Fortune-telling
Big data at Virginia Tech

Sensors Within
Goodwin Hall knows where you are

Monument Man
Alumnus shapes D.C. sites

VIRGINIA TECH magazine
winter 2014-15

Sowing the Future
Part Two
On Oct. 17, I had the pleasure of being formally “installed” as Virginia Tech’s president. Of course, I have occupied this role since June, but the ceremony afforded me the opportunity to share some ideas about future directions.

This balanced approach leads to beneficial interdisciplinary collaboration. That’s a mouthful of a phrase, but simply put, our program leaders work with each other to build teaching and research programs that mimic the real world. We create programs outside traditional disciplinary silos that address pressing world issues. Where else can one get a “water: resources, policy, and management” degree? Indeed, that’s a mouthful of a phrase, but simply put, our program leaders work with each other to build teaching and research programs that mimic the real world.

Looking to the future—a horizon I set at 2022, the year of our 150th anniversary—we should build on existing trajectories and set new goals.

Virginia Tech must continue to move up in the ranks of U.S. research universities. Goals and metrics are important in their own right. But in this context, I see rankings as proxy for impact on society—our ability to make UT Prosim real. We should continue our quest for top-10 status.

We live now in a world of wide horizons and international landscapes, so we should also commit ourselves to becoming recognized as a top-100 global research institution. The best talent knows no boundaries. Maintaining impactful, curiosity-driven scholarship requires the best minds on the planet.

For our students, it almost goes without saying that we should offer high-value degrees with a strong return on investment. Satisfaction surveys and rankings indicate that we do a pretty good job there. How can we expand our capacity here for you, our devoted alumni, to engage with our current students?

Every undergraduate who wishes to participate in study abroad should have the opportunity to do so without delaying as an adult than financial success.

The recent Gallup-Purdue Index report, which surveyed 30,000 graduates of U.S. institutions, is making feasible a focus on what truly matters to our students: Are they thriving in life and engaged in their work? And what experiences do students most strongly associate with thriving and engagement in later life?

Although we are just beginning to understand these data, early analysis clearly points to the importance of inspiring faculty, mentorship, and deep experiential learning. Thus, I believe that every Virginia Tech undergraduate should have the opportunity to participate in either an internship in a field related to his or her studies or a meaningful undergraduate research experience—or both. We have ample data to show that these opportunities open doors and raise ceilings.

Every student should have access to a personal mentor, whether that mentor is a Hokie alum, a faculty member, or a staff member. We have a tremendous opportunity here for you, our devoted alumni, to engage with our current students.

Every undergraduate who wishes to participate in study abroad should have the opportunity to do so without delaying degree goals and without financial hardship.

Every student, faculty member, and staff member at all of our campuses and facilities should have a culturally rich experience, with opportunities to live, work, and study with people whose life experiences are very different from their own. For this to happen, we must have a wide diversity of life experiences among our people. We will lead intentionally, with inclusion as a pathway to excellence.

These experiences will reinforce our parallel and intertwined efforts to structure our curricula to ensure that our graduates have both depth in their disciplines and the skills necessary to compete. Our students should also leave Virginia Tech with the entrepreneurial skills needed to turn their vision for a better world into reality.

While Virginia Tech has strategically plotted its course toward the future, the reality is that the ground underneath us is shifting again. The public-good model for funding public universities has eroded for three decades. At Virginia Tech, state support per Virginia undergraduate is only half what it was in real dollars in 2000. We must rebuild the strong support we have had and reverse this trend of declining state funding to ensure the affordability of a Virginia Tech education.

Similarly, the funding of research is increasingly unreliable in the current climate of state and federal government. If the funding model does not change, we will be relying to a greater degree on limited gifts and foundation funds to prop up our research in partnership with government and corporate sponsors.

The demographics of our future students from Virginia, the U.S., and around the world are shifting markedly, becoming more diverse in every dimension. We need to be ready. We need to anticipate. We need to be intentional and proactive in taking advantage of this diversity.

In short, we cannot rely on the government for funding. We must focus on resource-building. I am challenging the university community to at least double our current $800 million endowment.

This is Virginia Tech’s century. I am humbled to have been chosen to serve as your president at this extraordinary time. And I look forward to working with you on our journey together as we continue to build upon the spirit of UT Prosim.

www.vtmag.vt.edu
Food, water, and population growth

Developing new technologies and methodologies to help feed a growing human population is a noble and worthwhile cause. However, as any biologist, including this one, will tell you, providing a seemingly endless supply of food only serves to increase any species’ population, perpetuating a spiraling problem.

The largest part of the solution should be to slow down and reduce the world population. The Earth’s ecological carrying capacity has exceeded it. It’s time for us to recognize that a finite planet cannot sustain an infinite number of people. Smaller families (two or fewer children), having children later in life, and education all play major roles in achieving this.

In addition to smaller family sizes, it’s important that people in every age group and every walk of life make conscious choices, not one forced upon us. It’s our conscious choice to have children later in life, and education.

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Virginia Tech in hand

Download Virginia Tech Magazine’s free app—available in Apple’s App Store and Google Play—and experience every feature story, every class note, and all the news, along with video and audio extras.

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Bookmark your favorite stories. Share pages with your social networks.

letters to the editor

tailgate crew absorbed us into their party and even played “Purple Haze” and “Purple Rain” for us. We don’t get that everywhere we go, that’s for sure!

I’ve been to ECU football games at various venues in 11 states, and I have never been treated better by the opposing team’s fans than I have in Blacksburg. In fact, my husband and I have been to Blacksburg before and experienced the congeniality of your fans, so I know this is not an anomaly. You people at Virginia Tech do it right and set the standard for how it should be done on every campus on every game day!

Donna Raynor
Ayden, North Carolina

Economic engagement

I want to compliment Dr. Sands on his very insightful and encouraging message, “Unleashing the Innovation Ecosystem,” in the recent Virginia Tech Magazine. Having recently retired from the General Electric Co.’s major appliance division, I appreciate very much his views about engaging in commercialization and entrepreneurship.

Ralph Griffith (business administration ’56)
West Chester, Ohio

I, like most Americans who suffer from macular degeneration and similar eye diseases, have trouble reading Virginia Tech Magazine. I cannot read the orange print, so some of the content is lost and makes it very hard to read. Try plain old black and white. Many of us old-timers have weakening eyes and need all the help we can get.

Ralph Griffith (business administration ’56)
West Chester, Ohio

Editor’s note: Thank you for sharing your concerns. We’re working on a solution for the spring edition.

Corrections from the fall edition

A Class Notes entry misstated Wolfgang F. Freiheit’s (M.Arch. ’69) role with “Enhancing Building Performance”; he was co-editor.

A Book Notes entry on Jim Mize’s (biometry ’75, M.S. agricultural economics ’77) book on fishing humor, “A Creek Tricksles Through It,” misspelled his last name.

In the story on the Duck Pond, the reference to the book “Remarkable Trees of Virginia” should have included Professor Emeritus Jeff Kiewart’s contributions as one of the authors.

The Garnes-Waddle wedding photo on page 56 should have been credited to Laura’s Focus Photography.

Orange ink

There is probably some valuable information in the recent magazine from Tech, but the poor, weak orange-on-white and white-on-orange print makes it very hard to read. Try plain old black and white. Many of us old-timers have weakening eyes and need all the help we can get.

Ralph Griffith (business administration ’56)
West Chester, Ohio

This spring, the Virginia Tech Transportation Institute captured two federal contracts from the Federal Motor Carrier Safety Administration and the National Highway Traffic Safety Administration worth a combined potential $55 million. Collectively the largest of their kind awarded to the institute in its 25-year history, both contracts aim to mitigate fatalities and injuries on our nation’s roads.

For the Federal Motor Carrier Safety Administration, Richard Hanowski, director of the institute’s Center for Truck and Bus Safety, will oversee new research into commercial truck driver performance, such as fatigue and distraction, and other characteristics that influence driver behavior, such as vehicle handling and braking.

Expected to span several years, this research will incorporate the use of a naturalistic driving video-capture technique that places multiple cameras inside and outside a vehicle to record the driver as he or she interacts with the vehicle and the road.

Myra Blanco, who heads the institute’s new Center for Automated Vehicle Systems, will oversee the contract from the National Highway Traffic Safety Administration. Breaking new ground in the burgeoning field of automated vehicles, the research will focus on automated-vehicle technology, including safety protocols, that is expected to flood the automotive market in the next decade and beyond. Blanco will study vehicle electronic systems, seek reinforcements to block potential hacking of vehicles, and identify potential safety issues, including fail-safe systems.

Transportation institute awarded federal contracts

www.vtmag.vt.edu
Female cadets stand in formation in front of Lane Hall.

Virginia Tech Vice President for Research Robert W. Walters will retire Sept. 1.

During Walters’ eight years in the role, Virginia Tech has remained the Commonwealth’s only institution in the top 50 of the National Science Foundation (NSF) research expenditure rankings, reaching No. 40 in the most current national standings. In addition, NSF-reported research expenditures at the university grew by approximately $175 million—from $321.7 million in 2006 to $496.2 million in 2013.

From 1985 to 1997, Walters was a faculty member in the College of Engineering’s Department of Aerospace and Ocean Engineering. In 1988, he founded AeroSoft Inc., which specializes in computational fluid dynamics software development and applications to develop solutions for the aerospace and defense industries. After selling the company to employees a decade later, Walters continued with the aerospace and ocean engineering department and was named its chair in 2002.

“Dr. Walters’ leadership further established Virginia Tech as the Commonwealth of Virginia’s leading driver of innovation and invention,” said President Timothy Sands. “He brought a singular understanding of federal agencies, industry, and entrepreneurship to the position and built a strong platform for growth of Department of Defense-sponsored research. Because of his efforts, Virginia Tech is positioned to continue its progress to become an elite research university.”

**Engineering a new archive**

When W. Cully Hesson (agricultural engineering ’84, M.S. ’88), professor in the Department of Biological Systems Engineering, chanced upon thousands of photographs and documents deep within Sieitz Hall—some dating back to 1915—he knew he’d found the mother lode of Virginia Tech’s agricultural engineering history.

The materials—since compiled in a digital collection titled “Project No. 10,” the name of the entity that originally funded Tech’s agricultural engineering department, today’s Department of Biological Systems Engineering—have already proven valuable to researchers and historians alike, Hesson said.

Learn more about the collection—available in Discovery Commons, the university’s online research repository—at www.vtmag.vt.edu.

Firsts in Virginia Tech history: Coed residence halls

Virginia Tech’s groundbreaking 1973 decision to admit women into the Corps of Cadets not only predated the U.S. service academies by a year, but also led to another first for the university in 1981—a first that can also be considered a “last.”

Living in a separate residence hall from the males, female cadets in corps leadership roles found it increasingly difficult to fulfill their supervisory responsibilities. In response, the Board of Visitors backed off its hard-line policy of separating the sexes and allowed Brodie Hall to house both men and women.

Tech, however, was well behind the curve in this area. Said then-Vice President for Student Affairs James Dean, “We are the last university in the state and perhaps the last in the East that doesn’t have some form of coeducational living.”

But the die had been cast, and the commingling of genders soon spread to the civilian student body. In fall 1983, East Ambler Johnston became Virginia Tech’s first non-cadet residence hall to go coed.

Researchers discover potential markers for breast cancer

With one in eight women likely to develop breast cancer in their lifetimes, finding better predictive markers remains critical. In a study published in Breast Cancer Research and Treatment, Virginia Tech researchers in the Medical Informatics and Systems Division at the Virginia Bioinformatics Institute pinpoint diagnostic markers that may aid clinicians in better forecasting and preventing the disease.

Using breast cancer genome (blood) samples from The Cancer Genome Atlas Project and comparing them with samples from cancer-free individuals whose genomes are found in the 100 Genomes Project, the research team identified several novel markers that not only may reveal risks for breast cancer, but also may yield therapeutic benefits.

“There is still a lot we can learn from looking at the human genome and how it can be affected in ways that may be associated with disease,” said Natalie Fonville, a geneticist on the research team. “This study is the first of many in which we are engaged that identify subtle genomic changes that together may add up to cancer risk.”

In stock market game, brain patterns of high earners predict bubbles and crashes

In a study published in July in the Proceedings of the National Academy of Sciences, scientists at the Virginia Tech Carilion Research Institute and the California Institute of Technology discovered that when they simulated market conditions for groups of investors, economic bubbles invariably formed. More remarkably, a correlation between specific brain activity patterns and sensitivity to those bubbles was found.

“Stock market bubbles form when people collectively overvalue something, creating what economist Alan Greenspan once famously called ‘irrational exuberance,’” said Read Montague, director of the Human Neuroimaging Laboratory at the research institute and one of the study’s senior authors. “Our experiments showed how the collective behavior of market participants created price bubbles, suggesting that neural activity might offer biomarkers for the evolution of such bubbles.”

Montague and colleagues enrolled 320 subjects in a market-trading simulation game. Up to two dozen participants played in each of 15 market sessions, with two or three participants simultaneously having their brains scanned using functional magnetic resonance imaging, or fMRI, a noninvasive technique that allows scientists to use microscopic blood-flow measurements as a proxy for brain activity.

At some point during the 50 trading periods of each session, a price bubble would invariably form and crash. Although the scientists had suspected that crowd cognition would result in some bubble formation, they had not expected it to happen every time. Surprising the scientists even more were the distinctive brain activity patterns that emerged among the low earners and high earners.

The model may also shed light on other contexts in which groups or individuals overvalue something, Montague said. “This neurobehavioral metric could be used to help quantify situations in which people place excessive value on poor choices, such as drug addiction, compulsive gambling, or overeating,” he said.

Montague, who uses computational models to understand neuropsychiatric conditions, noted that the study could not have been conducted without two relatively new additions to the neuroscientist’s toolbox: fMRI and hyperscanning, a cloud-based platform that enables multiple subjects in different brain scanners to interact in real-time—whether across rooms or across continents—and allows scientists to study live human interactions. Montague likens the technique, which he and his team developed just over a decade ago, to being able to eavesdrop on an entire cocktail party conversation, rather than the monologue fMRI enables.
Healing wounds
twice as fast

While examining how electricity moves through cardiac muscle, Robert Gourdie’s research team developed a peptide that, as expected, enhanced the flow. Because other research had discovered similar proteins that supported healing, the scientists then scratched a single layer of skin cells lying on a Petri dish, applied their peptide, andwaited. The cells began mending.

“We had this fundamental question: How does electricity flow through the heart? We had no idea the answer would lead to a treatment for healing skin wounds,” said Goudie, director of the newly expanded Center for Heart and Regenerative Medicine Research at Virginia Tech Carilion Research Institute.

While early clinical trials using the peptide on diabetic foot ulcers have been promising, with the potential for wounds to heal in half the time, the treatment must progress through additional trials before it can be made available for wider use.

To see examples of the participatory maps and to learn more about Parks’ research, go to www.vtmag.vt.edu. Image courtesy of Mary Harman Parks.

Tooth buried in bone indicates prehistoric interactions

The tooth of a phytosaur, a reptile, lodged about two inches deep in the thigh bone of a rauisuchid, a land-bound carnivore, has led researchers to question the long-held belief that these two dominant predators didn’t interact some 210 million years ago.

In a paper published online in September 2014 in the German journal Naturwissenschaften, Stephanie Drumheller of the University of Tennessee and Michelle Stocker and Steven Nisbet, vertebrate paleontologists with Virginia Tech’s Department of Geosciences, presented evidence that the two creatures not only interacted, but did so on purpose.

The researchers discovered the bone by chance at the University of California Museum of Paleontology in Berkeley.

“Finding teeth embedded directly in fossil bone is very, very rare,” Drumheller said. “This is the first time it’s been identified among phytosaurs, and it gives us a smoking gun for interpreting this set of bite marks.”

Added Stocker: “This research will call for us to go back and look at some of the assumptions we’ve had in regard to the Late Triassic ecosystems. … Aquatic and terrestrial distinctions were oversimplified, and I think we’ve made a case that the two spheres were intimately connected.”

To those in the know, Blacksburg’s quality of life is seldom far from praise—a happy circumstance that boosts Virginia Tech’s ability to recruit and retain high-caliber faculty and staff.

Not only was Blacksburg ranked the “Best Place in the U.S. to Raise Kids” on a 2012 list compiled by Bloomberg’s Businessweek, Forbes.com named the Blacksburg-Christiansburg-Radford Metropolitan Statistical Area one of the best small areas to find employment, based on statistical data from the Bureau of Labor Statistics.

And to nary a Hokie’s surprise, in 2011, Southern Living included Blacksburg among the “Best College Towns in the South.”

In similar fashion, Virginia Tech’s efforts to ensure the well-being of both town and gown continue to attract their own accolades.

For the fifth consecutive year, the university received a gold award for its commuter program from Best Workplaces for Commuters, which encourages sustainable transportation. Last year, Virginia Tech landed the No. 1 spot on The Active Times’ list of the “50 Fittest Colleges in America.” And the year prior, the university and the area’s economic opportunities were cited as major reasons for Blacksburg’s top position on the “Top 10 Cities to Raise A Family” list on www.homes.com, a popular real estate site.

Hokies also endeavor to keep their necks of the woods as pretty as the town’s. Virginia Tech’s dedication to campus forestry management and environmental stewardship has earned the university recognition as a Tree Campus USA from the Arbor Day Foundation for the past three years.


Browse the archives at www.vtmag.vt.edu/archives.

Because we’re happy
The Sensors Within

by MASON ADAMS

Goodwin Hall knows where you are. Opened in June 2014, the newly built engineering building is rigged with 241 accelerometers that measure motion and vibration inside and outside its walls. The building—the world’s most-instrumented for measurement of vibrations—contains three times as many sensors as the world’s next most-measured building.

Vibrations large and small—from earthquakes to footsteps—are catalogued by sensors. The accelerometers are placed throughout the building and synchronized. Because each sensor records information in only a single direction, they’re frequently used in combination with one another. That’s especially the case at the building’s corners, where trios of sensors are mounted in triaxial formations to cover a range of motion and essentially produce a 3-D picture of what’s happening.

Eventually, the data could be used to “program” the building for more efficiency. If the building senses that every person within its walls has gathered on a particular floor in winter, it may consequently heat that floor while reducing the temperature elsewhere, saving on energy costs. If there’s a fire, the building may be able to transmit information to firefighters arriving on the scene. Long-term, the building will tell maintenance crews where it needs work.

The accelerometers mounted throughout the building will eventually be complemented by additional sensors that measure information such as temperature and light.

For a photo gallery and video on the sensors, visit www.vtmag.vt.edu.
What drew you into this field?

I have always been a curious person, which is a common or perhaps a required characteristic of scientists. In high school, I was amazed by how well the chemical mechanism of some enzymes was understood. I was interested in learning how scientists were able to understand how enzymes function. The results from enzyme/drug discovery research have the potential to improve the quality of life for many people around the world.

What excites you most about molecular science and drug development?

I believe that the major advance will come from computational biology. With this, we can use the power of the cloud to accelerate the development of new drugs.

Beyond the Petri dish, how is your research applied to other areas?

Our work has revealed the structure and mechanism-of-action of an enzyme called UDP-galactopyranose mutase, or UGM. Simply put, the enzyme provides the "blueprint" that can be used to accelerate the development of new drugs.

What advances do you foresee in molecular research in the next five to 10 years?

I believe that the major advance will come from computational biology. With this, we will be able to design from scratch an enzyme with a desired function. Similarly, computational biology will accurately predict the potential role of a compound as an inhibitor or as a substrate for a particular enzyme.

What do you foresee as the most challenging obstacle in enzyme and drug discovery research?

The major obstacle is development of drug resistance. As we embark into a drug discovery program, we need to be aware of selecting drug targets that have low potential for developing drug resistance.

Amy Laeffer is a science writer in the College of Agriculture and Life Sciences.
The Science of Virginia

Downtown Roanoke’s pedestrian bridge over Norfolk Southern’s railroad tracks loomed in the background as Joe Wartenby talked about the Virginia Tech Steel Bridge Design Team’s work on a smaller structure.

Families attending the Virginia Science Festival in Roanoke, Virginia, watched and explored the team’s bridge as Wartenby, a senior majoring in civil engineering, described the American Society of Civil Engineers’ bridge competition: how the bridge must fit into a small box with no pieces sticking out, how the team has a limited time for setup, and how the structure is tested and points are awarded.

Nearby, other Virginia Tech student teams showcased an off-road Baja vehicle, a human-powered submarine, and a formula-style racecar. And that was just a small fraction of what was available to see on the closing day of the inaugural Virginia Science Festival.

“That’s a big part of what the science festival is about: taking what people are doing and bringing it to a space where kids can enjoy it, the general public can enjoy it,” said Phyllis Newbill, studio associate for outreach and engagement at Virginia Tech’s Institute for Creativity, Arts, and Technology (ICAT).

With events across Virginia, the festival originated when Science Museum of Western Virginia officials brainstormed ways to bring their educational mission into the community while College of Science Dean Lay Nam Chang and Communications Director Ronnaire Bushby sought ways to mark the college’s 10th anniversary. Based on Bushby’s proposal for a science fair, the college and the museum joined forces. Provost Mark McNamee and his staff, particularly Susan Short, associate vice president for engagement, worked with Jim Rollings and Michael Hemphill, respectively the museum’s executive director and director of marketing and development, to further develop the idea and then secure a $10,000 grant from the Science Festival Alliance.

The idea picked up steam quickly and blossomed into a statewide event once U.S. Sen. Mark Warner got wind of it. Warner and fellow U.S. Sen. Tim Kaine agreed to serve as co-chairs of the festival, and the Virginia Institute of Marine Sciences in Gloucester Point, Virginia, staged several events during the week of the festival, including a moonlight beach walk and undersea crafts.

In Richmond, Virginia, scientists helped students steer digital mice through a maze to put a ball in a hoop—an exhibit known as rat basketball. About 5,000 people attended the Blacksburg festival day, another 5,000 attended the Roanoke events, and an additional 5,000 people came to campus for Hokie BugFest on the Roanoke festival day.

Scheduled during Fall Family Weekend, the campus festival day included more than 100 exhibits and speakers, showcasing Virginia Tech’s world-class faculty, students, and programs.

“What a great opportunity for family members to learn about what kinds of thought leaders are at Virginia Tech,” said Short. Various branches of the U.S. Armed Forces brought pieces of heavy equipment that proved to be kid magnets. NASA Langley Research Center and WDBJ7’s Weather Fest, which were major attractions, appeared at both the Blacksburg and the Roanoke events. Likewise, the Tuxedo Pandas, a group of STEM-focused 7th- through 10th-graders in Montgomery County, drew attention with their robots, panda hats, and tuxedo T-shirts.

In Southwest Virginia, the Bristol Motor Speedway hosted more than 40 teachers for a workshop about engaging students in science through stock cars, with discussions on vehicle safety, engineering, helmet research, and racing physics. Various branches of the U.S. Armed Forces offered small structures for the students to learn about what kinds of thought leaders are at Virginia Tech.

蛭子虫更多：
For a photo gallery and a video on the festivities, visit www.vtmag.vt.edu.

www.vtmag.vt.edu

Virginia Tech Magazine winter 2014-15
So long, crystal balls.

Through the use of big data, Naren Ramakrishnan and his team from the computer science department’s Discovery Analytics Center (DAC) may make forecasting the future as commonplace as forecasting the weather.

The term “big data” refers to the use of algorithms and other tools to train computers to spot trends in collections of information that are too massive and complex to analyze with traditional methods. The proliferation of data has accelerated with the integration of computers into our daily lives, from social media on our phones to tracking buying habits at the grocery store.

Virginia Tech’s efforts stand at the forefront of the big data movement, with labs and professors across the commonwealth conducting increasingly data-driven research as the university looks to build additional capacity for future initiatives. Maintaining a strong presence in Blacksburg as well as in the National Capital Region allows for significant collaborations in the domains of intelligence analysis, national security, and health informatics.

“Virginia Tech’s researchers, big data represents an important opportunity to create knowledge and provide insight by leveraging large, potentially unstructured data sets,” said Scott Midkiff, the university’s vice president for information technology and chief information officer and a professor in the Bradley Department of Electrical and Computer Engineering.

Projects like DAC’s EMBERS and the Virginia Bioinformatics Institute’s (VBI) Network Dynamics and Simulation Science Laboratory (NDSSL), which simulates disasters to evaluate emergency response and disaster preparedness policies, are telling examples of big data’s potential.

EMBERS – A system developed by the Discovery Analytics Center that provides a continual, automated analysis of open-source data to forecast significant societal events.

NDSSL – For a disaster resilience study, the Virginia Bioinformatics Institute’s Network Dynamics and Simulation Science Laboratory created a simulated environment using big data methods to evaluate disaster preparedness policies and interventions.

Forecasting the future

EMBERS, the acronym for “early model-based event recognition using surrogates,” provides a continual, automated analysis of open-source data—everything from Facebook posts and website searches to satellite images and restaurant reservations made online—to forecast significant societal events such as disease outbreaks, domestic crises, and elections in countries around the globe.

Once a trend or pattern is recognized, EMBERS applies thresholds learned by the algorithms that process past data and events. If the threshold is met, an alert is sent to a third party for evaluation. Training the computers to recognize trends is not very different from teaching an email system to recognize spam, said Ramakrishnan, the Thomas L. Phillips Professor of Engineering and DAC’s director.

“The science of big data is about designing algorithms that can transform raw data into actionable knowledge or intelligence,” Ramakrishnan said. “There isn’t one specific, magic algorithm or threshold in EMBERS. There are a variety of data filters and distinct models trained to identify different patterns. All these models’ outputs are then fused into the final model that forecasts the event and produces the alert.”

EMBERS now sends 40 to 50 alerts per day to its clients.

“EMBERS, when we say forecasting, we really are forecasting,” Ramakrishnan said. “A lot of projects have the benefit of hindsight, and [people] look back and say, ‘Oh, we could have predicted that,’ but we send forecasts before the event happens.”

Rather than filtering just a few hundred emails, though, EMBERS since its inception has collectively sorted through more than 21 terabytes of data, looking only at a small portion of the world. For perspective, 1 terabyte of data could store 1,000 to 5,000 movies.

EMBERS processes between 200 and 2,000 messages—a tweet, news item, blog post, or stock value—per second. With such a wide breadth of information, there are bound to be widespread inaccuracies, such as rumors, spam, or news stories that are later retracted. However, EMBERS’ algorithms are designed to weed out misinformation, Ramakrishnan said.

Not surprisingly, EMBERS is getting attention from the federal government; the project is funded by the Intelligence Advanced Research Projects Activity (IARPA), which is part of the Office of the Director of National Intelligence. DAC was one of three teams chosen to compete in IARPA’s Open Source Indicators (OSI) program. Starting in April 2012, DAC’s team vied for full funding from IARPA, alongside industry competitors Massachusetts-based Raytheon BBN Technologies and California-based HRL Laboratories.

For two years, the three teams focused their forecasts on about 20 countries in Latin America. EMBERS accurately forecasted several events there, including riots following the impeachment of Enrique Peña Nieto, Mexico’s president, in March 2014.

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Selected big data efforts at Virginia Tech:

- The Bradley Department of Electrical and Computer Engineering at Virginia Tech compiles radio astronomy data to advance knowledge of cosmology, pulsars, and other heavenly phenomena.
- The Virginia Tech Transportation Institute collects and analyzes massive amounts of video and sensory data from cars, trucks, and motorcycles as part of its naturalistic driving studies.
- The Pamplin College of Business has launched the Center for Business Intelligence and Analytics, an interdisciplinary resource that encourages big data research, study, and applications in the business world. The center’s goals also include developing an interdepartmental minor in business intelligence and analytics. With specialty areas in social media analytics, text analytics, health analytics, and more, the center is working with the Virginia government office and many large corporations on big data and business analytics projects. In one successful project focused on quality control, researchers mined online data to detect product defects.
- Graduate students and faculty from the College of Liberal Arts and Human Sciences, the Discovery Analytics Center, and University Libraries collaborated with the University of Toronto to mine data from more than 100 different newspapers chronicling the 1918 influenza pandemic. The project, which sought to understand how newspapers shaped public opinion and represented authoritative knowledge during the deadly pandemic, was one of 14 projects approved for funding in the National Endowment for the Humanities and the Social Sciences Research Council of Canada’s Digging into Data Challenge.
- Researchers in the Virginia Bioinformatics Institute and the Center for Peace Studies and Violence Prevention used disease transmission models to study criminal incarceration, examining how incarceration can be transmitted to the family and friends of those who are incarcerated. Synthesizing publicly available data from a variety of sources, the researchers generated a realistic, multigenerational synthetic population with contact networks, sentence lengths, and transmission probabilities to model the future sustainability of Virginia’s resources, beginning with forestry resources.
- Part of information technology, Advanced Research Computing (ARC) supports cutting-edge computing resources, including the Blue Ridge and HokieSpeed supercomputers, that serve researchers across the university. Virginia Tech’s investment in high-end computational architectures is paying off for researchers by processing data generated from projects ranging from geospatial image data to genomic sequences.
- In the College of Natural Resources and Environment, the geography department is using massive amounts of radar data from the National Weather Service and the National Climatic Data Center to create a 3-D immersive tornado in the Moss Arts Center’s Cube. Researchers hope to unlock the power of big data to improve the understanding of the underlying physics of atmospheric phenomena and provide insight in the area of atmospheric dynamics. In addition, the college’s new Center for Natural Resources Assessment and Decision Support is using big data sets to model the future sustainability of Virginia’s resources, beginning with forestry resources.

For his efforts in big data and cloud computing, Professor Wu Fang — featured in a Q&A on page 13 — is also being featured in one of Microsoft’s global advertising campaigns. One of the ads credits Virginia Tech scientists and engineers with harnessing “supercomputer power to analyze vast amounts of DNA sequencing information and help deliver lifesaving treatments” in the fight against cancer. To see a photo gallery of the commercial shoot with Feng on campus, visit www.vtmag.vt.edu.

Paraguay’s president in 2012, Hantavirus outbreaks in Chile and Argentina in 2013, and elections in Panama and Colombia in 2014.

IARPA monitored the three teams’ progress while an independent government contractor assessed the quality of forecasts. Each month, EMBERS and the other teams would receive a scorecard evaluating their forecasts based on five criteria: lead time, mean probability score, quality score, recall, and precision.

EMBERS scored at or above target in most of the categories, forecasting events with a mean lead time of 7.54 days. Of the three teams awarded an initial contract, DMC was the only team to secure a contract for the third and final year of funding. (DAC expects to secure funding to continue its forecasting work.)

Jason Matheny, OSI program manager at IARPA, said DMC’s team has “been able to accurately forecast hundreds of societal events, days to weeks before they occur, with a low false-alarm rate.”

DAC has widened its focus from Latin America to the Middle East and North Africa. Since June 2014, EMBERS has been sifting through information gathered from seven Middle Eastern countries, including Bahrain, Egypt, Iraq, Jordan, Libya, Saudi Arabia, and Syria.

Because of the geographic change, Ramakrishnan and his team have had to adapt several models to the new region. DAC now has a Middle East expert on its team to help understand the complex linguistic, cultural, and political environments. EMBERS also provides data on power-network data, and surveys of human behavior.

“Forecasting civil unrest is useful for people and groups as they make travel plans,” Ramakrishnan said. “It also helps governments understand what people are frustrated about, know what the hot-ticket items are, and [decide] what they can do about it. It helps them understand what the citizens’ priorities are. What are the most important grievances?”

EMBERS success fully forecast student-led protests in Venezuela that initially began due to the attempted rape of a student, but morphed into broader protests against police brutality and other issues. In addition, EMBERS also forecast that the protests would turn violent and that they would spread to multiple cities.

EMBERS forecasts

Spread of protests in Venezuela, January and February 2014

# of protests
0 15 30 45 60

EMBERS- Student protests in Venezuela

EMBERS success fully forecast student-led protests in Venezuela that initially began due to the attempted rape of a student, but morphed into broader protests against police brutality and other issues. In addition, EMBERS also forecast that the protests would turn violent and that they would spread to multiple cities.

EMBERS forecasts

EMBERS forecasts

E M B E R S: Student protests in Venezuela

EMBERS successfully forecast student-led protests in Venezuela that initially began due to the attempted rape of a student, but morphed into broader protests against police brutality and other issues. In addition, EMBERS also forecast that the protests would turn violent and that they would spread to multiple cities.
NDSSL disaster resilience study:
1. NDSSL collected open-source information (e.g., infrastructure data, etc.) to create more than 730,000 synthetic individuals in a simulated infrastructure.

2. The model tracks behavior and how individuals interact with infrastructure.

3. Decision-makers in public safety and other areas can use simulations to improve disaster resilience by taking proactive measures.

result of the unimaginably complex algorithms and computer modeling the team had created. Millions of simulated individuals were incorporated into a single, mineable dataset based on real-world information, Barrett said.

The team found that even a small increase in the ability to provide functional communication systems would allow people to do a substantially better job coordinating activities such as finding family members. Because humans’ first instinct in the wake of a disaster is to use their phone, communication systems tend to falter with the magnitude of texts and calls. Such findings allow the lab to provide decision-makers with better information.

“This is a really important finding, and this could not have been done in this particular form had we not put all the data together, filled in, made a consistent representation, taken the things forward, and then mined out of nuggets within this,” Marathe said.

Said Barrett, “Even though human behavior is a black box in a black box in a black box, we still can come very close to getting very rational, analytically stated ways that you would expect people to move.”

With the rapid pace of technological advances, information from big data simulations can be generated more quickly than ever. Marathe said the time it takes to run a simulation has decreased from a couple of days to mere minutes.

In addition to improved technology, Eubank attributes the growth of big data to the changes in the way society collects information.

“We had no idea that 20 years from when we started a transportation project that it would be commonplace for people to report their location on a minute-by-minute basis to the world,” Eubank said.

In the lab:
For a video about NDSSL, visit www.vtmag.vt.edu.

Virginia Tech Magazine winter 2014-15

www.vtmag.vt.edu

Built upon interdisciplinary collaborations, Virginia Tech’s approach to big data exemplifies the role of the 21st-century research university, strategically investing in resources to study and solve complex societal problems.”

—President Timothy Sands

Living in a data-driven world
Scientists and researchers working with big data foresee even more innovation on the horizon.

In fact, those like Ramakrishnan, Marathe, Barrett, and Eubank—who have made a habit of dealing with the future—see the future of big data happening at Tech.

“I think that Virginia Tech has provided us with an environment and ecosystem to carry out this research over the [past] 10 years which has been very, very conducive to doing this and I certainly value this. Tech has been very supportive of our work,” Marathe said. “It is very cool to have an institute that allows us to do things in a very novel and aggressive way.”

Barrett sees their big data research as world-leading, explaining that Virginia Tech’s approach to computationally enabled social science and the development of a synthetic information platform are conceptually different from anything else in the field.

Ramakrishnan also echoes the sentiment that Tech is at the forefront of big data research. “By creating DAC, we have brought together an interdisciplinary group of researchers from computer science, statistics, electrical and computer engineering, and mathematics. We have initiated graduate and undergraduate courses in this topic and hope to be a one-stop shop for the university and beyond in leading research and educational efforts in big data. The LARPA EMBERS project is an example of how DAC has led an interdisciplinary effort in this space, and we have just begun,” he said.

As Virginia Tech researchers continue to develop new uses for big data, the university has upgraded its computer systems to keep pace and ensure the capacity to house the collected information. Midkiff, the university’s vice president for information technology, sees collections of big data as a chance to re-evaluate Virginia Tech’s missions and operations.

The investment in big data initiatives in Blacksburg and in the National Capital Region allows for greater connections with industry partners while also making use of data to better serve society. “Without improving the lives of people who actually produce social data, big data is more than just a passing trend,” said Christopher Walker, DAC program manager.

The wave of research also is moving into classrooms as the university presents students with more opportunities to innovate. Many degree programs—computer science, electrical engineering, statistics, and many more—already include big data elements, while two interdisciplinary undergraduate degrees have been introduced (see the sidebar at right).

Virginia Tech is working to ensure that all of our graduates are prepared to thrive in a society that is data-driven and networked,” Midkiff said.

No matter what the future holds, big data research has found a home at Tech. •

Madeleine Gordon, a senior English and communication major, was an intern with Virginia Tech Magazine. Emily K. Alberts, formerly the Discovery Analytics Center’s public relations and marketing specialist and now the Department of Engineering Education’s office manager, contributed to this article.

“the horizon.

In addition to algorithm design and modeling, the major will also address important ethical considerations, ranging from data collection to the responsibility of a scientist to present clear and unambiguous explanations to those responsible for making public policy.

A enlarge the world becomes more data-driven, Virginia Tech is incorporating aspects of big data into classes and academic programs across campus. Additionally, Tech is offering two new, interdisciplinary undergraduate degrees based largely around big data: environmental informatics in the College of Natural Resources and Environment and computational modeling and data analytics in the College of Science.

The environmental informatics major incorporates information technology, data analysis, natural resources, geospatial science, and ecological modeling to enable students to explore and apply information science to the sustainable management of the natural world.

Students develop skills in remote sensing, ecosystem management, spatial data analysis, statistics, Web and database management, and sustainability analytics that can be utilized in many environmental professions and applications, ranging from forestry and landscaping mapping to pollution modeling and watershed ecology.

The College of Science’s computational modeling and data analytics major draws together mathematical modeling, modern data science, and high performance computing. The degree is targeted at students from a variety of disciplines, especially those with a deep curiosity for understanding how the world works by developing computer simulations and mathematic models.

In addition to algorithm design and modeling, the major will also address important ethical considerations, ranging from data collection to the responsibility of a scientist to present clear and unambiguous explanations to those responsible for making public policy.
Boosting soil productivity and crop yields.

Building capacity in developing nations.

Overhauling curriculum.

Researching ways to use more of the world’s water.

Developing more resilient crops.

Across the globe, Virginia Tech is Sowing the Future

Part Two
Rain doesn't have far to fall in Ecuador.

The volcanic mountains that rise from the country's dramatic terrain often pierce the rainclouds and seem to scrape the sky with slopes so steep they challenge even the most surefooted hikers.

Long gone are the trees that once covered the landscape, replaced by a patchwork quilt of farms that blankets the Andes slopes so steep they challenge even the most surefooted hikers. Local clad in the colorful woolen shawls and Panama hats that typify Andean dress work the land with the sweat of their brow, a good back, and crude tools. They take pride in the cornucopia of food they grow and sell at farmers markets around the country.

Over the past few decades, as the country's population has swelled, thousands of new mountainside farms have sprung up, each one moving farther up the hillside as over- ers clear-cut the trees that once bound the one moving farther up the hillside as own.

Problems arise when a deluge of rain meets steep mountains and deforested land. Raindrops smashing into freshly tilled dirt creates runoff that erodes the soil. Valuable nutrients wash away, as do the pesticides that farmers overspray. In cities and towns downstream, the water supply is polluted and sometimes undrinkable. Sail-laden riv- ers regularly overflow their embankments, causing hundreds of millions in damages yearly. The land that was once so fertile has lost much of its poteny.

The situation is playing out in similar fashion in countries across the globe, as hundreds of Virginia Tech faculty, staff, and students help humanity face perhaps its greatest challenge ever: providing food and fresh water to a growing population.

"The story of what is happening in Ecuador is far from unique," said Jeff Alwang, a professor of agricultural and applied economics in the College of Agriculture and Life Sciences (CALS), who has worked in South America for decades with others from Virginia Tech. "All over the world, nations are facing the challenge of feeding populations on limited lands. As agricultural production expands into more marginal areas, there are myriad challenges, from maintaining or increasing productivity to reducing soil erosion and lowering damages from toxic chemicals. At Virginia Tech, we are trying to help ease this pressure by sharing our knowledge that will help feed the world in a sustainable and profitable way."

Mounting pressures

Add a billion people here, a billion there, and the systemic pressures on the globe's re- sources can seem insurmountable. By 2050, the world's population could increase from 7.2 billion today to 9.6 billion, according to a 2013 United Nations report. In turn, the Earth's food pantry will have 37.5 percent more people to feed, when 805 million are already undernourished in the world.

The individual demands of the inter- connected system amplify each other. Agriculture accounts for 70 percent of the world's water usage, and experts estimate that water inputs to agriculture will have to double by 2050 to feed the growing population. In addition, aquifer depletion threatens traditional irrigation and drinking water sources, with an underreported side effect: A recent study found that as much as 42 percent of the annual sea- level rise can be attributed to irrigation runoff, as depleted soil fails to absorb the groundwater and surface water pumped onto crops.

Meanwhile, carbon emissions trap warmth in the atmosphere, shrinking glaciers, tinkering with surface and ocean-water tem- peratures, shifting jet streams, and altering microclimates. Water, the most elemental human need, is also a destructive force.

"Climate change is really water change," said Luke Juran, an assistant professor in the College of Natural Resources and Envi- ronment's (CNRE) geography department who studies the intersection of water and disasters. Juran expects the frequency and intensity of hydrometeorological hazards such as hurricanes, droughts, severe thun- derstorms, and blizzards to increase—"an unfolding, more permanent disaster that's creeping up," he said.

The natural world's volatility, of course, seeps into human behaviors. In the mid-1990s, Yannis Stivachtis, as a research fellow at the United Nations Institute for Disarmament Research, argued for greater economic, social, developmental, and environmental investment in the Middle East and northern Africa. The associate professor and director of inter- national studies in the College of Liberal Arts and Human Sciences' Department of Political Science saw that demographic and economic trends in the region pointed toward a young population with limited access to food, clean water, health care, and economic opportunities—limitations that paved the way for extremism. Despite calls for a comprehensive approach to regional issues and a substantial investment and aid plan, Congress didn't want a new Marshall Plan, which rebuilt European economies after World War II, nor did the American people envision global engagement of such magnitude, Stivachtis said.

"States have to deal with economic, social, developmental, and environmental issues in a very comprehensive way. Otherwise, we face problems at a global scale," said Stivachtis, offering as an example neighboring countries fighting over water resources. "It's only a disaster that makes people change course of action, and this change is generally more expensive than the investment that was initially needed to prevent it."

Capacity building

In the carrot-versus-stick dichotomy of for- eign policy, the carrots are offered through Virginia Tech's Office for International Research, Education, and Development (OIRED). With a portfolio approaching $100 million, OIRED manages projects in some 30 developing countries. Two primary thrusts are the Innovation Labs—sustainable Agriculture and Natural
Feeding the future: [Opposite page] Sekouma Diatta, a graduate student at Virginia Tech, is an associate professor at the University of Dakar. Tom Thompson, head of the Department of Crop and Soil Environmental Sciences, dubbed Diatta the “unofficial dean of the Senegalese students.”

All told, the OIRED efforts currently involve some 300 Virginia Tech faculty, staff, and students. Said Bertelsen, “[The outreach] all fits into the land-grant mission and Ut Prosim. It’s projecting the land-grant mission overseas—the research, the education, and the outreach.”

“Virginia Tech is a major player in the USAID Feed the Future initiative,” said Guru Ghosh, vice president for outreach and international affairs. “The very survival of the human race is at stake, especially in the vulnerable regions of the world.”

Teaching the world

Sekouma Diatta is keeping a close eye on his Virginia Tech professors. Pursuing a master’s degree in the Department of Crop and Soil Environmental Sciences, Diatta already holds a Ph.D. from a Senegalese institution and is an associate professor at the University of Dakar. In Senegal, professors customarily lecture from a chapter summary without expecting student discussion. A syllabus is rarely used. But in the U.S., students read materials beforehand and know what to expect from the class.

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Feeding the future: [Opposite page] Sekouma Diatta, a graduate student at Virginia Tech, is an associate professor at the University of Dakar. Tom Thompson, head of the Department of Crop and Soil Environmental Sciences, dubbed Diatta the “unofficial dean of the Senegalese students.”

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“I’m learning a lot by the way they’re teach- ing here—how they relate with students, how they coordinate activity. I am looking deeply at aspects of Virginia Tech life, to think that can help me initiate, innovate, when I’m back in Senegal,” Diatta said.

Wangui Gichane (international studies ‘13, crop and soil environmental sciences ‘13), a graduate student from Northern Virginia with Kenyan roots, is surveying the curricular needs of the agriculture-related departments at five Senegalese universities and how to empower students using learner-centered strategies in lieu of teacher-centered learning—precisely the difference that Diatta has come to appreciate. “It’s a big part of distributing knowledge,” Gichane said of reforming Senegalese curricula. “It’s an important step in establishing overall food security.”

Three-fourths of the population in Senegal works in agriculture, yet 70 percent of the rice is imported. “Between these two statisti- cals, we need to have an adequate answer to provide food by ourselves. I hope that we are in the right way to get the answer. If you correctly identify a problem, you have at least half the solution,” Diatta said, adding that he’s glad Virginia Tech is helping us “to answer the questions by ourselves.”

Improving soil productivity

Despite adequate rainfall in Zambia’s Luangwa River basin, villagers have a name for November, December, and January: “the hunger season.” “I see people planting corn in the fields, and it gets 6 inches high,” said Conrado Heatwole, an associate professor in the Department of Biological Systems En- gineering in CALS and the College of Engineering (COE). Degraded soil prompts the farmers to clear forest land, which leads to great yields in the first few years . . . yields that de- mographically drop as nutrients are depleted. For in- stance, farmers often sweep organic residue from the fields and burn it, simply because their fathers did so. After five to seven years, the topsoil is gone. So at the sight of 6-inch corn, farmers repeat the cycle, which reduces agricultural land farther into forest land, driving up transportation costs and distancing farmers from community infrastructure.

They’ll say, ‘This land is spent, this land is not productive anymore.’ It seems like an inevitable outcome to them,” Heatwole said. “They’ve never seen sustainable outcomes.”

Similar soil issues are found in Senegal. Commonly sandy, acidic, and saline, most soils are infertile due to a lack of plant nutrients. Soils are bereft of organic mat- ter because crop residues are removed for fuel, animal feed, and building material. In Haiti, massive deforestation leads to similar problems with soil quality. “It is easy to say that at least half of the world’s fertile topsoil has been lost through erosion and degradation,” said Tom Thompson, head of the Department of Crop and Soil Environmental Sciences.

In certain spots around the globe, the yield gap is already closing. Adopting improved bean varieties is leading to an average yield gain of 53 percent in Rwanda and 60 percent in Uganda, said Catherine Lanoselle, a research assistant professor in CALS’ Department of Agricultural and Applied Economics. The gains produce ripple effects: Families earn more, and shorter production cycles free up land and labor for other uses. Beans are mainly grown by women, and the extra time can be invested in handicrafts and tending the health, education, and nutrition of children. And new varieties are often more nutritious, fighting the hidden hunger of nutrient deficiency.

Sustainable outcomes: In Zambia, Conrado Heat- wole, an associate profes- sor in the Department of Biological Systems Engi- neering, has spent eight years monitoring water- sheds and demonstrating sustainable practices.

For eight years running, Heatwole has trav- eled twice a year to Zambia, monitoring four watersheds and demonstrating the potential of sustainable practices. “The productivity in that area is just a small fraction of what it could be,” he said. “The potential is great to feed themselves and have significant exports.”

The idea of boosting productivity is prom- ising. A July 2014 article in the journal Sci- ence examining 17 key global crops—16 of the highest calorie-producing crops, along with cotton, for its intensive water and nutrient needs—found that current yields are 50 percent below “realistically attainable” yields and that closing the yield gap could provide enough calories to meet the needs of about 900 million people.

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Hardier crops

Growing rice is water-intensive, for sure. But don’t flood it. When completely covered, the plant tries to quickly grow and reach the surface, leading to an energy crisis, carbohydrate starvation, and death. In rice-producing nations, flash floods cost more than $1 billion in rice losses annually. Ten years ago, however, Takeshi Fukao, an assistant professor in the crop and soil envi- ronmental sciences department, was at the University of California, Riverside, where he worked with collaborators to analyze the functional importance of a gene dubbed “Submergence 1-A” that amplifies flood tolerance. Today in South and Southeast Asian countries, rice cultivars carrying the gene (transferred through conventional breeding methods rather than genetic modification) react much differently to a flood. In a passive strategy, the submerged plant reduces its metabolism and energy consumption, restarting photosynthesis once the water subsides. “It’s like they’re in hibernation,” said Bishal Tamang, a Nepalese Ph.D. student working with Fukao on research into genes associated with flood and drought tolerance.

As climates change around the world, leaving farmers to contend with more flooding, the submergence tolerance gene offers researchers an advantage because the entire DNA sequence, submergence tolerance, and metabolic mechanisms are now known quantities that can serve discovery in other species. “This is a very good model for stress tolerance,” Fukao said of Submergence 1-A.

Worth its salt

Three concepts—recycling, conserving, and desalination—point the way forward for the world’s water supply. Today, about 1 percent of the world’s water is utilized, said Jason He, an associate professor of civil and environmental engineering in COE. In coming decades, providing water for agriculture and drinking may well require using wastewater and ocean water to a much greater extent.

In He’s Hancock Hall lab, in a student-made, lidless container the size of a washing machine, water gurgled through numerous vertical PVC pipes that lined the container’s edges and disappeared beneath the rolling surface water. With a 100-liter capacity, the device is the world’s largest microbial desalination system.

He’s research has two directions. The first is developing microbial fuel cells that harness electrical energy from bacterial activity and organic waste. The second is using that energy to desalinate water. The potential synergies—picture a wastewater treatment facility built next to an ocean that generates energy and clean water—are profound. The next step is scaling up the process to the point that industry collaborators are ready to invest.

Juran, the CNRE assistan professor, en- courages viewing wastewater as a resource. Urine and feces can be safely neutralized, giving the water new life as an irrigation source and more. “We need a paradigm shift,” Juran said. “We can look at wastewater.
Virtual Water

You use far more water than you imagine. Consider virtual water, the water embedded in our consumer products. With a glass of wine, consider this: it took 20 liters of water to transport the bottle.

<table>
<thead>
<tr>
<th>Item</th>
<th>Liters of Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>glass of wine</td>
<td>20 liters</td>
</tr>
<tr>
<td>potato</td>
<td>70 liters</td>
</tr>
<tr>
<td>hamburger</td>
<td>120 liters</td>
</tr>
<tr>
<td>1 cup of coffee</td>
<td>140 liters</td>
</tr>
<tr>
<td>1 gallon of water</td>
<td>360 liters</td>
</tr>
</tbody>
</table>

Source: Luke Juran, College of Natural Resources and Environment

You might ask, ‘How does any of this help?’ It is the ‘why’ of water that is in play. The water cluster challenges the intellectual community to think of water in new ways; it addresses the broader impact of water on society, and it provides the capacity to improve lives.

Virtual water exists because we take water for granted. The value of water is often measured in dollars, but the communities that we live in are created, maintained, and sustained by water. By itself, water is not a commodity, but it is the foundation for processes that create value, and the majority of our water use is for consumption, not production.

The world will soon have to provide food and fresh water to 10 billion people.

Are you optimistic?

I am optimistic simply because we do not have a choice. I just pray that we do [solve the problem] early enough before many more people suffer even more. For a solution to happen, a worldwide effort on political and social levels has to materialize, in which water shortage becomes an integral part of our thinking in everyday activities, from legislation down to washing our cars.

—Mohammad Al-Smadi (Ph.D. biological systems engineering 13), who is working on a comprehensive water resources project in Saudi Arabia, attempting to quantify resources and forecast the potential for additional water resources.

I am cautiously optimistic. . . . It’s certainly double to double crop yields in most parts of Africa. We have the knowledge. We have the technology. It’s a matter of building capacity.

—Tom Thompson, head of the Department of Crop and Soil Environmental Sciences

Yeah, definitely. Because there is a continuous effort. Scientists all over the world are fighting this problem.

—Bishal Tamang, Ph.D., student, Department of Crop and Soil Environmental Sciences

Additional reading on tackling food waste, a water project in the Caribbean led by civil and environmental engineering students and faculty, the use of coconut dust to protect seeds, and much more.

For the rest of the responses to “Are you optimistic?” visit www.vtmag.vt.edu. There, you’ll find a wealth of additional material:

• Q&As with alumni Mohammad Al-Smadi, engaged in a water resources project in Saudi Arabia, and Guy Hanes, with the International Potato Center in Peru

• A story on alumnus Ahshtek Roys’ innovations in reverse osmosis membranes for desalination, industrial water, and residential water purification applications

• An interview with current student Brian Walsh, the former national Future Farmers of America president, as part of FutureFood 2050, an initiative of the Institute of Food Technologists

• Additional reading on tackling food waste, a water project in the Caribbean led by civil and environmental engineering students and faculty, the use of coconut dust to protect seeds, and much more.
From his vantage point as the project executive leading recent repairs on the Washington Monument, Kenneth Terry ’94, ’14 has a dynamic view of some of Washington, D.C.’s most recognizable buildings.

Washington, D.C., is one of the most recognizable cities in the world, its skyline, monuments, memorials, and buildings featured in countless movies, television shows, and photos. In particular, the city’s monuments define the events and people that have shaped the United States.

Kenneth Terry (civil engineering ’94, MBA ’14) would know. As lead project manager for the National World War II Memorial, lead engineer on the Martin Luther King Jr. Memorial, and, most recently, project executive leading repairs on the Washington Monument, Terry has left his imprint on the landmarks of the nation’s capital.

Terry’s first assignment after graduating from Virginia Tech was the Ronald Reagan Building and International Trade Center. As a project engineer with Tompkins Builders, he spent two-and-a-half years coordinating the fabrication and installation of huge stones that form the exterior façade of the building. “I gained a lot of experience on that project in terms of new stone fabrication and installation,” Terry said. “I was just lucky to be on the project, and I learned a lot. Then about eight years later, the World War II memorial came around, and I already had an unusual amount of experience with new stone construction.”

In June 2001, under a joint venture between Tompkins and Grunley-Walsh, Terry became the project manager for that memorial, which remembers the more than 400,000 who died, and the lion who served in the U.S. armed forces, during World War II. The memorial’s project executive, worked alongside Terry. “Ken was very proactive in problem avoidance. And when an issue came up, he focused on fixing the problem, not fixing the blame,” Owenby said. “Ken is a man of integrity. He also has a very effective manner in dealing with clients, subordinates, and his leadership. He has a tremendous reservoir of professional experience and knowledge.”

In 2007, Terry was asked by the Martin Luther King Jr. Memorial Foundation to serve as the project executive on a memorial to commemorate the civil rights leader. The design for the memorial—the first on the National Mall dedicated to an African American—was selected through a competition administered by Virginia Tech’s Washington-Alexandria Architectural Center. (To read the story from the winter 2012-13 edition, visit www.vtmag.vt.edu/winter13.)

Most recently, Terry, now with Grunley Construction, led the restoration of the Washington Monument, which was damaged when a 5.8-magnitude earthquake hit Virginia on Aug. 23, 2011. “Initially after the earthquake happened, the U.S. National Park Service had what they call their ‘special access team’ assess the damage,” said Terry. “They rappelled down the four faces of the monument over a period of four to five days with cameras and photographed every instance of damage.”

From there, the team created a set of designs to guide the repairs. “Once we arrived at the site, we erected the scaffolding, which took about three months, and once that was in place, we could more easily inspect the areas,” said Terry. The restoration project lasted from November 2012 to May 2014. Terry wasn’t the only Hokie working on some of the most visible and important structures in the country: “On each of these projects, there was a significant number of people from Virginia Tech involved,” Terry said. “On the World War II memorial, the contracting officer was an alum, and one of the designers went to the architecture school. On the Washington Monument repair, one of the engineers had just graduated. And there are plenty of people from the National Park Service who are alumni as well. One of the neat things about working in D.C. is that you run into a lot of people [from Virginia Tech].”

Besides his specialty in memorials, Terry also helped restore St. Elizabeth’s Hospital, a mental health facility in D.C., from 2006-09. “Building buildings is very different than building or restoring memorials,” he said. “The attention that the memorials draw makes them complex because there
are so many people [involved at] every step of the way. Politically, building memorials is more challenging, but from a technical standpoint, building buildings is more challenging.”

Terry said his time as an undergraduate provided him with a base of engineering and construction knowledge. “I also learned the importance of working within a team to accomplish a project, relying on every member’s ideas and strengths to solve problems and achieve the common objective,” Terry said.

Andree Yaap, a project executive for Grunley’s interiors department, works with Terry, who as a deputy operations manager supports the department’s human resources needs. “Ken has excellent people skills,” Yaap said. “He is dependable, friendly, hardworking, and a great team player. If I had to pick his greatest strength, I would say it is his problem-solving and planning skills.”

In May 2014, Terry completed his MBA at Virginia Tech’s Northern Virginia Center in Falls Church, Virginia. “[The MBA] helped me to fill a lot of gaps in my knowledge of how to manage the business side of the construction industry,” he said. “I learned a lot from my professors and fellow students about topics which I intuitively figured out through my years of working experience, but never fully understood.”

What’s next for Terry? Two projects are quite prominent—at the Smithsonian’s National Museum of American History and the National Museum of Natural History. He’s also completing two D.C. apartment buildings—perhaps the least recognizable projects in the portfolio of America’s monument builder.

English major Nikki Clemons was a Virginia Tech Magazine intern. She was assigned stories about topics which I intuitively learned a lot from my professors and fellow students about topics which I intuitively figured out through my years of working experience, but never fully understood.”

Even those cadets looking to serve outside of the military are being influenced by the new advisors. Command Sgt. Maj. Daniel Willey, First Battalion’s senior enlisted advisor, shares a unique perspective on career development with cadets. “After serving over 30 years in the Army, I also went through the job search process less than two years ago,” Willey said. “I can relate to what the members of the Citizen-Leader Track have to do as they get close to graduation and seek employment.”

Cadet Ray Pereira said that his senior enlisted advisor in Second Battalion, Master Gunnery Sgt. Lance Jones, has had a profound impact. “When I was a cader first sergeant, Master Gunnery Sgt. Jones … taught us how to have the moral courage to hold our people, including friends, to standards. He instilled a level of pride and confidence in each of us that was tempered by a sense of humility,” Pereira said. “Master Gunnery Sgt. Jones has been an integral part of my development as a leader, and I will not forget the lessons that he has taught me.”

Willey relishes his role as an advisor. “I truly believe that leaders are not born, they are built. Starting with quality stock that are built. Starting with quality stock that are built. Having corps staff who have served and risen through the enlisted ranks to teach and guide cadets has greatly improved cadet experiences and the leadership development program at Tech. For example, Lt. Col. Charles Payne, Third Battalion deputy commandant, is now aided by Sgt. Maj. David Combs, the battalion’s senior enlisted advisor. Cadet Lt. Col. Tyler Dick has noticed the impact. “Sgt. Maj. Combs has provided the noncommissioned officer perspective of leadership from an extensive and diverse military career. His guidance has led to significant changes in our daily operations, training, and professional development in just over a year,” Dick said.

The Virginia Tech Corps of Cadets has the mission of preparing young men and women of strong character to become leaders in the military and in public and private sectors. As the corps has continued to grow—it now numbers more than 1,000 cadets for the third consecutive year—the corps’ leadership saw that more staff members were needed to effectively mentor and develop future leaders. As a result, in summer 2013, the corps hired three senior enlisted advisors, one for each battalion.

By far, enlisted members make up the vast majority of those in the U.S. military, serving as the backbone of the force, and they will look to our graduates as their leaders. Having corps staff who have served and risen through the enlisted ranks to teach and guide cadets has greatly improved cadet experiences and the leadership development program at Tech. For example, Lt. Col. Charles Payne, Third Battalion deputy commandant, is now aided by Sgt. Maj. David Combs, the battalion’s senior enlisted advisor. Cadet Lt. Col. Tyler Dick has noticed the impact. “Sgt. Maj. Combs has provided the noncommissioned officer perspective of leadership from an extensive and diverse military career. His guidance has led to significant changes in our daily operations, training, and professional development in just over a year,” Dick said.

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Accounting for Future Hokies

by ALBERT RABOTEAU

Kenneth E. Cooke '92

In 1992, months before earning his bachelor’s degree in accounting, he donated several thousand dollars.

“I didn’t have a lot of money, but I made [giving] a priority,” said the native of Richmond, Virginia, who now lives in Manhattan in New York City and is a vice president at Goldman Sachs. “A university provides you a foundation and learning. If you graduate, there’s no way you didn’t have a great experience, and so you have to make the path a little easier for those who come after you.”

While that mindset inspired Cooke to donate regularly for more than 20 years, it also led him to support the university in numerous other ways, including serving on the advisory board of the Pamplin College of Business’ Department of Accounting and Information Systems. In January and October of 2014, he returned to campus to speak at Pamplin events. And he was a driving force in Goldman Sachs’ hosting the annual Hokies on Wall Street event in April 2014. Cooke also gives back to his profession by chairing the board of the National Association of Black Accountants (NABA).

“The chance to be a mentor and help develop a sense of community in the professional world is fantastic,” he said.

During his student years at Virginia Tech, Cooke said he found a strong sense of community, which was fostered in part by Barbara Pendergrass, whom he considered a mentor. She was an assistant to the vice president for student affairs while Cooke was enrolled, but she later served as dean of students for many years.

“To my mother’s horror, I had a scholarship offer at U.Va. and still came to Tech, which gave me no money, but I loved the people and the campus,” Cooke said.

After his mother let him choose the school she thought best fit him, Cooke did follow her urging to study accounting because it was a field with strong hiring demand. After earning his degree, Cooke, who is a certified public accountant, worked for Coopers & Lybrand, Philip Morris USA, General Electric, and Genworth Financial before joining Goldman Sachs.

His career and the skills that you have.”

Cooke regularly touts the opportunities available in his field. Giving to support programs in the Department of Accounting and Information Systems that prepare students to take advantage of those opportunities is something Cooke also does regularly.

“I think there’s an obligation for people to give back,” he said.

Albert Raboteau is the director of development communications.

A Good Harvest

by ALBERT RABOTEAU

Richard Crowder’s work in agriculture may have begun with driving mules on a small tobacco farm in Virginia’s Mecklenburg County, but it’s taken him all over the world in his role as a driving force opening up global trade opportunities.

As an undersecretary with the U.S. Department of Agriculture from 1989 to 1992, Crowder managed the Food, Agriculture, Conservation, and Trade Act of 1990, commonly known as the “Farm Bill,” and was the nation’s agriculture negotiator for the Uruguay Round of multilateral trade talks that led to the creation of the World Trade Organization. He headed two missions for President George H.W. Bush to the former Soviet Union to address food needs and policies.

He later served as the nation’s chief agricultural negotiator for the Office of the U.S. Trade Representative within the Executive Office of the White House—a post with ambassador’s rank. After leaving that position, he served as a special advisor to the trade representative’s office before joining the faculty at his alma mater in 2008.

“At this stage of my life, I’m doing what I can to give back to help Virginia Tech, particularly the students,” said Crowder (agricultural and applied economics ’60, M.S. ’62), who also earned a Ph.D. from Oklahoma State University.

In 2013, Crowder was appointed the C.G. Thornhill Professor for Agricultural Trade, a position endowed the previous year by C. Gordon Thornhill Jr. (animal science ’75).

In 2015, at the Governor’s Conference on Agricultural Trade, a position endowed the previous year by C. Gordon Thornhill Jr. (animal science ’75).

Crowder said having a named professorship is a powerful endorsement that helps motivate the interests of Virginia’s agricultural and forestry industries.”

In addition to his notable accomplishments in the educational and government fields, Crowder has a distinguished history in industry, having held senior executive positions with Wilson & Co., Pillsbury, Armour Swift-Eckrich, DEKALB Genetics, and the American Seed Trade Association.

“He’s held a broad range of positions and, at every step of the way, his actions and his work have been important for U.S. agriculture,” said Bob Stallman, president of the American Farm Bureau Federation, which in 2013 presented Crowder with its highest honor, the Distinguished Service Award.

Albert Raboteau is the director of development communications.
I once got to do comedy at a company party on a turntable, or Lazy Susan for those of you over 50. The room was stationary but the part of the floor that I performed on spun around, making a 360-degree lap every 10 minutes. In a 60-minute show, everyone got to see my face six times. There was a wall behind me, so people on each side of the room couldn’t see each other, which made it even more interesting because I’d spin slowly into one part of the room, annoy the people who had forgotten there was comedy, and then I’d spin out. Sixty minutes of this...

I got another chance to spin at an event a few years later, but instead of the floor spinning, it was just me! The company that hired me said that since there would be more than 1,000 people in attendance, they wanted to make sure everyone could see me. So they put me on a pedestal in the middle of the room, with people sitting all around me, and asked me to spin while I told jokes. I’ve always wanted to be put on a pedestal—figuratively, not literally. I didn’t know about the spinning until I arrived at the event, and the client kept asking me before the show, “So do you think this is okay?” I refused to say yes because I didn’t want to take the blame for it, so I just responded, “I’ll try it.” I did end up having a lot of fun with it, and even though it was reprinted below. ...
A motto with real meaning

Since President Timothy Sands arrived on campus more than seven months ago, he has made several astute observations about Virginia Tech based on his perspectives of other institutions he has attended or served. One of those observations involves how our university motto is woven so tightly into the fabric of the university and the entire Hokie Nation. *Ut Prosim* (That I May Serve), adopted in the late 1800s, is both a life value and a commitment of paramount importance to students, faculty, and staff. For alumni, the motto remains embedded in their lives and is practiced daily through their professions, volunteerism, and commitments to family and personal relationships.

President Sands’ discovery is a refreshing observation and a confirmation of a phenomenon we generally take for granted. Yet there are many examples of how our university benefits from the service rendered by its campus family and its many thousands of alumni spread across the globe. We are fortunate to have a culture of service that is instilled in every student and faculty and staff member, often extending into their lives beyond Tech.

Service at Virginia Tech is best illustrated by the philanthropic and volunteer service projects performed by students, both within student organizations and on a collective basis. Thousands of students come together for large-scale events, such as the annual Big Event, where they perform up to 1,000 service projects on a single Saturday. For a number of years, Relay For Life has been staged as a 24-hour event that raises in excess of $500,000 annually, setting consecutive national collegiate fundraising records for cancer research.

In communities around the world, our alumni engage in every conceivable avenue of service to better their communities and the quality of the human condition. Many of our alumni chapters engage in service activities, and they continue to increase both their hours of service and numbers of projects adopted each year. There is no better tribute to our university than those who honor our motto by living it each day and building on the reputation that so easily captured the attention of our new president. He discovered in his first days on campus that Virginia Tech truly is “for life,” an attitude which includes a motto that is practiced with pride and real passion.

Tom Tillar ’69
Vice President for Alumni Relations
New Black Alumni and Ex Lapide societies

New alumni societies have been formed to serve the interests of black alumni and LGBTQ+ alumni (lesbian, gay, bisexual, transgender, queer, asexual, and other) alumni, and the Alumni Association welcomes the opportunity to engage with and learn from these Hokies through the programs created by their societies.

The Black Alumni Society is an organization serving all black alumni. Future activities include the 2015 Black Alumni Summit in Tidewater, Virginia, and the 2016 Black Alumni Reunion on the Blacksburg campus.

Ex Lapide (“out of stone,” in Latin) is a society for LGBTQ+ alumni and their allies. Activities include a fall reunion held in October, a fall tailgate with the University of Virginia’s Serpentine Society, and the Year Zero Graduation Reception with recent graduates.

The societies work to promote closer fellowship among their constituencies, establish and strengthen relationships with the university, and assist with the university’s ongoing diversity and inclusion efforts.

Both societies are affiliated with the Virginia Tech Alumni Association and the Office of the Senior Vice President and Provost. For more information, contact Latanya Walker at latanya@vt.edu or 540-231-8970. To receive information about the societies, visit www.diversity.vt.edu/alumni and sign up for the mailing list(s).
2015 travel tours

Paris Immersion
AHI
April 6-17 • $3,295*

Cuban Discovery
Go Next
April 9-17 • $5,399*

A Toast to Provence and Burgundy
Go Next, A-ROSA Stella
May 1-9 • $3,669*

Waterways and Canals of Holland and Belgium
AHI
May 2-10 • $2,495*

Isles and Empires of the Adriatic
Go Next, Oceania Cruises’ Riviera
May 2-11 • $2,999* (air included)

Southern Culture and Civil War
Go Next, American Queen
May 14-23 • $4,699*

Sicily - Alumni Campus Abroad
AHI
May 15-24 • $2,795*

River Routes and Channel Crossings
Go Next, Oceania Cruises’ Marina
May 18-June 3 • $5,299* (air included)

Exotic Mediterranean
Go Next, Oceania Cruises’ Nautica
May 19-31 • $3,999* (air included)

Essential Europe Grand Trip
A-ROSA Alumni World Travel
May 22-June 9 • $3,725

Swiss Alps and the Italian Lakes
AHI
June 5-14 • $3,295*

Pearls of the Mediterranean
Go Next, Oceania Cruises’ Riviera
June 15-23 • $2,699* (air included)

Normandy - Alumni Campus Abroad
AHI
July 3-9 • $2,895*

Coastal Alaska
Hosted by Dwight Shelton, vice president for finance and chief financial officer
Go Next, Oceania Cruises’ Regatta
July 7-14 • $2,299* (air included)

Passage of Lewis and Clark Expedition
Go Next, American Steamboat Company’s American Empress
July 18-26 • $3,795*

North America’s Five Majestic Great Lakes
Go Next, MS Saint Laurent
Aug. 1-10 • $4,199* (air included)

Baltic Marvels
Hosted by Tim Tiller, vice president for alumni relations
Go Next, Oceania Cruises’ Nautica
Aug. 19-27 • $2,999* (air included)

Jewels of the Aegean and Holy Lands
Go Next, Oceania Cruises’ Riviera
Sept. 16-27 • $4,299* (air included)

Iberian Princes and Palaces
Go Next, Oceania Cruises’ Marina
Oct. 23-Nov. 3 • $3,799* (air included)

Country Music
Go Next, American Steamboat Company’s American Queen
Oct. 24-Nov. 1 • $2,699*

Mediterranean Artistic Discoveries
Go Next, Oceania Cruises’ Riviera
Nov. 6-18 • $3,999* (air included)

Nordic Pathways
Hosted by Patricia A. Previto, vice president for student affairs
Go Next, Oceania Cruises’ Marina
Oct. 23-Nov. 3 • $3,799* (air included)

Columbarium expanded
Located on a grassy knoll with a view of the Duck Pond, Virginia Tech’s columbarium contains niches for either individual or dual interments. Each niche is covered with a maroon granite square, on which name(s) will be engraved with gold-filled lettering. A few of the first 60 niches are still available to reserve, and an expansion housing an additional 60 niches was recently completed. For more information or to reserve a niche, contact Jay Whitlow at 540-231-6285 or JOWHITL4@vt.edu.

Columbarium

* Dates and prices are subject to change. Listed price is the base price per person on double occupancy without air, except as noted. Free air is based from select North American gateway cities. The Alumni Association encourages all alumni to consider purchasing travel insurance.

www.alumni.vt.edu/travel
Successful alumni connect through Hokie Nation Networking

The Virginia Tech Alumni Association offers Hokie Nation Networking, a professional networking program designed to bring alumni together to make long-lasting connections. (The association’s multifaceted efforts in networking were described in this magazine’s fall edition commentary by Tom Tillar.) Whether you are recruiting employees, identifying new clients, or looking for a job or career change, there are Hokies who can help.

A cornerstone of the program is a series of professional networking events that target specific professions and connect alumni with experts in those fields. These events provide opportunities for Hokies to grow in their careers, identify new talent to bring into their organization, and discuss trends in their field.

A recent Hokie Nation Networking event centered on finance took place at Wells Fargo, America’s premier financial services company. Previous events have included networking with experts in technology, forestry, real estate, hospitality and tourism, technology careers, and the collective areas of legal, financial, insurance, and banking services.

This spring, the Alumni Association will host a technology-focused event during the Tech60 series of networking events throughout the country. For information about events taking place in your area, find your local chapter’s website or Facebook page at www.alumni.vt.edu/chapters. If you don’t have a local chapter and are interested in starting one, please contact Katie Marquis at kmarquis@vt.edu.

In addition to events hosted by the Alumni Association, alumni chapters are hosting networking events throughout the country. For information about events taking place in your area, find your local chapter’s website or Facebook page at www.alumni.vt.edu/chapters. If you don’t have a local chapter and are interested in starting one, please contact Ginny Ritenour at gritten@vt.edu.

To strengthen the networking initiative, the Alumni Association offers a suite of online resources at www.alumni.vt.edu/hnn. The Hokie Nation Network site leverages LinkedIn, the alumni directory, job listings (no PID or password required), webinars, and other career resources designed to help Hokies connect with fellow alumni. These resources can be invaluable to anyone interested in professional networking and career growth.

For more information about Hokie Nation Networking, please visit www.alumni.vt.edu/events/networking/events.html or contact Katie Marquis at kmarquis@vt.edu.
At Virginia Tech, collaboration is at our core. Leveraging 15 consecutive years of research growth and 660 collaborative sponsored-research awards last year alone, we cooperate with business and industry partners to accelerate entrepreneurialism, advance the science of sustainability, and create technology. Invent cancer treatments. Build resilient communities. Lead the world.

In your career, in our classrooms, or in our communities, you can make a difference. And you can be part of something bigger. To learn more about the projects and opportunities available, visit the Virginia Tech Research Foundation.

HANDS ON. MINDS ON.

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When a decisive audience made the Virginia Symphony Orchestra (VSO) consider leaving the Williamsburg, Virginia-area, Bertram Aaron (electrical engineering ’43) recruited his friends and, in 1996, organized the Virginia Symphony Society of Greater Williamsburg (VSSGW), a branch of the VSO Board of Directors, to support the symphony so that it could continue to perform.

“One thought was a disaster,” Aaron said of the possibility of losing the symphony. “It is a great symphony, one of the top 10 in the country.”

The VSSGW raises awareness and funds for the VSO and arranges social functions and performances. Since the group was formed, the VSO has played four sold-out performances in Williamsburg. In June 2014, the symphony’s board of directors adopted a resolution recognizing Aaron’s dedication and service.

Wesley H. Roush III (BSOL) Springfield, Mo., named Drury University’s Faulty Award for Teaching for challenging, engaging, and inspiring students.

Horace A. Valeras (CHE), La Jolla, Calif., was appointed by Gov. Jerry Brown to serve on the Virginia Tech Board of Visitors.

Organization of the VSSGW has been just one of Aaron’s interests. From working with the U.S. Army Signal Support Agency in 1950-53 to organizing the first West Coast Chapter of the Micro wave Theory and Techniques Society, and from organizing and chairing a symphony for the Virginia Breast Cancer Foundation to helping develop the Williamsburg Kiwanis Colonial Polo Cup, Aaron has an illustrious history of service.

On the professional front, Aaron founded an engineering company, Bertram D. Aaron & Co., Inc., and made a commitment to reach out to others. “I made it a point, contrary to others in my industry, to meet the senior executives and senior engineers of the organizations with whom I did business,” said Aaron, who is now retired. “It was a constant, invigorating learning experience. I had to deal with all types of people, from the good to the miserable.”

Whether running his company or organizing fundraisers, Aaron has prioritized finding common goals with others. “I believe that if you have people motivated to do a job in which they have an interest and ownership, it matters not if it is volunteer or paid.”

English major Nikki Clemons was a Virginia Tech Magazine intern.
Joyful Freeman is a first-year biochemistry major and passionate intramural soccer player who has kicked off her college career with an ambitious goal: becoming a neurosurgeon.

To learn more about how philanthropy helps students like Joyful reach their goals, or to make your own gift to Virginia Tech, visit www.givingto.vt.edu.

Nancy L. McGee (SOC, SOC ’99), Blacksburg, Va., is the head of the Department of Hospitality and Tourism Management at Virginia Tech.

Sonia Calver Armstrong (ACCT), Louisville, N.C., is senior vice president for BK&T in North Carolina.

Mary Buade Glavasen (ACCT), Vienna, Va., is associate vice president and chief business officer at George-town University Medical Center.

George T. Probst (ME, EE ’96), Blacksburg, Va., had his photos featured on Yahoo during Shark Week.

Erik David Unger ’02, James-town, N.C., is a boy, Isaac Edward, 9/28/14.

Tony C. Reames ’04 and Lindsay Potts Reames ’04, Amelia Court House, Va., a daughter, Hollis Shannon, 12/20/13.

Potts Reames ’04, Amelia Court House, Va., a daughter, Hollis Shannon, 12/20/13.


Keith N. Wood (ME), Blacksburg, Va., 7/10/16.

Joshua R. Lorenz (HIST), Blacksburg, Va., was named Hokie Hero for the East Carolina University football game.

Alexandra T. Tate (HIST), Reisterstown, Md., was named Hokie Hero for the William & Mary football game.

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Erik David Unger ’02, James-town, N.C., is a boy, Isaac Edward, 9/28/14.
A Hokie sits at the helm of the Virginia Army National Guard, the Virginia Air National Guard, and the Virginia Defense Force, in June 2014, Brig. Gen. Timothy Williams (management science ’85) was sworn in as the new adjutant general of Virginia.

Williams, a member of the Corps of Cadets during his time at Tech, follows a long tradition of service. “My dad was in the Army, and my grandfather was in the National Guard and served in the Navy during World War II,” said Williams. “My older brother, Class of ’79, was in the corps and was also going into the National Guard.” After graduating from Tech, Williams spent five years on active duty and then worked at Virginia Tech for two years as a corps recruiter. He went on to become an active guardsman.

His service experience helped prepare him to take on the role of adjutant general. The role was an adjustment as Williams began working at a national level, engaging with congressional staff and state delegations and working with senior military leaders, the National Guard, the Army, and the Air Force, he said.

Williams’ time in the corps molded him. “It certainly did shape my early career and my want to serve and then go into the military,” Williams said. “I would credit the corps with my ability to do well as a lieutenant and captain. Virginia Tech has been a big part of our family. My wife was in the corps, my sister was in the corps, and my cousins were Hokies, as well. It’s a family affair.”

On Oct. 30, Williams came to campus as a guest of the Corps of Cadets’ Maj. Gen. W. Thomas Rice Center for Leader Development to speak about the benefits of joining the National Guard and the Virginia National Guard, as well as the organizations’ values, expressing the slogan, “Always Ready, Always There.”

Alumnus serves as Virginia adjutant general by NIKI CLEMONS

Virginia’s adjutant general, Brig. Gen. Timothy Williams ’85, spoke to cadets in October 2014.
Kicking back
by KENDEY MCGRAH
photos by CHELSEY ALLDER

Several months ago, we asked on the Virginia Tech Facebook page for you to tell us where on campus you preferred to spend a sunny afternoon. The response, overwhelmingly, was the Drillfield and the Duck Pond. So we visited those two spots in October. For a photo gallery of additional images from the afternoon, visit www.vtmag.vt.edu.

Kenedy McGrath is a communication major.

Virginia Tech Magazine winter 2014-15
www.vtmag.vt.edu
2015 Drillfield Series

The Drillfield Series continues in 2015 with weekends devoted to fine dining, energy, history and legacy, student applicants, and a women’s weekend, along with opportunities to connect with fellow alumni for a golf tournament or a microbrew festival. Make plans now to attend these events designed for alumni and their families and friends, and take advantage of the specially discounted accommodations available at The Inn at Virginia Tech.

Feb. 20-21 Food for Thought
March 20-21 What Fuels our Planet?
June 5-6 The Rich Heritage of Southwest Virginia
July 10-11 Alumni and Legacy Weekend
July 17-19 Women’s Weekend

2015 Special Events

June 15 Hokie Classic
June 27 2nd Annual Summer Beer Festival

For more information on the events, visit www.alumni.vt.edu/drillfieldseries/.

The Rich Heritage of Southwest Virginia
June 5-6

Enjoy lectures and tours of regional homes in this historical look at the pioneers who settled the area in the 18th and 19th centuries, influencing the origin of Virginia Tech. Highlights include a lunch and tour at Smithfield Plantation (above), the original home of four Virginia governors, with a presentation on the contributions of Col. William Preston and the opening of Kentucky lands for settlement by colonists pushing westward. James I. Robertson Jr., author and Alumni Distinguished Professor Emeritus, will be among the featured speakers.