAS) at Virginia Tech. "Working together, we have a way forward toward the development of legitimate, commercial uses of the technology."

Research will include classroom training, followed by hands-on instruction of media representatives in flying aircraft. Test flights will begin in rural areas and progress toward urban areas. Pending Federal Aviation Administration approval, the effort may create a path for media to receive a federal exemption allowing for flights to begin while the legal framework for unmanned aircraft is still being worked out.

In December 2013, the FAA selected Virginia Tech as one of six national test programs to conduct research to

integrate unmanned aircraft into the nation's airspace. In August, 2014, the partnership -- with test sites in Virginia, New Jersey, and Maryland -- hosted FAA Administrator **Michael Huerta**, Virginia Gov. **Terry McAuliffe**, and other leaders at the Virginia Smart Road at the Virginia Tech Transportation Institute to watch a simulation of Virginia Tech engineers using an unmanned aircraft to gather information at a mock accident scene on an interstate highway.

The helicopter was specially modified for transportation research by students working with **Kevin Kochersberger** of mechanical engineering.



Federal Aviation Administration Chief **Michael Huerta** (center) speaks with media about the future of unmanned aviation at Virginia Tech-hosted event in August 2014. Behind Huerta are Virginia Tech President **Timothy D. Sands**, Virginia Gov. **Terry McAuliffe**, **Rose Mooney** of the Institute of Critical Technology and Applied Science, and **Kevin Kochersberger** of the College of Engineering.



student
SHORTS

Video competition winners at the 2014 AICHE Chem-E-Car regional competition.

Chemical engineering students won accolades at the American Institute of Chemical Engineering's Chem-E-Car Competition in fall 2014. The six-member team won the video competition and finished fourth out of 36 competitors, following a first place finish

in the Mid-Atlantic regional competition in April 2014. Team members included **Jessica Kersey, Yining Hao, Bobby Hollingsworth, Tyler Reif, Coogan Thompson, and Avinash Yadav. Shashwat Sinha** produced the winning team video.



Animus team members, left to right, Jason Duane and Nicholas Socky, and their third-place finishing lunar rover.

The seven-member Virginia Tech Robo-Ops team finished third in the June 2014 RASC-AL Robo-Ops Challenge, sponsored by NASA and the National Institute of Aerospace. The team competed with a self-built green, 3-foot-long, 19-inch-tall, six-wheeled lunar rover named Animus (Latin for "intellect"). Student members were **Matt Canavra, Jimmy Congleton, Tom Corona, Jason Duane, Christopher Gumm, Joe Haslem, Kevin Hummel, and Nicholas Socky.**

An aerospace and ocean engineering student team won first place in the NASA-sponsored University Aeronautics Engineering Design Challenge competition with its concept of a twin-fuselage unmanned aircraft fueled by liquid hydrogen.



The winning NASA concept designed by aerospace and ocean engineering students.

The winning concept was dubbed "Gobble Hawk" by the team. The competition is not meant to create aircraft that will be built and flown, but to spur design skills among college engineering students. Team members were **Jordan Ambers, Bennett Coffey, Katie Hettmann, Kyle Johnson, Brian Petrosky, Tristan Pietrzak, Matt Schmit, Cory Reed, and Sarah Woodward.**

Rebekah Less, a biomedical doctoral student was awarded a Science, Mathematics and Research for Transformation (SMART) graduate fellowship from the U.S. Department of Defense, based on her research in drug metabolism with the liver and gastrointestinal tissues. As part of the Computational Tissue Engineering Graduate Education Program,

Less is working closely with **Padma Rajagopalan** of chemical engineering and the Institute for Critical Technology and Applied Science (ICTAS).



Rebekah Less

Microsoft features Feng in TV commercial, print ads

In February, tech giant Microsoft debuted a 30-second TV commercial featuring **Wu Feng** of computer science that was filmed on campus this past fall. The commercial spot aired across North American and Europe, with state side appearances alongside such programs as Late Night with David Letterman, CBS Evening News, 60 Minutes, and on ESPN, MSNBC, and Fox News, among others.

The commercial, part of the company's global advertising campaign, highlighted Feng's computing collaboration with medical researchers at Virginia Tech and other research centers with such programs as Computing in the Cloud – an effort to spur research discoveries within medicine. It was part of a combined print and television advertising campaign that saw Feng and Virginia Tech appearing in print ads in the *Washington Post*, *New York Times*, *USA Today*, *Wall Street Journal*, *Time*, and *Wired*.

Microsoft said it was highlighting individuals and organizations the company calls "leaders in harnessing supercomputer powers to deliver lifesaving treatments." A longer, 100-second spot was made available at Microsoft's website. Filming took place at Torgersen Hall, Goodwin Hall, the Virginia Bioinformatics Institute, and Burruss Hall. Dozens of students appear as extras in a classroom and on the Torgersen Bridge.



Wu Feng, professor of computer science, poses as filming on the Microsoft commercial moved to Burruss Hall's first floor. Among the film crew was director of photography Newton Thomas Siegel, most famous for filming crime classic "The Usual Suspects."

Computer Science team bound for Morocco world final



Left to right, Pruet, Sharp, and Yusupov are the Traveling Salesmen. They will travel to Morocco in 2015 for the World Finals of the Association of Computing Machinery's International Collegiate Programming Competition.

Three Department of Computer Science students will head to Morocco in May for the World Finals of the Association of Computing Machinery's International Collegiate Programming Competition.

Student team The Traveling Salesmen placed third in the fall 2014 Mid-Atlantic U.S. regional competition finals, held at seven sites across the region, including at nearby Radford University. Roughly

190 teams competed, from dozens of universities. Multiple regional competitions are held throughout North America, according to organizers of the competition, known as ACM-ICPC.

The Traveling Salesmen team includes juniors **Benjamin Scott Pruet** and **Miraziz Yusupov**, and senior **Nick Sharp**. They will travel to Marrakech, Morocco, for the May 16-21 ICPC Word Finals, which the

association says encourages "creativity, teamwork, and innovation in building new software programs, and enables students to test their ability to perform under pressure."

Traveling with the team will be coach and faculty advisor **Godmar Back**, associate professor of computer science. "The skills learned in these competitions are skills students need to have if they want to be successful in their job hunts," said Back.

Dot Torgersen remembered as an inspiration and a gracious host



Long before 1994, **Dorothea "Dot" Torgersen** was well known to the many students who took her husband's Theory of Organization class within the College of Engineering. Paul Torgersen used an anecdote about meeting her in his popular lecture on how to take advantage of opportunities, and she made a practice of hosting the entire class for a lunch at her home – no small feat considering it could have around 100 students. After her husband took office in 1994 as Virginia Tech's 14th president, a far larger portion of the university community came to know Dot Torgersen, whose gracious nature, skill at entertaining, and

enthusiasm for the Hokies allowed her to thrive for six years as the university's first lady. As he continued to lecture in the Theory of Organization class even after stepping down as president, Paul Torgersen would always tell the story of how he met his wife. During that presentation, he would show a slide of her as a young woman and mention that she had been such an "inspiration" to him. Dot Torgersen died on Sept. 27, 2014, in Roanoke. Her dedication to her husband – and to Virginia Tech – continues to inspire the many people who came to know her over the years.

~ Albert Raboteau

Grado was namesake of the industrial and systems engineering department

John Grado, 87, namesake of the Grado Department of Industrial and Systems Engineering (ISE), died Nov. 27, 2014. He was remembered by Virginia Tech President Emeritus **Paul Torgersen** as a “very successful industrialist who was willing to share his expertise and financial successes with others.”



“To a great number of people, he was like an older brother, giving advice but only when requested. He was a giant among men. He will be missed by many,” added Torgersen, who once served as head of ISE.

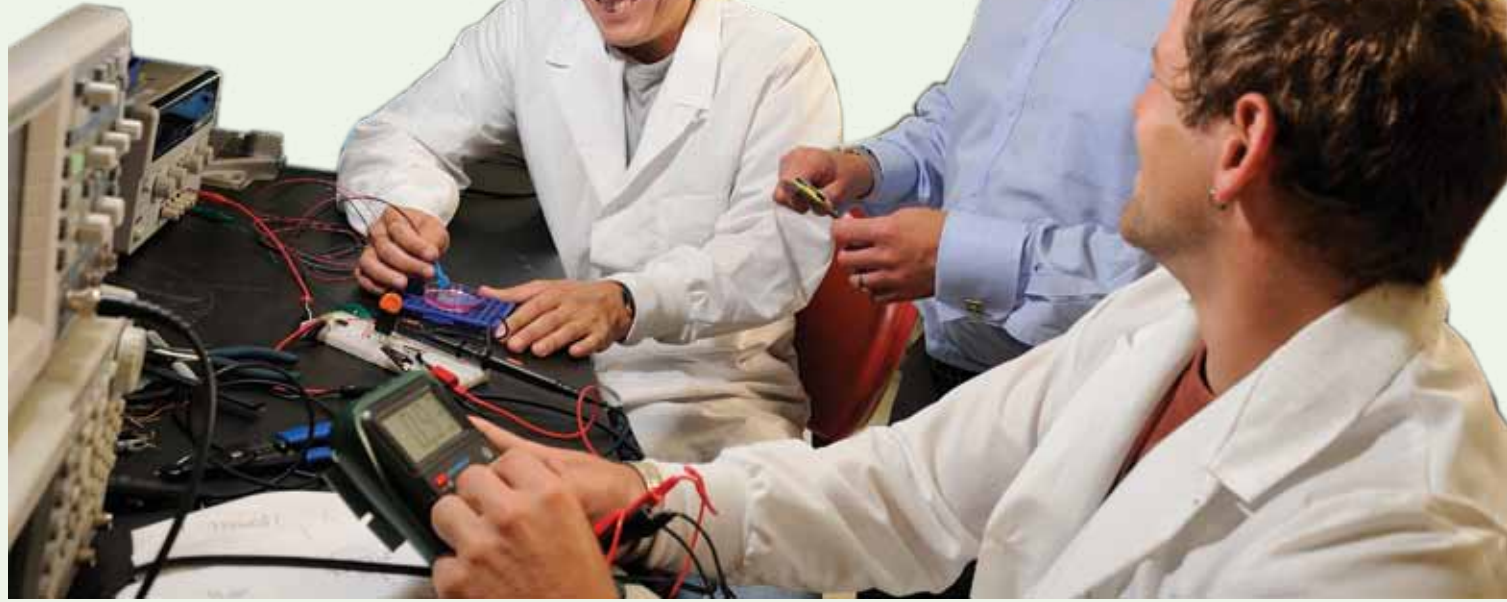
Grado was the first member of the department’s advisory board, formed by Torgersen. When Torgersen became dean of the College of Engineering and established a college-wide advisory board, Grado became its first member. The department, as well as several scholarships and a professorship, bear Grado’s name. He and his wife, Corrie, joined the President’s Circle within the *Ut Prosim Society*. He received Virginia Tech’s Alumni Distinguished Service Award in 2002, and served on the board of the Virginia Tech Foundation.

Grado entered Virginia Tech at age 16. He suspended his studies to serve for two years during World War II. He later completed his bachelor’s in industrial engineering and operations research in 1951. He made his career at Fitchburg Paper Co., before buying the company in 1983 and renaming it Technographics. He sold it in 1999 and retired.

Grado entered Virginia Tech at age 16. He suspended his studies to serve for two years during World War II. He later completed his bachelor’s in industrial engineering and operations research in 1951. He made his career at Fitchburg Paper Co., before buying the company in 1983 and renaming it Technographics. He sold it in 1999 and retired.

“He was a giant among men. He will be missed by many.” ~ Paul Torgersen

Rafael Davalos (standing) developed in 2011 a new cancer treatment used on a pet. The same treatment is moving closer to human trials.



Cancer treatment for dog increases hope for similar tests with humans

Five years ago, a seven-year-old Labrador retriever suffering from brain cancer was operated on using a technique eventually patented by Virginia Tech biomedical engineering faculty member **Rafael Davalos**. The experimental treatment eradicated the malignant tumor, with no cancerous recurrence.

Now the National Cancer Institute has awarded **Scott Verbridge** of biomedical engineering and mechanics a \$386,000 grant to take a related medical procedure a step closer to using on humans. Verbridge will lead a new effort to focus on targeting and destroying the most therapy-resistant infiltrative cells in malignant glioma. This follows modeling techniques of the treatment for humans and a publication in the *Journal of Technology Cancer Research and Treatment*.

Glioblastoma is “almost universally fatal, with a five-year survival rate of less than five percent,” Verbridge said. “This statistic has not improved significantly in decades, and there is still no treatment option.”

Davalos’ technique is called irreversible electroporation. Investigators now propose that these pulses can be tuned “to target the unique physical properties of malignant cells,” Verbridge said. By contrast, chemotherapy and radiation use to fight cancer also kill healthy cells. Clinical trials using the irreversible electroporation procedure have occurred in the treatment of liver, kidney, pancreatic, and lung cancer.

In addition to Davalos, Verbridge’s research team includes Virginia Tech faculty and research fellows, and faculty from Wake Forest University and Ohio State University.

Faculty, student team focus on curbing water contamination in Dominican Republic village

A team of Virginia Tech civil and environmental engineering students and faculty are helping curb ground contamination problems involving sewage and human waste that has hampered Veron, a town in the Dominican Republic just off the path of the main tourist tract known for resorts and beaches.

“This is a significant project that is drawing national attention in the Dominican Republic,” said team leader **Mark Widdowson**. “The soils are not suitable for waste treatment and the hydrogeology is not ideal for natural protection of the groundwater supply. This year, our students have been collecting data to benchmark the performance of the wastewater treatment system and the groundwater quality.”

Widdowson, CEE professor emeritus **John Novak**, and graduate students **Nick Mason**, **Robert Garrett Wilcocks**, and **Nicole Abramson** studied the contamination, providing reports in 2012, 2013, and 2014. Among their findings: In Veron – population 60,000 – sewage is disposed of through pipes drilled into the ground. Groundwater is the sole source of fresh water in Punta Cana. So when Veron’s residents use open fields for defecation or dump household waste into unlined ground pits, health concerns are raised.

“This is a significant project that is drawing national attention in the Dominican Republic.”
~ **Mark Widdowson**

Significant contamination in Veron’s well water, including *E. coli* and elevated nitrates, was also found.

Despite the fact that well water is not used for drinking, Mason said the presence of “fecal matter remains a threat.”

The team’s efforts are not just research. Beginning in fall 2013, with efforts of the government and nonprofits, a small-scale wastewater treatment system was constructed inside Veron. It began operation in 2014, with Widdowson’s team “contributing expertise along the way to support the design and implementation.”

A senior design team of biological systems engineering students developed the design of the treatment system. The goal: reduce pathogens that are recharged into the aquifer resulting “in the reduction of waterborne diseases,” some of which may have affected tourist areas.

The final design was completed by engineers with the U.S. Peace Corps.



Mark Widdowson, center, tests Veron’s water supply. In Veron, most sewage is disposed of through pipes placed directly into the ground, and groundwater is the sole source of fresh water there.



Virginia Tech joins \$30M effort to curb head injuries among college athletes, military personnel

Virginia Tech was handpicked to participate in a landmark \$30 million national effort sponsored by the National Collegiate Athletic Association and the U.S. Department of Defense to combat concussions among college athletes and active service military personnel.

The initiative has been called the most comprehensive study of concussion and head impact exposure ever conducted, with 25,000 male and female NCAA student-athletes participating in the study. Virginia Tech is focusing on football, women's soccer, men's soccer, and women's lacrosse. Data collected from athletes will be used to help curb head injuries among U.S. Armed Forces personnel. The study was launched by the White House.

"We have a long history in this research area as we pioneered the concept of instrumenting student-athletes to better understand concussions starting in 2003, well before the dangers of head

injuries suffered by athletes at youth, college, and professional levels became a focus of the national media," said principal investigator **Stefan Duma**, head of the Department of Biomedical Engineering and Mechanics.

Among Duma's local research partners in the national effort are the Edward Via College of Osteopathic Medicine and the Virginia Tech Athletics Department.

Also during the past year, Duma updated results of his adult football helmet ratings, which are designed to identify key differences between the abilities of individual helmets to reduce the risk of concussion. All five of the new adult football helmets introduced in mid-2014 earned the five-star mark, the highest rating awarded by the Virginia Tech Helmet Ratings. Also on dock for Duma's team is the highly anticipated release of ratings for professional and youth hockey helmet ratings, released this spring.

Husband and wife team garner recognition for computer research

Husband-and-wife team **Dhruv Batra** and **Devi Parikh** of the Bradley Department of Electrical and Computer Engineering had a banner 2014, capturing multiple research grants for work into "teaching" computers to act smarter, including picture identification.

In spring 2014, Batra accepted three major federal research grants worth more than \$1 million: a National Science Foundation CAREER Award, a U.S. Army Research Office Young Investigators Award, and a U.S. Office of Naval Research grant. The awards – valued at \$500,000 for five years for the CAREER Award, \$150,000 for three years from the Army, and \$360,000 for three years from the Navy – focus on machine learning and computer vision. They will be used to create algorithms and techniques that will teach computers to better "understand" photographic images, and quickly.

"When we see an image, we see things that a computer won't see. We see people, action, and the environment, the layout of space, and what is in front and



Dhruv Batra



Devi Parikh

behind. We interpret right away emotion, action, and place, the city or the rural country," said Batra. "Computers cannot do that."

Parikh last year captured three awards: \$150,000 U.S. Army Research Office Young Investiga-

tors' Award, a \$92,000 Google Faculty Research Award, and a \$1 million award from the Paul G. Allen Family Foundation. She wants to create a two-way communication between user and computer vision systems, allowing computers to diagnose their own failures.

"Models that characterize the failures of a system can then also be used to predict oncoming failure," said Parikh, adding corrective programming could be used in artificial intelligence systems.

In her research for Google, Parikh will use visual abstracts and cartoons to teach machines how to better operate on their own, and for the Allen Distinguished Investigator Award, will likewise use cartoon scenes crafted from clip art to help computers "read" complex images.



Robert Walters, vice president for research at Virginia Tech and a former head of the Department of Aerospace and Ocean Engineering, retired on Feb. 1. Walters served the university for 30 years. With his oversight, National Science Foundation-reported university research expenditures grew by \$175 million to \$496.2 million in 2013, compared to \$321.7 million in 2006.

faculty / research SHORTS

- **Popular Science** named **Nicole Abaid** of biomedical engineering and mechanics as one of its 2014 Brilliant 10, highlighting how bats swarm during flight in order to gain insights on improving the control of proposed underwater robotic vehicle teams.
- **William Baumann** of electrical and computer engineering is part of a multi-university team to discover a molecule believed to help determine if breast cancer cells that are resistant to antiestrogen therapy will live or die.



Jake Socha

- **Bahareh Behkam** of mechanical engineering won a National Science Foundation CAREER award of \$505,000 to investigate interactions between bacteria and tumorous cells in a 3-D model.
- **Ali Butt** of computer science and **Chao Wang** of electrical and computer engineering are co-investigators of a \$750,000 National Science Foundation grant to improve resource management tools that handle massive, fast-moving swaths of data on mobile devices.
- **Robert Canfield** of aerospace and ocean engineering received the American Institute of Aeronautics and Astronautics Multidisciplinary Design Optimization Award for 2014.
- Civil and Environmental Engineering's **Matthew Eather-ton** won a \$500,000 National Science Foundation CAREER Award to research how steel plates with carefully designed geometric patterns – or voids – cut into them can better withstand extreme events better than standard, solid steel plates.
- **Jesus de la Garza** of civil and environmental engineering was named a distinguished member of the American Society of Civil Engineers, the society's highest accolade.
- Rolls-Royce Commonwealth Professor for Aerospace Propulsion Systems **Srinath Ekkad** was appointed associate vice president for research programs at Virginia Tech.
- Electrical and Computer Engineering's **Michael Hsiao** will use a \$418,000 National Science Foundation grant to further develop an algorithm based on swarm intelligence among ants.
- Electrical and Computer Engineering's **Fred Lee** received the 2015 Institute of Electrical and Electronics Engineers' Medal in Power Engineering for his contributions to power electronics.
- **Alexander Leonessa** of mechanical engineering joined the National Science Foundation in fall 2014 as director of

the agency's general and age-related disabilities program.

- **Kray Luxbacher** and **Emily Sarver** of mining and minerals engineering are leading two federally-funded projects to improve mine safety and health for underground workers.
- **John Novak**, professor emeritus of civil and environmental engineering, was the 2014 recipient of the Association of Environmental Engineering Scientists and Professors Perry L. McCarty Founders Award.
- **Amy Pruden** of civil and environmental engineering was named associate dean and director of interdisciplinary graduate education in the Graduate School at Virginia Tech.
- **Jake Socha** of biomedical engineering and mechanics won a \$300,000 five-year National Science Foundation CAREER Award to study the mechanisms that allow some species of snakes to "fly," using their coiled bodies to glide in air.
- Mechanical engineering's **Michael von Spakovsky** received the 2014 American Society of Mechanical Engineers James Harry Potter Gold Medal for his research into thermodynamics.
- Mechanical engineering's **Pablo Tarazaga** won a \$450,000 Air Force award to study sound wave propagation in a solid structures, possibly manipulating the shape of objects such as aircraft wings.
- **Allison Tegge**, a post-doctoral associate researcher in computer science, was awarded a three-year National Institutes of Health fellowship worth \$150,000 for her computational research work in an effort to understand how liver cells signal one another.
- **Daphne Yao** of computer science will investigate for the U.S. Army cybersecurity anomalies caused by system compromises and malicious insiders.
- Mining and minerals engineering's **Roe-Hoan Yoon** was awarded the 2014 Lifetime Achievement Award at the 27th International Mineral Processing Congress for his work into separation processes.



These lightweight, plastic coins were 3-D printed at Goodwin Hall and later flew aboard the Orion craft, along with similar coins from other universities.

Students, alumni were behind the scenes of historic Orion launch

When NASA's Exploration Flight Test-1 Orion spacecraft blasted in to space for an historic five-hour orbit 3,600 miles above the earth on Dec. 5, 2014, Hokie engineers – both alumni and students – were behind the scenes for NASA and had research work onboard the unmanned capsule.

Strapped into a pilot's chair of the unmanned craft was a NASA-sponsored

radiation shield experiment spearheaded in part by first-year engineering students Christopher Dobyms and Anna Montgomery, while they were seniors at the Virginia Governor's School of Science and Technology, participating in NASA's Exploration Design Challenge. The student team beat out thousands of entries to make space history.

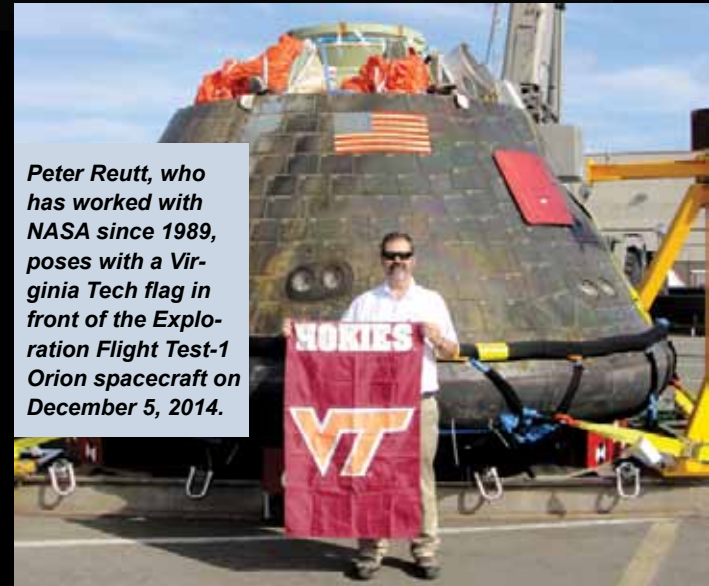
Designing and building the box underwent many generations to meet a weight limit, space constraints, and be able to withstand likely high levels of radiation.

Dobyms and Montgomery watched the Dec. 5 launch live at Kennedy Space Center, and met, among others, Charlie Bolden, head of NASA. (Coincidentally, Virginia Tech College of Engineering Dean Richard C. Benson, who had been invited by NASA-Langley, also was there for the live launch.)

"The launch was the most beautiful thing I have ever seen," said Montgomery.

Also on board were 3-D printed plastic coins created by students in the Design Research and Education for Additive Manufacturing Systems (DREAMS) Lab, based at Goodwin Hall. "The coin is printed as a single part, so there is no assembly required," said lab member Nicholas Meisel.

Among the notable alumni involved in the launch and recovery effort was Peter Reutt, a 1981 graduate of the Department of Aerospace and Ocean Engineering now working with NASA in vehicle recovery missions. He was part of the team to recover the vessel in water post-flight near San Diego, bringing the craft onto a ship after the capsule traveled 3,600 miles above the earth for the five-hour unmanned mission.



Peter Reutt, who has worked with NASA since 1989, poses with a Virginia Tech flag in front of the Exploration Flight Test-1 Orion spacecraft on December 5, 2014.



Christopher Dobyms, Anna Montgomery

"As recovery move director in charge of access and handling of the Orion crew module, the recovery was nominal," Reutt said. "Our prior training showed as it was a very smooth operation to bring the capsule into the well deck, offload the ship, and prepare it for return to Kennedy Space Center."

alumni HONORS

Much of the success and growth of the College of Engineering comes from the constant support of our amazing alumni. Among those alumni we honored this past year are...



John Sparks

John F. Sparks, director of programs at Aerojet Rocketdyne, was named the Distinguished Alumnus for 2014. Sparks' leadership skills were critical to the college in its early attempts to secure funding from the Virginia General Assembly for the \$95 million Goodwin Hall by holding personal and direct meetings with legislators as far back as

2007. "Before John and his committee took shape, the Virginia General Assembly had little idea what the Signature Engineering Building was," said Richard C. Benson, dean of the college and the Paul and Dorothea Torgersen Chair. "Without John Sparks' leadership, we wouldn't [have this building] today."

Sparks earned his bachelor's, master's, and doctoral degrees in 1974, in 1976, and in 1981, respectively, in mechanical engineering. He has served as a member of both the College of Engineering and the Department of Mechanical Engineering advisory boards, chaired the college's advisory board during the 2011-12 academic year, and has volunteered his time as a guest speaker on numerous occasions, including with the Student Engineers' Council. "To even be considered as a candidate for the award is an honor; to be selected is overwhelming," Sparks said.



Diane and David Lohr

Advisors, Lohr has spent the past four years on the College Advisory Board, serving alongside fellow alumnus John Sparks as an integral member of committee tasked with meeting members of the General Assembly in order to help secure funding for the construction of Goodwin Hall.

Lohr also was a founding member and a past chairman of the Department of Chemical Engineering's advisory board.

Along with other key alumni members, Lohr is fast at work to continue the college's brick-and-mortar growth by seeking funds for the renovation of Holden and Randolph halls.

David Lohr, a 1976 graduate of the chemical engineering department, was the recipient of the 2014 Distinguished Service Award.

The owner of Navigation Point



2014 Academy of Engineering Excellence and Young Alumni

The college in 2014 inducted eight new members into its Academy of Engineering Excellence and honored two new Outstanding Young Alumni. The Academy is an elite group of engineering alumni with 127 members who have achieved multiple honors throughout their careers. Pictured here left to right with Richard C. Benson, dean of the College of Engineering, are the 2014 members of the Academy and the Outstanding Young Alumni. Front row: J.B. Jones, a former Department of Mechanical Engineering head from 1964 until 1984; David Childress, a project manager with Gilbane Inc. who oversaw construction of Goodwin Hall; and Joseph Meredith, president of Virginia Tech's Corporate Research Center. Center row: Wayne Snodgrass, a retired vice president at Northrop Grumman; Greg Lavendar, chief technology officer for architecture and infrastructure engineering at CitiGroup; and Pardha Pyla, a senior interaction designer and the design director for Bloomberg. Back row: Daniel Carson, a retired vice president of Appalachian Power Co.; Ed Tiedemann, vice president of engineering at Qualcomm Inc.; and Charles "Chip" Blankenship, president and CEO of GE Home and Business Solutions. Not pictured is Paul Baduini, a retired vice president and director of engineering at Rohm and Haas Co.

Goodwin Hall's first day in the spotlight

Hundreds of students entered Goodwin Hall, first called the Signature Engineering Building, on the morning of August 25, 2014, the first day of the fall 2014 semester.

Students walking into the main entryway looked toward the ceiling to see the Rolls-Royce Trent 1000 engine hanging from the second floor. Dozens of others made their way to the second floor and gathered around the glass walls of the Terrestrial Robotics and Engineering Controls Lab, with lab members already at work on the robot SAFFiR. Nearby humanoid robots tall, CHARLI, and short, DARwIn, looked out. Students took "selfies" of themselves and the robots.

Overheard comments were many. "This place is pretty sweet." "Amazing." "I got here early just to see it." Inside **Pat Koellers**'s electrical and computer engineering's 8 a.m. class, one Corps of Cadet student came in, ran up to his friends, and excitedly gestured, "Have you seen the engine!?!"

Faculty from the College of Engineering's departments of chemical engineering, engineering education, mechanical engineering, and aerospace and ocean engineering, had been working inside since June 1, when the building opened for them to move in, a process that took several weeks. Additionally, the Center for Engineering Diversity hosted the "O Show" – or "Opportunities Show" – on August 24, with an estimated 900 first-year students invited to meet with more than two dozen engineering labs, teams, and organizations.

Not all of the classes inside the \$100 million, 155,000-square-foot building are engineering-based. About a third of the classes are from others college from across Virginia Tech, including university studies, philosophy, and more. Construction on the building began in fall 2011.

