2013-14

ANNUAL REPORT

Transition and Tradition

VirginiaTech

Invent the Future®

UT PROSV

Message from President Sands

At a major land-grant university like Virginia Tech, teaching and learning, discovery, and service to others are in a constant state of transition. Navigating those transitions has proven difficult in recent decades, but Virginia Tech has met the challenges while remaining true to its missions of preparing the next generation to participate in our democracy and translating the knowledge we create into practical applications that will improve the human condition and the economy of the region.

In fact, since its beginning as a basic agricultural and mechanical arts college, Virginia Tech has grown into one of a handful of public institutions that balances the land-grant mission with a 21st-century portfolio of academic disciplines that features a strong core in science, engineering, agriculture, and technology complemented by excellence in the humanities, arts, and social sciences. One need only look to the opening of the magnificent Moss Arts Center in 2013 to see how far we have progressed from that early technology institute to a comprehensive university.

This forward-thinking approach and adaptation to change can be seen in our undergraduate curricula, which broke into U.S. News & World Report's top 25 among public universities for the first time in 2013-14. In this annual report, you can read about a new array of relevant and challenging undergraduate major and minor options, including neuroscience, packaging systems and design, computational modeling and data analytics, nanoscience, real estate, and multimedia journalism. On the graduate level, a new master's program will lead to a degree in arts leadership.

Because of these new interdisciplinary programs that integrate diverse streams of knowledge and expertise, soon-to-be-engineers learn to appreciate the insights of a demographer; computer scientists are inspired by the visual artist; a business student discovers a new career trajectory by conversing with a plant pathology major; and a budding teacher sees the future of education unfolding in a tool developed for an entirely different purpose by a technology student. There has never been a time in the history of American higher education when the interplay among the traditional disciplines has been more important to student success, the research mission, and our engagement imperative.

The changing nature of our research also reflects the transitions we face. In just one example, Virginia Tech recently took a lead role in investigating the integration of unmanned aerial vehicles into the nation's airspace, work that could transform transportation, agriculture, emergency response, and a variety of other activities.

In addition to shifts in academics and research, engagement — as embodied in our motto, *Ut Prosim* (That I May Serve) — has transitioned considerably from primarily service in the defense of our nation to service to humanity in general. For instance, in this annual report, you will read about research on harvesting energy, efforts to defeat the papaya mealybug in India, and undergraduate students who have invested their expertise and countless hours of their time to design an infant resuscitator that helps newborns in underdeveloped areas breathe.

Under former President Charles W. Steger's leadership, Virginia Tech took great strides toward the future, and he left behind a legacy of adaptation and collaboration that kept the university at the forefront of the rapid transformation that higher education has experienced in recent years.

As we look ahead to our 150th anniversary in 2022, Virginia Tech will continue to strive to be better still. The university will foster inclusive excellence; enhance the value of a Virginia Tech education through improvements to the undergraduate experience; further solidify our position among the nation's and world's leading research universities; compete globally to attract and retain talent; translate our discoveries into useful products, services, and policies; and leverage Virginia Tech's presences, from the

main campus in Blacksburg to a growing footprint in the National Capital Region, Extension offices and facilities in every county in the commonwealth, and facilities and programs overseas. True to our multidisciplinary thinking, Virginia Tech will be a global leader in addressing the broad challenges of the 21st century: security, resilience, health, and sustainability.

In this annual report, you'll read about how the university already has a solid foundation to move ahead on many of these promises.

For example, our partnership with Carilion Clinic through the Virginia Tech Carilion School of Medicine and Research Institute provides a compelling example of what can be accomplished when corporations and regional governments partner with the university. During 2013-14, the medical school graduated its first class and gained accreditation, and the research institute announced a new research focus through the Center for Heart and Regenerative Medicine Research.

Meanwhile, the Virginia Tech Foundation is working with government and private industry to open a complex in Newport News based on the successful Corporate Research Center model in Blacksburg.

Among the many skills we hope our students will leave Virginia Tech with is a capacity for entrepreneurial thinking. As part of our efforts to reach that goal, the Pamplin College of Business opened the Apex Systems Center for Innovation and Entrepreneurship in 2013-14 to help guide such programs as the college's entrepreneur minor and the university's entrepreneurship living-learning community, Innovate.

The university faces numerous challenges as it builds on the past and prepares for the future. Due to the decline in public support (the university now receives an amount, adjusted for inflation, that is just half of what it received from the commonwealth per in-state student in 2000), the increasing unreliability of research revenue sources, and the growing diversity of our student population (which is a good challenge to have to address), Virginia Tech will need to undergo a major transformation, much like it has done before, most recently in the 1990s and the early 21st century.

As we adapt and grow, we won't leave tradition behind. In fact, at Virginia Tech, tradition is the foundation for transitions. And I am convinced that there is absolutely no better platform than Virginia Tech from which to make a permanent and transformative impact on humanity. If I were given the opportunity to design an institution for the coming century, it would look much like this institution. The credit for positioning Tech so well for the future rests with our hardworking university community and its visionary leadership over the generations.

Transition and tradition

Modern higher-education institutions face multiple challenges to make the transitions needed to be competitive in and contribute constructively to the future. Choosing the right people to lead those transitions is crucial.

Virginia Tech saw a number of important personnel changes, but none more critical than the decision the Board of Visitors made in appointing Timothy D. Sands as the university's 16th president.

"Dr. Sands impressed many from the start and garnered even more support after our personal interviews," said Mike Quillen, then-rector of the board, in introducing Sands to the community. "He has stellar academic credentials and administrative experience from some of the nation's outstanding land-grant and public research universities. We were particularly impressed with Tim's sense of the modern research university's role in advancing American society and its economy."

"There is so much here that Virginia and the nation needs," Sands said. "Virginia Tech truly embodies the 21st-century land-grant university role."

It's a role, as first expressed in the 1862 Morrill Act, that Sands has long been drawn to: preparing citizens from all classes of society to be active participants in our democracy and teaching students to perform research and engage the community in order to advance economic prosperity. "Nothing's really changed," Sands said. "It's as relevant today as it was back in the 1860s."

In championing those aims, Sands said, Virginia Tech took an unusual track. "Matter of fact, I only count six or seven institutions that went this route — and that was to maintain the strength of the engineering and science disciplines but to carefully balance them with the arts, the social sciences, and the humanities. If you really think back to the Morrill Act, you've got to achieve that balance. … Virginia Tech maintained that balance, and we're very well positioned."

Sands came to Tech on June 1, but before he officially took over he made more than half a dozen orientation trips to meet people and learn the issues. He had been executive vice president for academic affairs and provost at Purdue University, where he was also the Basil S. Turner Professor of Engineering in Purdue's School of Materials Engineering and School of Electrical and Computer Engineering.

As Purdue's chief academic officer, Sands led efforts to elevate student success, resulting in the highest first-to-second year retention and four-year graduation rates in Purdue's history. He initiated a move toward full-year utilization of facilities to enhance opportunities for student internships while allowing students to maintain academic progress during the summer.

Sands also launched Purdue's online teaching and learning platform known as Purdue NExT, a modular approach that emphasizes interactive learning for advanced undergraduate and beginning graduate-level courses.

Sands has a bachelor's degree in engineering physics and a master's and Ph.D. in materials science and engineering, all from the University of California, Berkeley. He began his professional career in 1984 at the Lawrence Berkeley Laboratory. He spent nine years as a member of the technical staff and as a research group director with Bell Communications Research Inc. (Bellcore) in Red Bank, N.J.

He returned to his alma mater in 1993 as a professor in the Department of Materials Science and Engineering, and joined Purdue in 2002 as the Basil S. Turner Professor of Engineering. He also served as director of the university's Birck Nanotechnology Center, an interdisciplinary center encompassing 12 academic disciplines.

Sands' wife, Laura P. Sands, formerly the Katherine Birck Professor in the School of Nursing at Purdue, is a part of the Department of Human Development at Tech. Her research focuses on optimizing care pathways for older adults, and she brought two National Institutes of Health grants to Virginia Tech. Her latest set of papers examines self-reported unmet needs, which are prognostic of future healthcare needs, hospitalization, and onset of mortality. "An ounce of prevention is like a pound of cure because we find that these people with unmet needs have very expensive outcomes," she said.

Robert T. Sumichrast (left) returned to Virginia Tech to take over leadership of the Pamplin College of Business, which under retired dean Richard E. Sorensen has risen to become one of the top 25 public business schools in the nation.

Mixing disciplines is at the forefront of the incoming president's mind. Said Sands, "I typically find myself reading books about science and entrepreneurship and connecting them to other fields in the humanities and the arts — which actually is interesting because that's the way I see Virginia Tech. It's very well connected between the disciplines." The interdisciplinary collaboration, similar to the path pursued by Virginia Tech, has yielded tremendous growth in research dollars for Purdue.

Sands said he recognizes a common denominator among his mentors over the years. "I think they're all true to themselves and honest. That has certainly shaped the way I approach problems and the way I approach people."

Administration, colleges, and athletics

The university's extensive efforts in the National Capital Region are now led by a new vice president in **Steven H. McKnight** (materials engineering '90), former division director for Civil, Mechanical, and Manufacturing Innovation within the Directorate for Engineering at the National Science Foundation (NSF).

In his new position, McKnight continues to develop and oversee strategic initiatives for Tech in addition to coordinating services and program initiatives for the university's seven sites in the region. McKnight brought significant leadership and research experience from his position at the NSF and from previous roles with the U.S. Army Research Laboratory. He also joined the faculty of the Department of Engineering Science and Mechanics as a tenured professor.

Virginia Tech also welcomed new leadership at two of its colleges during 2013-14.

Robert T. Sumichrast took over July 1, 2013, as dean of the Pamplin College of Business, succeeding Richard E. Sorensen, who retired after 31 years leading the college. Sumichrast had been dean of the Terry College of Business at the University of Georgia.

The appointment represented a homecoming for Sumichrast, who began his faculty career at Tech in 1984 and taught here for almost 20 years. He also served for four years as Pamplin's associate dean for graduate and international programs. He left in 2003 to become dean of the E.J. Ourso College of Business at Louisiana State University and then went to Georgia, where he was noted for leveraging strong collaborations with departments outside the business college, improving education and research programs, and increasing services to students.

Dr. Cyril R. Clarke left his position as professor and dean of Oregon State University's College of Veterinary Medicine to become dean of the Virginia-Maryland College of Veterinary Medicine, succeeding Gerhardt G. Schurig, who returned to the faculty after 10 years as both interim dean and dean.

"The college has established a distinguished record of accomplishment in veterinary education, delivery of clinical and diagnostic services across a wide range of clinical specialties, and biomedical research in comparative health sciences," Clarke said. "It is particularly well-positioned to advance translational medicine and the concept of One Health, which recognizes the close linkage between animal and public health."

Clarke was a faculty member at Oklahoma State University from 1987 to 2007, where he also served as a department head and associate dean for academic affairs in the College of Veterinary Medicine.

The university picked new leadership for an important nonacademic segment that will undoubtedly be facing enormous change in the future — athletics. **Whit Babcock** was named Tech's athletic director, coming to Blacksburg from his spot as athletic director at the University of Cincinnati. He took over for Jim Weaver, the athletic director since 1997, who retired.

Babcock was born in Lynchburg and grew up in Harrisonburg, Virginia. He played baseball at James Madison University and graduated in 1992. He also received a master's degree in sports management from West Virginia University in 1996.

Left: The Skipper has been rattling windows and exciting Hokie fans for 50 years. The cannon is cared for by the Virginia Tech Corps of Cadets, which in 2013-14 boasted its largest enrollment in decades.

Bottom left: For 20 years, the Women's Center has been promoting a safe, equitable, and supportive community for women while celebrating their experiences, achievements, and diversity. One of the events the center helps sponsor is the annual Take Back the Night rally and march.

Below: After 25 years of groundbreaking research, the Virginia Tech Transportation Institute is the second largest university-level transportation institute in the United States, with more than 400 employees and $125 million in active research awards. Its mission is to save lives, save time, save money, and protect the environment.

Anniversaries honor the past

Traditions were in the spotlight during 2013-14 in the form of some notable anniversaries.

Virginia Cooperative Extension celebrated its 100th year as a critical component of the three-part land-grant mission at Virginia Tech and Virginia State University. In 2013, Extension programs reached more than 2.6 million participants statewide, and more than 29,500 volunteers donated more than 966,000 hours of their time.

The College of Architecture and Urban Studies celebrated 50 years. When the college was originally established, architecture, planning, art, and building construction were all part of the curriculum — the precursors to the four schools in the college today.

The Women's Center at Virginia Tech has been serving faculty, staff, and students for 20 years. Issues the center addresses include gender-based violence, leadership, equity, and health and wellness.

The Virginia Tech Transportation Institute opened its doors and the Virginia Smart Road to the public as part of a 25th-anniversary celebration of its groundbreaking research. The institute started in 1988 as the Center for Transportation Research with 15 employees. Since then, the institute has constructed six buildings and employs 400. It has more than $125 million in active research awards.

The Virginia Tech Corps of Cadets celebrated the 50th anniversary of Skipper with the beloved cannon firing the final volley of a special 21-gun salute.

Research and scholarship

As a land-grant institution, Virginia Tech has long been aware of and dedicated to its responsibility to put knowledge and expertise to work to benefit society at large. Even as its research portfolio has grown to nearly $500 million, though, the university has had to become more aware of its crucial role in what is known as the "innovation ecosystem."

Universities must engage in commercialization and entrepreneurship, but they also have to realize that sometimes they need to do so for important institutional and societal benefits, not just for the potential revenue stream. Gaining a reputation for translating discoveries into useful products or services attracts top-quality faculty, staff, and students; lets researchers know they have the freedom to run with ideas; and can inspire more productive scholars who bring their enhanced knowledge to the classroom.

I-Corps

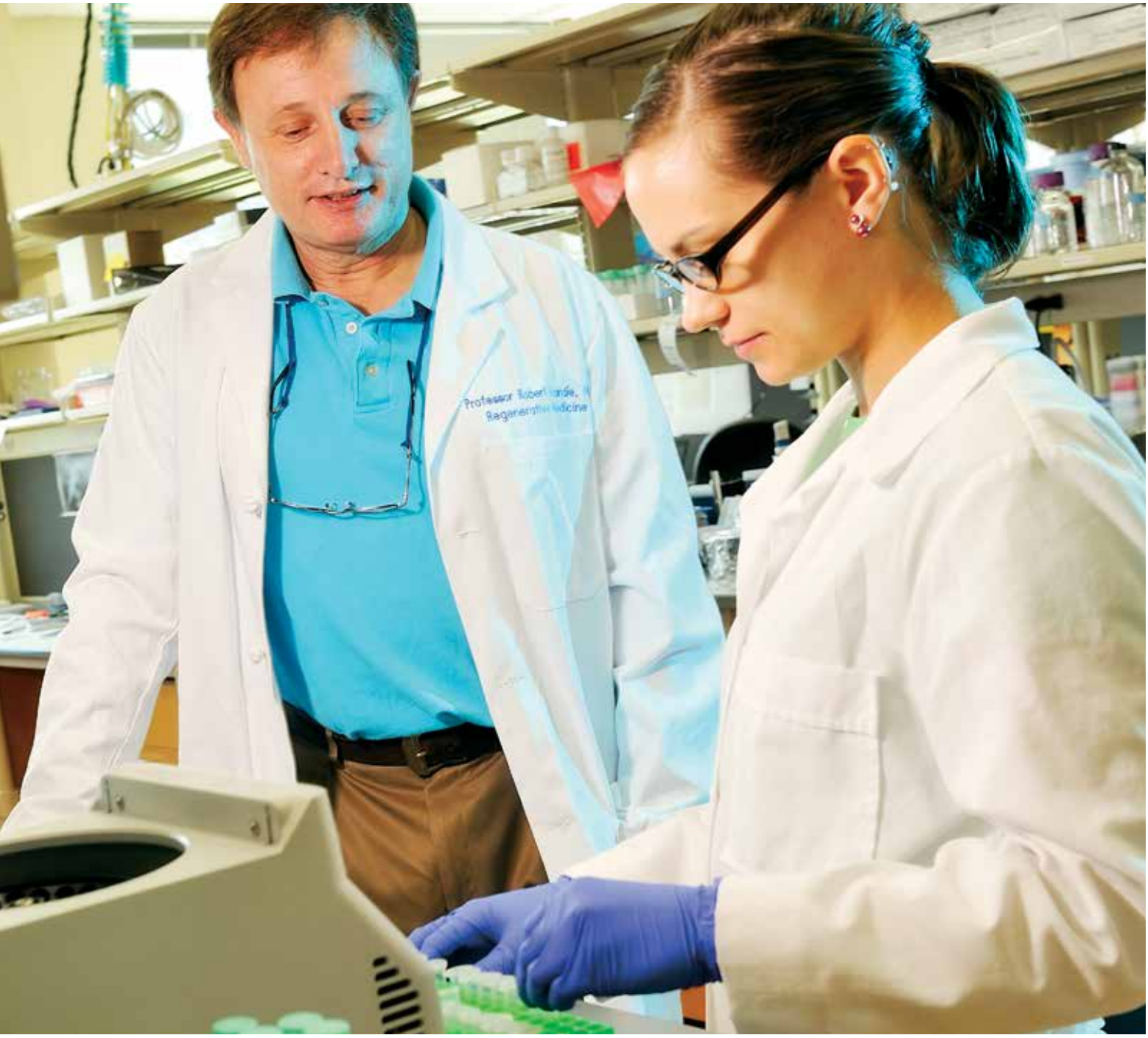
As part of its effort to do more to make Tech an entrepreneurial hotbed, the university joined the University of Maryland and George Washington University to use $3.75 million in funding from the National Science Foundation (NSF) to launch a regional Innovation Corps (I-Corps) node with one sweeping goal: find the best entrepreneurial student and faculty researchers and help them bring their discoveries to market.

I-Corps takes researchers through a seven-week program based upon Stanford University's Lean LaunchPad course, with additional elements designed just for I-Corps participants. The program's methodology emphasizes talking to as many potential customers as possible, pivoting in response to resulting insights, building low-cost prototypes to get customer feedback, constantly adapting, and building a scalable business model.

"The nodes are the foundation of a national innovation ecosystem and focus on the front lines of local and regional commercialization efforts," said Errol Arkilic, NSF I-Corps program director. "We are looking to them to provide long-term, critical education infrastructure and feedback to the programs that support the commercialization of our nation's basic research portfolio."

The Mid-Atlantic I-Corps node joined others in California and New York, and at Georgia Tech and the University of Michigan. Collectively, these nodes create the foundation of NSF's plan to establish a National Innovation Network designed to propel research to market.

Through the node, NSF will select up to 50 research teams from across the country each year and send them to the area to be guided through I-Corps. Annually, the Mid-Atlantic Node will also offer I-Corps programming to an additional 50 teams of its choosing.



Robert Gourdie, professor of emergency medicine, is director of Virginia Tech Carilion Research Institute's new Center for Heart and Regenerative Medicine Research, one of the latest examples of the university's commitment to use the knowledge it develops to benefit the community. Here, he works with research associate Emily Ongstad.

"Thirty-five of the top 200 U.S. universities in research and development expenditures are located within a four-hour drive of this I-Corps partnership," said John "Jack" Lesko, associate dean for research and graduate studies in the College of Engineering at Tech and the university's liaison to I-Corps. "Those universities collectively conducted $14.3 billion in research in 2010."

One I-Corps project — in conjunction with the Virginia Tech Foundation; Roanoke-Blacksburg Technology Council; Roanoke Blacksburg Innovation Network; Virginia Tech's Corporate Research Center; VT KnowledgeWorks; and Virginia Tech's Institute for Creativity, Arts, and Technology — is NuSpark, a creative space in downtown Blacksburg that allows entrepreneurs to commercialize their ideas.

Nestled in a 4,200-square-foot area in Collegiate Square at the corner of Prices Fork Road and North Main Street, NuSpark offers rent-free space for faculty, staff, students, and members of the public to turn early-stage ideas into new ventures. When

NuSpark is a space in Blacksburg that helps entrepreneurs get their ideas into the marketplace. Among the companies taking advantage of the free service is Card Isle, which is developing greeting card kiosks.

a company reaches either 12 months at NuSpark or $500,000 in revenue or capital funding, they move on.

"NuSpark is more than just space — it is programming and community," Lesko said. "NuSpark is a safe place to fail, and it builds a community of entrepreneurs-in-training that learn from each other through formal and informal programming and interaction."

Pamplin opens innovation center

The Pamplin College of Business, long at the forefront of entrepreneurship efforts at Tech, started its own Center for Innovation and Entrepreneurship and began operations with two experienced business development and technology partnership specialists. Linda Oldham, former executive director of Georgia Tech's Denning Technology and Management Program, is the center's executive director, and Derick Maggard, former executive director of the Roanoke-Blacksburg Technology Council, is the director.

The center supports entrepreneurship and innovation programs across the university that educate traditional students, corporate innovators, and others involved in entrepreneurial ventures through courses, experiential learning, and mentoring relationships. Center participants gain experience developing business plans and launching new ventures based on innovative technologies. They will also benefit from networking with the large number of Virginia Tech alumni who are successful entrepreneurs.

The center also helps guide such programs as the college's entrepreneurship — new venture growth minor and Innovate, the university's living-learning community focused on entrepreneurship.

At Pamplin, Oldham will develop a plan to promote the center and raise its visibility in Blacksburg and the Washington, D.C., area. Maggard has been involved with the Innovate community since its beginnings, including teaching one of its courses. In his new role, he will continue to be active in the entrepreneurial and technology communities at Virginia Tech and in the region.

Getting to the heart of research

In a different field, the Virginia Tech Carilion Research Institute, known for its world-class brain research, launched a major new initiative in cardiovascular research. Michael Friedlander, the institute's executive director, announced that two new researchers, John Chappell and James Smyth, joined the new Center for Heart and Regenerative Medicine Research. Along with the center's director, Robert Gourdie, and a current research group leader, Steven Poelzing, the scientists will spearhead individual, yet linked, cardiovascular research projects.

Each of the four cardiovascular research team leaders brings additional researchers, technicians, and students with them, and they will further expand their teams. To-

gether, the teams already have more than $1.25 million per year in awarded extramural research funding and another $1.8 million a year in pending grants.

Gourdie leads research into the repair and regeneration of diseased and injured tissues, including the heart. In addition, he has helped develop a company that is creating new treatments for tissue injury and repair.

Poelzing, an associate professor at the research institute, investigates the mechanisms of arrhythmias — abnormal patterns of electrical activity in the heart — that can cause loss of coordinated blood pumping capability and even lead to sudden cardiac death.

Chappell's research focuses on angiogenesis — the growth and regrowth of new blood vessels — in the injured heart, and Smyth leads his laboratory's research program on heart failure and the development of effective anti-arrhythmic treatments.

Faculty of Health Sciences

Also in the health field, the Virginia Tech Board of Visitors approved creation of a Faculty of Health Sciences, which will serve as a catalyst for health sciences research and education collaborations across Virginia Tech's colleges and research institutes and with partner institutions. The university's research funding in the health sciences is already estimated at more than $100 million.

The Faculty of Health Sciences will also serve as the academic home for Virginia Tech's translational biology, medicine, and health program, a doctoral program that involves at least 17 departments in seven colleges and six institutes and centers.

"Virginia Tech will build on its new initiatives in biomedical and health science graduate education, expand its investments in health sciences research, and bring traditional and nontraditional disciplines together — all to achieve innovation in the science of health," said Friedlander.

Membership in the Faculty of Health Sciences is available to all Virginia Tech faculty members who hold a graduate or professional degree in a relevant discipline and have a primary appointment in a college, school, research institute, or vice presidential unit.

Battery of the future

In another important research development that could benefit the world, a Tech research team developed a battery that runs on sugar and has an unmatched energy density, a development that could replace conventional batteries with ones that are cheaper, refillable, and biodegradable.

Y.H. Percival Zhang, an associate professor of biological systems engineering in the College of Agriculture and Life Sciences and the College of Engineering, said that while other sugar batteries have been developed, his has an higher energy density, allowing it to run longer before needing to be refueled.

In as soon as three years, the new battery could be running some of the cell phones, tablets, video games, and myriad other electronic gadgets that require power in our energy-hungry world, Zhang said.

Reorganization to focus on diversity, inclusion

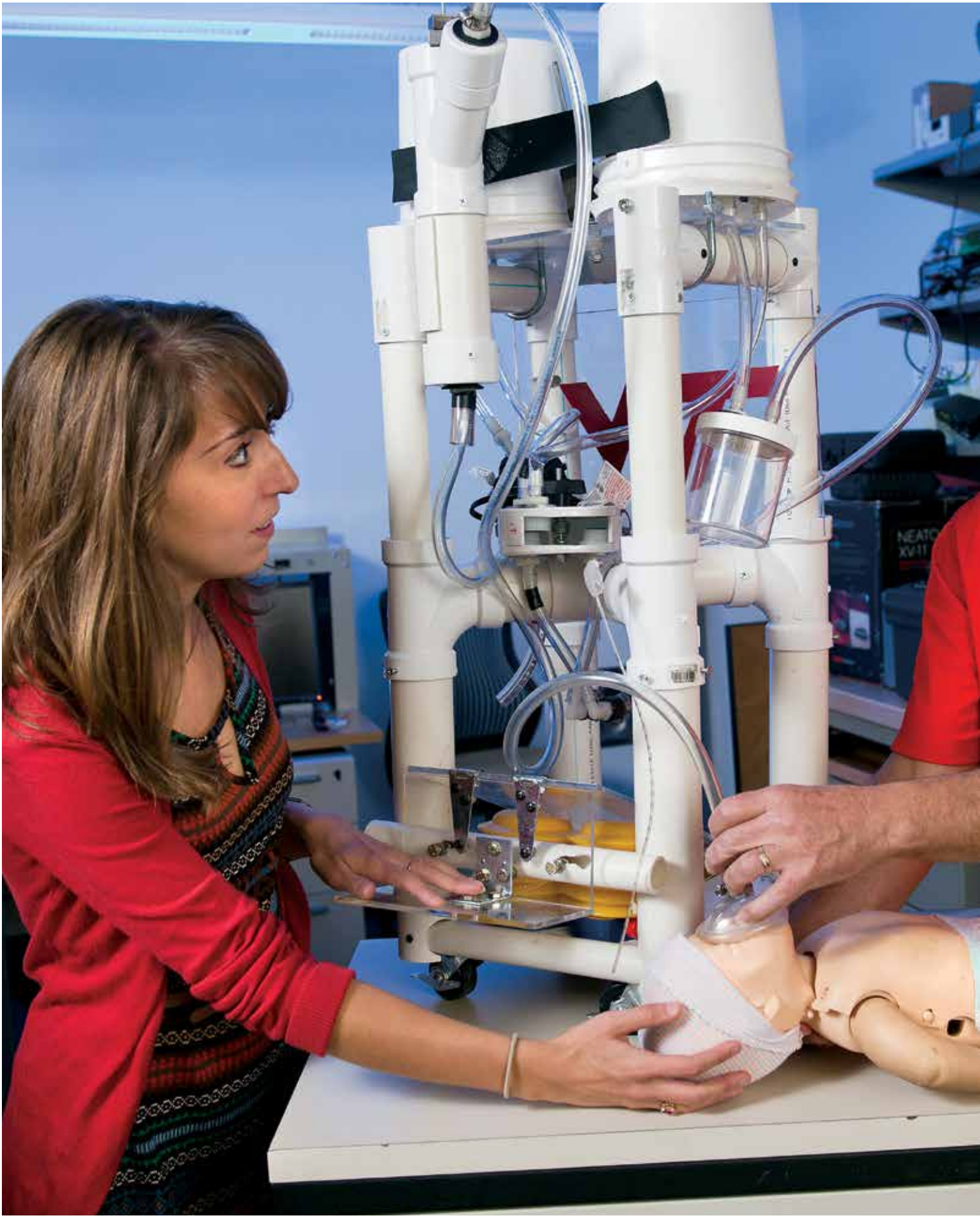
Acting on recommendations of the Task Force on Inclusive Excellence created in fall 2013 by former President Charles W. Steger, Virginia Tech reorganized inclusion and diversity efforts and expanded and enhanced its commitment to the values expressed in the Principles of Community.

Inclusion and diversity initiatives will be led by a newly established President's Inclusion and Diversity Executive Council, chaired by President Timothy D. Sands. This approach will include a senior level advisor to the president who will also serve as an interim vice provost for inclusion and diversity during the transition.

"This new organizational model is simply a scaffold; success in distinguishing Virginia Tech as the exemplar for the modern land-grant research university will only come with the efforts of every student, staff, and faculty member to advance a bold and reinvigorated inclusion agenda," said Sands. "A commitment to inclusion as an integral and inseparable element of institutional excellence is a requisite characteristic for attracting talent, for assembling world-class research teams, and for fulfilling our engagement mission."

The new administrative structure consists of four key components — the executive council; the Office of the Senior Vice President and Provost, which will serve as the administrative home for supporting inclusion and diversity efforts; a decentralized structure to develop and implement inclusion and diversity efforts, including six university employees to serve as inclusion and diversity coordinators; and a senior advisor to the president.

In addition, Sands and Provost Mark McNamee will invite guidance from an advisory committee comprised of caucus chairs, alumni, individuals identified by the Commission on Equal Opportunity and Diversity, and others.



Reaching out to the future

Land-grant institutions were founded in part to reach out to and improve the lives of people. That continues today at Virginia Tech, although the ways in which the university accomplishes that responsibility have transitioned over time.

For instance, it wasn't many decades ago that it would have been hard to imagine five mechanical engineering students designing an infant resuscitator to help newborns in underdeveloped areas breathe.

The Global AIR (Assistance of Infant Resuscitation) team — made up of undergraduate students Garret Burks, Jamie Cabaleiro, Megan Cash, Lisa Gonzalez, and Ashley Taylor — decided that their senior project should make a world of difference.

"I think the biggest motivator for me was that we are going to devote one year of our time to the senior design project," Burks said. "I wanted to work on something that could have an immediate impact on people."

Al Wicks, associate professor in the Department of Mechanical Engineering, and Dr. Andre A. Muelenaer Jr., associate professor of pediatrics at the Virginia Tech Carilion School of Medicine and adjunct professor at Virginia Tech-Wake Forest University School of Biomedical Engineering and Sciences, pointed out the need for an infant resuscitator that could function without electricity.

Through funding provided by the scieneering program (undergraduate studies and research in a combination of science, engineering, and law), Burks and Taylor traveled to Malawi in summer 2013 to see the need firsthand and assess local resources. They visited rural hospitals and outreach clinics.

They returned knowing they needed to use parts available in Malawian hardware stores so that the respirator can be fixed there. They also wanted to keep the total cost under $100. And they knew that the two vital functions of the resuscitator — suction to remove anything blocking a newborn's airway and inflation to fill the infant's lungs for the first time — had to operate without electricity.

Over the course of the yearlong project, the students were able to build a functioning prototype using resources found in hardware stores; during the spring semester, they tested the device at a Carilion simulation center in Roanoke. After making numerous design refinements, Taylor and fellow students Philip Repisky and Andrew

Virginia Tech seeks to instill *Ut Prosim* (That I May Serve) in daily life. Here, mechanical engineering graduate student Ashley Taylor and Professor Al Wicks experiment with an inexpensive infant resuscitator designed by students for use in the developing world as part of their senior project.

Jung returned to Malawi in summer 2014 to get feedback from clinicians there. Based on those suggestions, the students hope to make design improvements by December 2014 and start testing a small number of the devices in Malawi hospitals as early as summer 2015.

"Of anything I have ever worked on," Taylor said, "this is perhaps the closest thing to my heart, and I truly believe it has the potential to 'invent the [brighter] future,' especially for newborn babies around the world who are often a victim of their environments."

Collaborating in India

It was four years in the making, but Virginia Tech's research laboratory in India became a reality. Now-retired university President Charles W. Steger presided over the ribbon cutting.

For Steger, the efforts in India are a way to marry Virginia Tech's high-tech research with its tradition of putting new ideas and inventions into practice for the world's betterment. "We have an opportunity to expand beyond our neighbors in Western Europe into Asia, creating a global enterprise focused on one of the most important research areas for humankind — energy," he said.

The lab is outfitted with equipment to enable researchers to harvest energy in new ways from waves, sun, and wind, and even from mechanical vibrations, such as those produced by trains. The 6,000-square-foot facility will feature a state-of-the-art wind tunnel where researchers can develop high-efficiency wind turbines by optimizing their aerodynamic and structural performance.

"We are crossing continents to meet the global demand for new energy technology development," said Virginia Gov. Terry R. McAuliffe. "The insights we gain and the technology we create all transfer back to Virginia, and we can apply those assets to build new industry, address U.S. energy challenges, and create a 21st-century Virginia economy."

In March 2010, Virginia Tech announced plans for a center, now called the VT, India Institute for Critical Technology and Applied

Science Innovation Center, to be located on 30 acres inside Amrita Research Park in the state of Tamil. As work proceeded with private-sector partner MARG Swarnabhoomi, which contributed almost $2 million to the laboratory, two of Virginia Tech's research entities came to hold prominent roles: the Center for Energy Harvesting Materials and Systems and the Institute for Critical Technology and Applied Science.

Also in India, the Tech researchers who first discovered the papaya mealybug and devised a natural way to combat it have found that their work saved up to $309 million the first year and more than $1 billion over five years.

That's the amount of damage the mealybug would have wreaked ripping through papaya, eggplant, and tomato crops in southern India had Rangaswamy "Muni" Muniappan, head of Virginia Tech's Integrated Pest Management Innovation Lab program, not identified the pest and spearheaded the natural control program for the relatively modest cost of $200,000 during the first year of intervention.

The successful method involved deploying three parasitic wasps that lay eggs inside the mealybug larvae, and when the eggs hatch, the young wasps eat the larvae. The university's work to stop the papaya mealybug was also an important contribution to protecting U.S. crops, said Marjorie A. Hoy, a University of Florida entomologist who was instrumental in controlling a Florida infestation.

Reaching across the state

Back in Virginia, the Virginia Tech Foundation is reaching out with the Tech

Center at Oyster Point, a 100-acre, $250 million development comprising retail, residential, and commercial space, and a technology and research center — all under construction in the heart of Newport News, Virginia.

Situated adjacent to Thomas Jefferson National Accelerator Facility, commonly called the Jefferson Lab, and within minutes of NASA's Langley Research Center, Tech Center is primed to become a hub of entrepreneurial innovation in Newport News. Tenants will find themselves in the epicenter of a booming, high-tech business community bent on creating jobs, improving lives, and strengthening the economy.

Tech Center models itself after the Corporate Research Center (CRC) adjacent to Virginia Tech's Blacksburg campus. Home to some 150 companies and 2,700 employees and owned by the Virginia Tech Foundation, the CRC was named the 2010 Outstanding Research Park by the Association of University Research Parks. Creating such an environment is the motivation for the Tech Center partnership, comprised of Newport News-based developer W.M. Jordan Co. and its president and CEO, John Lawson, former rector of the Virginia Tech Board of Visitors; Georgia-based retail developer S. J. Collins Enterprises; Virginia Tech; and the City of Newport News.

The sprawling mixed-use campus will offer luxury apartments; easy access to walking, biking, and exercising facilities; and even healthy food choices, such as a Whole Foods store. The first research building is slated for completion in late 2015.

The Virginia Tech Foundation's successful Corporate Research Center model is being exported to the Tech Center at Oyster Point in Newport News, Virginia. Tenants will find themselves in the epicenter of a booming community centered on creating jobs, improving lives, and strengthening the economy.

Academics keep pace with transition

To continue offering the challenging academic programs students, employers, and graduate schools have come to expect from Virginia Tech, the university and its colleges must constantly look ahead and build on past successes. The past year saw a near-avalanche of new programs crafted to meet the needs of today's society, old programs revived and adapted to meet a resurgence of demand, and decades-old majors restructured to fit modern realities.

For instance, the College of Natural Resources and Environment (CNRE) unveiled a new undergraduate major in environmental informatics, based in the Department of Forest Resources and Environmental Conservation. Bringing together information technology, data analysis, natural resources, geospatial science, and ecological modeling, environmental informatics enables students to apply information science to sustainable management of the natural world.

"Today's problems are increasingly complex and involve vast amounts of data," said Randolph Wynne, professor of forest remote sensing. "As a result, the need for professionals trained in technical and analytical approaches to environmental problems is rising dramatically."

Also in CNRE, another new undergraduate degree program will allow students to do more than think outside the box — they'll be thinking about the box itself, as well as the entire packaging system.

The packaging systems and design degree program teaches students how to design the most economically, aesthetically, environmentally, and technically sound packaging systems for the goods people use. CNRE is the only institution in the state and one of just a handful in the nation to prepare undergraduates with expertise in packaging science and technology.

The nuclear engineering program, which was originally revived in 2007 with a long-term vision of an interdisciplinary program encompassing several of Tech colleges and the Virginia Tech Carilion School of Medicine, expanded with approval from the State Council of Higher Education for Virginia for the Tech program to award master's and doctoral degrees.

David Christian, CEO of Dominion Generation, explained to SCHEV that his company, as well as other entities in Virginia and across the nation, needs to hire nuclear engineers who can meet the nation's present and future energy needs. Christian noted that five reactors are under construction in the U.S. and 66 are under construction worldwide.

In another innovative addition to the university's degree offerings, the Board of Visitors underscored the university's commitment to lead the way and prepare students for careers in critical 21st-century fields of study and industry by approving STEM-H bachelor's degree programs in computational modeling and data analytics, microbiology, and nanoscience.

The computational modeling and data analytics program will help students meet industry and government needs by preparing students with the requisite computational skills to work with vast data sets and to develop code for specialized applications.

The microbiology program will prepare graduates for interdisciplinary research and education; employment in the private

Fashion merchandising and design student Mary Elise Jennings works on pieces for the Fashion and Merchandising Design Society fashion show. As a result of curriculum changes that will better prepare Hokies for the modern world, students will now be able to major specifically in various fields — including fashion merchandising and design — that before were just concentrations within another major.

sector and state and federal government agencies; and post-baccalaureate training.

Virginia Tech will become only the second university in the nation to offer a bachelor's degree in nanoscience. The NSF estimates that by 2020, a U.S. workforce of 2 million people will support a $3 trillion market for nanotechnology products.

New programs weren't limited to the sciences.

The university established a master of fine arts degree in arts leadership — the study and practice of arts management and advocacy. The degree is offered through the School of Performing Arts and offers full tuition waivers and three-year fellowships to all students accepted into the program.

"Grounded in the premise that leadership emerges at the intersection of challenge and possibility, the new arts leadership program is designed to foster the development of leaders who both challenge themselves and inspire others through critical thinking, creative problem-solving, and bold experimentation," said Patty Raun, director of the School of Performing Arts.

The program combines course work with hands-on learning to provide both a theoretical framework and practical experience to develop skills in business writing, communication, fiscal management, and marketing, as well as study theory and practice in the areas of leadership, advocacy, strategic planning, and artistic management.

In the College of Liberal Arts and Human Sciences, students gained a new foreign language major — Russian. The language concentration previously was offered only as a minor.

Other majors were also reconfigured to better reflect today's needs. Students interested in communication can now major in communication studies, multimedia journalism, or public relations. Similarly, students in the apparel, housing, and resource management department can major in property management, consumer studies, or fashion merchandising and design.

Keeping the nation secure electronically

The university was the recipient of $4 million NSF grant to create a scholarship program that will enhance the university's growth in the expanding field of cybersecurity. Each scholarship recipient in the CyberScholars Program will receive three years of funding leading to a master's degree in computer science or in computer engineering with a graduate certificate in either cybersecurity or information assurance.

The scholarship program will also offer federal internships and full-time placement within a federal agency upon graduation. Cyberscholars will be required to "pay back" their scholarships by working in a position related to federal, state, or local efforts to implement cybersecurity across the nation.

Stamps Scholars

The desire to recognize and assist exceptional students prompted the Stamps Family Charitable Foundation Inc. and alumnus Dave Calhoun to establish the Stamps Leadership Scholars program with combined gifts of $2.25 million, one of the largest philanthropic infusions to the Virginia Tech University Honors Program ever.

Up to five Stamps Scholars will be awarded full tuition, fees, and room and board, as well as a generous enrichment fund to support experiential learning opportunities. The merit-based scholarships will be renewable for four or five years. The first recipients of the scholarships were engineering major **Galina Belolipetski,** communication major **Jessica King,** university studies major **Wolfe Glick,** and physics major **Moira Miller.**

Other student recognitions and achievements during 2013-14 included:

A team of rising juniors in the College of Architecture and Urban Studies' industrial design program won a silver for Best Accessibility Innovation in the 3rd Annual International User Experience Awards. They were the only student team recognized in the international competition. Their winning design utilizes controls operated by facial muscles to make cell phone use easier for a person who has lost a limb due to a major injury. The three students were **Conor Brown, Michelle Murgia,** and **Cole Smith,** all industrial design majors.

Two College of Engineering teams advanced to the second phase of the Robotics Challenge sponsored by the Defense Advanced Research Projects Agency (DARPA). The goal: create rescue robots that can easily maneuver through disaster scenes and save lives. **Team THOR** is an international team of academic and private roboticists designing and building a semi-autonomous robot that will drive a Jeep-like vehicle, walk over rubble, clear objects blocking a door, and enter a building, where it must perform several tasks. **Team ViGIR** is a collaboration between College of Engineering spin-off company TORC Robotics; the computer science department's Center for Human-Computer Interaction; and Germany-based Technische Universitat Darmstadt. The team must design software to monitor and control a virtual robot to complete tasks exactly mirroring those of THOR's physical goals.

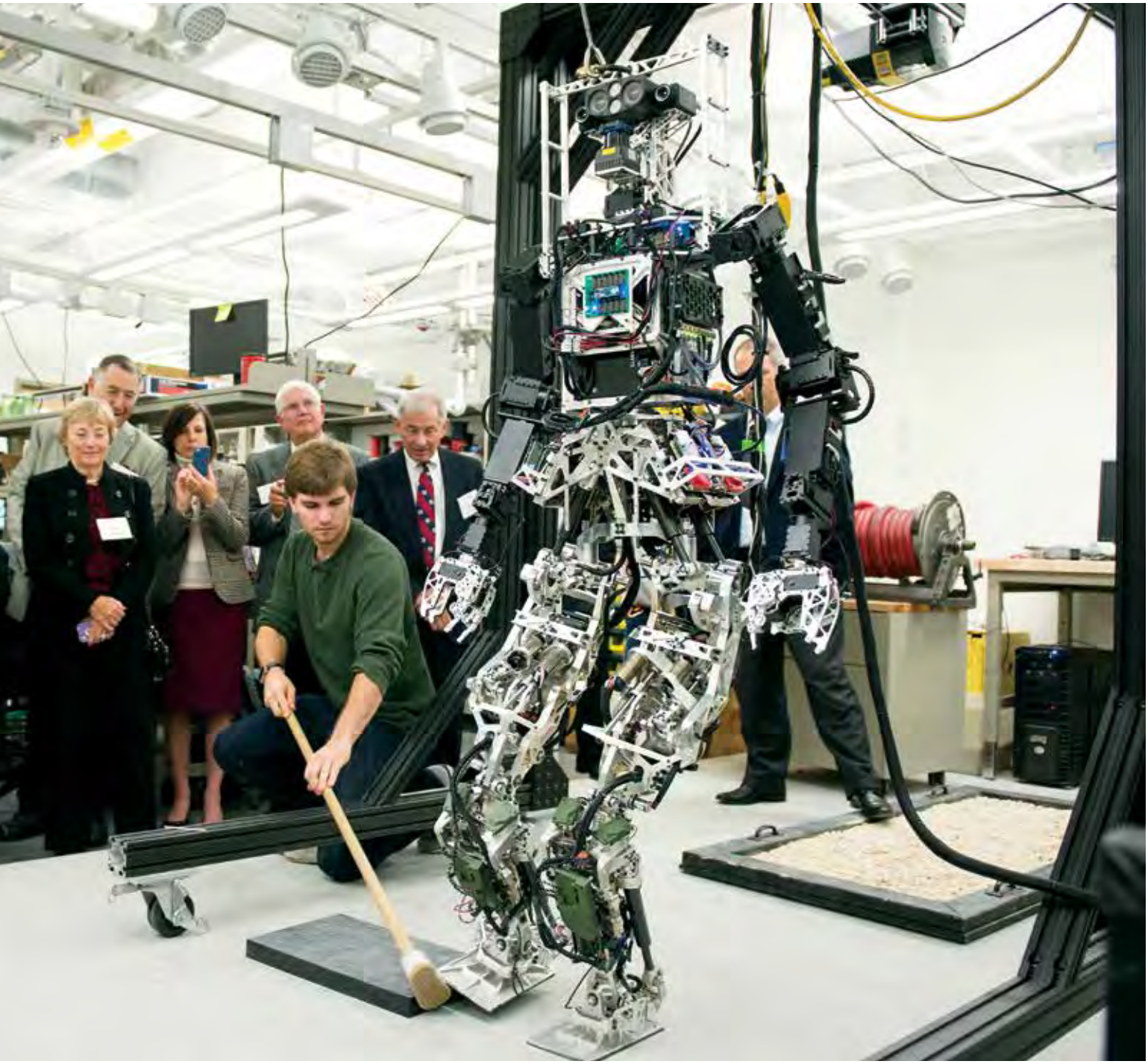
Amelia Liarakos won a national student gold ADDY Award from the American Advertising Federation for her work "North by Northwest Titles" in the Elements of Advertising — Visual category. Liarakos is a May 2013 graduate with a bachelor of fine arts in visual communication design from the College of Architecture and Urban Studies' School of Visual Arts and a minor in classical studies from the College of Liberal Arts and Human Sciences.

A Virginia Tech graduate student who helps develop stem cell treatments for horses at the Marion duPont Scott Equine Medical Center traveled to the Baltic region of Northern Europe to do similar research in human medicine under the Fulbright U.S. Student Program. **Daniel W. Youngstrom** is a Ph.D. candidate in biomedical and veterinary sciences at the Virginia-Maryland College of Veterinary Medicine.

Virginia Tech students swept the awards in several categories at the Dairy World Expo. The Virginia Tech Dairy Judging Team placed first in the Overall Team category in the Intercollegiate Dairy Cattle Judging Contest and first in three of seven breeds, and also won top honors in the oral reasons competition. This is the fourth time a Tech team has won the contest in eight

years. The students on this team were **Lizzie Davis, Mackenzie Moore, Mandi Ramsburg,** and **Lyndsey Royek.**

Catherine Goggins, a junior majoring in agricultural and applied economics in the College of Agriculture and Life Sciences and a University Honors student, received a 2014 Udall. In her capstone course, Goggins teamed up with the Alderson Hospitality House, which provides meals and lodging to families and friends of women incarcerated in the federal wom-



Robotic first responders of the future that will be able to stand up to nuclear disasters and natural catastrophes alike are under development in the Terrestrial Robotics Engineering and Controls Lab.

en's prison in Alderson, West Virginia. Goggins worked with the organization to establish a community garden.

David Mackanic, a junior double-majoring in engineering in the College of Engineering and chemistry in the College of Science and a University Honors student, was awarded a Barry M. Goldwater Scholarship for the 2014-15 academic year. He was among 283 sophomore or junior mathematics, science, and engineering students nationwide selected for the honor.

The Virginia Tech Soil Judging Team claimed top honors at the Soil Science Society of America National Intercollegiate Soil Judging Contest for the third time in five years. And **Julia Gillespie** and **Emily Salkind,** both seniors majoring in environmental science, went on to compete in an international soil judging contest in Jeju, South Korea. Students on the winning team also included **Ruth Anderson, Emily Baer, Nick Hebel, Brian Nester, Stephanie O'Neil, Natasha Nahas,** and **Miranda Livas.**

Faculty experts build on the best

Faculty members and teachers working at the forefront of their respective fields are necessary for any university adapting to the transitions needed in a modern world. A large number of Virginia Tech educators and reseachers were recognized for their leading efforts in 2013-14.

Three Virginia Tech teachers and researchers garnered prestigious National Science Foundation (NSF) Faculty Early Career Development Program (CAREER) grants in 2013-14 to continue their work. The awards support junior faculty who exemplify the role of teacher-scholars through outstanding research, excellent education, and the integration of education and research. Two others earned a Presidential Early Career Award for Scientists and Engineers (PEACASE).

Guohua Cao, assistant professor of biomedical engineering, is working to expand the medical community's ability to clinically assess blockages called atherosclerotic plaques in the human body. These dangerous blockages that can lead to heart attacks and strokes are not easily diagnosed due to "the lack of noninvasive imaging techniques to accurately model atherosclerotic plaques in vivo," he said.

Cao's $400,000 award will help in his development of an unprecedented microcomputer tomography scanner for the in-vivo imaging of atherosclerotic plaques in transgenic mouse models. Of all the imaging tasks involved with small animals, cardiovascular imaging is among the most challenging because the physiological motions of small animals are about 10 times faster than those of humans, Cao said. He now hopes to develop a carbon-nanotube field emission X-ray source to reduce the blurring of pictures that come from the heart motions and to achieve the required time-based high resolution.

Physicist **Camillo Mariani,** an assistant professor in the College of Science, was awarded $630,000 for his research on neutrino interactions in matter. Mariani's award also includes an educational component to create a QuarkNet center at Virginia Tech to attract high school students and teachers, with initial emphasis on neutrino physics.

"The research and educational programs laid out in his proposal will have a significant and positive impact well beyond Virginia Tech," said Jonathan Link, director of Virginia Tech's Center for Neutrino Physics, which has grown into one of the largest and most visible neutrino research groups in the world.

Denise R. Simmons, a principal faculty member and assistant professor in the Myers-Lawson School of Construction, received her CAREER award to learn more about the influence of various factors in the choices undergraduate engineering students make regarding their co-curricular involvement, ultimately leading to their entry into the workforce. Simmons' goal is to become a global leader in research that broadens the participation of engineering students, ultimately increasing the num-

Wu-chun Feng, professor of computer science and expert on energy-efficient parallel computing, has been a leader in the green supercomputing movement.

bers entering the technological workforce. Her prior work suggests that underrepresented students' decisions to persist in undergraduate engineering studies are influenced by their sense of belonging and involvement in co-curricular activities.

In 2012, **Raffaella De Vita,** associate professor of engineering science and mechanics, received a CAREER award to lead a national study on pelvic floor disorders, which affect some one-third of adult American women, and in 2013-14 she was named a recipient of a PECASE, the highest honor the White House bestows on science and engineering professionals in the early stages of their research careers. The PECASE will enhance her ongoing CAREER award efforts.

Pelvic floor disorders include urinary and/or fecal incontinence, and pelvic organ prolapse that occurs when the pelvic organs protrude into, or out of, the vaginal canal. In the U.S., the cost for pelvic organ prolapse surgeries alone is more than $1 billion annually. De Vita is working with several collaborative research partners, including the Walter Reed Army Medical Center and the Biophysics Collaborative Access Team at the Argonne National Laboratory near Chicago.

Isis Kanevsky-Mullarky, an associate professor of dairy science in the Virginia Tech College of Agriculture and Life Sciences, was awarded her PECASE for research centering on enhancing the immune response to *Staphylococcus aureus* infections, identifying biomarkers and vaccine targets, and delineating immune system development in the neonate. She currently teaches mammary immunology and mentors both master's and doctoral students.

Staphylococcus aureus infections make up a portion of the overall mastitis infections that cost the U.S. dairy industry about $2 billion annually, or 11 percent of the value of total milk production.

The State Council of Higher Education for Virginia named Virginia Tech's **Wu-chun Feng** a 2014 Outstanding Faculty Award winner, the commonwealth's highest honor for faculty members. The award recognizes commitment to excellence in teaching, research, knowledge integration, and public service.

Feng, professor and Elizabeth and James Turner Fellow in the Department of Computer Science, is an internationally recognized researcher in efficient parallel computing, a field that includes computer architecture, systems software and tools, middleware, and applications. Feng is best known for his research in energy-efficient parallel computing, which started in 2001 with his founding of the Supercomputing in Small Spaces project and resulted in creation of Green Destiny, a 240-node super-

Virginia Outstanding Scientist Harold E. Burkhart has been earning accolades for decades for his groundbreaking work in sustainable forestry practices and for his passionate mentoring of future scientists.

Right: All members of the first Virginia Tech Carilion School of Medicine class were accepted into a residency of their choice on Match Day. Then, following their graduation, the school was fully accredited by two national organizations.

computer in five square feet with a power envelope of only 3.2 kilowatts. In turn, the supercomputer inspired the founding of the Green500, which identifies the world's greenest supercomputers.

More recently, Feng's research has delivered parallel computing to the masses by simultaneously coordinating two types of silicon brains in mobile devices, desktop computers, supercomputers, and MOON and cloud computing to accelerate research and innovation and to educate tomorrow's scientists and engineers. In all, his research has been supported by more than 70 grants totaling more than $32 million.

David G. Schmale III, an associate professor of plant pathology, physiology, and weed science in the College of Agriculture and Life Sciences, was named to Popular Science magazine's 2013 Brilliant Ten list for his research using unmanned aerial vehicles (UAVs) to explore microbial life in the atmosphere. The Brilliant Ten is a list of international scientist s, engineers, and thinkers whose innovations change the world.

Schmale and colleagues use research drones to track the movement of dangerous microorganisms that surf atmospheric waves. This research has deepened understanding of the flow of life in the atmosphere, and has contributed unique tools for scientific exploration in the burgeoning field of aeroecology. UAVs can be used to help predict potential outbreaks of human and animal diseases, and even help farmers time their application of pesticides to thwart crop destruction.

Dushan Boroyevich, the American Electric Power Professor of Electrical and Computer Engineering, was one of 67 new members elected to the National Academy of Engineering. Boroyevich was honored for his advancements in control, modeling, and design of electronic power conversion for electric energy and transportation. He is also co-director of the university's Center for Power Electronics Systems.

Terry Clements, associate professor of landscape architecture in the College of Architecture and Urban Studies, was named a Fellow of the American Society of Landscape Architects. In the announcement of her recognition as Fellow, the organization noted Clements "is a consummate leader and advocate of landscape architecture through her work with students, fellow professionals, allied disciplines, and community groups."

The Design Futures Council has named **Jack Davis,** Reynolds Metals Professor of Architecture and dean of the College of Architecture and Urban Studies, a Senior Fellow. Davis was one of 13 individuals recognized in 2013.

Harold E. Burkhart, University Distinguished Professor and the Thomas M. Brooks Professor of Forestry in the College of Natural Resources and Environment, was named Forest Champion of the Year by the Forest Landowners Association. Burkhart is considered by many forest scientists to be the father of forest biometrics, which explores the theory and applications of quantitative models of forest stands.

Sandeep Shukla, professor of electrical and computer engineering in the College of Engineering, was named an Institute of Electrical and Electronics Engineers (IEEE) Fellow for contributions to applied probabilistic model-checking for system design. The status of Fellow is bestowed upon less than one-tenth of 1 percent of the annual voting membership of IEEE.

Three College of Science faculty members were elected Fellows of the American Physical Society (APS): **Leo Piilonen,** the William E. Hassinger Jr. Senior Faculty Fellow in Physics and chair of the department; **Bruce Vogelaar,** professor of physics and director of the Kimballton Underground Research Facility; and **Uwe Tauber,** professor of physics. Fellowship in the APS is limited to no more than one-half of 1 percent of membership.

Erika Meitner, associate professor of English in the College of Liberal Arts and Human Sciences, received a U.S. Scholar Award from the US-UK Fulbright Commission. A teacher and poet, Meitner will be the Distinguished Scholar in Creative Writing at the Seamus Heaney Centre for Poetry at Queen's University Belfast in Northern Ireland for spring 2015.

Medical school passes milestones, gains accreditation

The past year was a banner one for the Virginia Tech Carilion School of Medicine, culminating in full accreditation from two key organizations following graduation of the school's first class.

Accreditation came from the Liaison Committee on Medical Education, the nationally recognized accrediting authority for M.D. programs in the U.S. and Canada, and the Southern Association of Colleges and Schools, one of the nation's six regional accrediting bodies.

"We couldn't be more delighted," said Virginia Tech President Timothy D. Sands. "The core strength of the Virginia Tech Carilion School of Medicine is its union between Virginia Tech — an institution with world-class programs in science, engineering, and biomedicine — and Carilion Clinic, a health care system with a long and distinguished history in medical education."

Earlier in the year, the graduating class surpassed the national average in the second step of its United States Medical Licensing Examination. And at the school's inaugural Match Day in March, all members were matched to a residency of their choice.

"We're thrilled that our charter class had a 100 percent match rate," said Dr. Cynda Johnson, founding dean of the school. "There's a shortage of available residencies, so this is a huge accomplishment for our students. It's also an important national benchmark for our school."

The school's curriculum emphasizes patient-centered, problem-based learning in small groups. The school's vision also includes an intensive research component threaded through all four years of a student's experience. So far, more than 50 medical students have presented their research at conferences around the country and even internationally.

Technology on high

Advances in technology have dramatically reshaped education and research horizons in such a rapid fashion in recent years that keeping up with advances can be a challenge. However, Virginia Tech is a leader is some of those changes.

In 2013-14 Virginia Tech was one of the few chosen by the Federal Aviation Administration (FAA) to lead technological innovation in the sky — in the form of umanned aerial vehicles. The FAA picked the Mid-Atlantic Aviation Partnership, a group led by Tech and Rutgers University that the University of Maryland later joined, to operate a test site to safely and responsibly integrate unmanned aircraft into the national airspace.

In addition, the Commonwealth of Virginia announced it will award more than $2.6 million over three years in Federal Action Contingency Trust (FACT) funds to Tech to operate an unmanned aircraft systems test site. The grants will provide the university with $1 million in fiscal year 2014, $1.2 million in fiscal 2015, and $437,000 in fiscal 2016. The FAA provides no funds to test consortiums.

"Virginia Tech and its partners are positioned to lead growth in a dynamic new industry," said then-Virginia Tech President Charles W. Steger. "Integrating unmanned aircraft into the national airspace is a great responsibility, one that our faculty members and government, university, and industry partners take very seriously."

Much is at stake. Introducing unmanned aerial vehicles to U.S. skies could add more than $13.6 billion to the national economy by the end of the decade, with totals reaching as high as $82.1 billion by 2025, according to the Association for Unmanned Vehicle Systems International.

Moreover, the association ranks Virginia eighth among states with the most to gain from unmanned aircraft systems. By 2017, unmanned aircraft systems-related work is expected to inject $463 million into the commonwealth's economy, produce $4.47 million in additional tax revenue, and add more than 2,300 jobs.

In a recent economic study, the Virginia Department of Aviation, the Virginia Economic Development Partnership, the commonwealth's Center for Innovative Technology, and Virginia Tech concluded that Virginia is well-positioned to meet the needs of unmanned aircraft manufacturers because of the commonwealth's manufacturing capacity and because 300,000 people already work in related fields.

"Virginia already has a ready-made workforce for technology development in unmanned vehicles systems," said Jennifer Shand, senior economic development specialist with the Office of Economic Development, part of Virginia Tech's Outreach and International Affairs.

The FAA has until 2015 to develop regulations aimed at limiting the privacy and safety concerns associated with unmanned aircraft. To help, Congress called for the establishment of six national unmanned aircraft system research and testing sites

Aerospace engineering students Mark Palframan (left) and Chris Kevorkian prepare the unmanned aerial vehicle (UAV) SPARRO for a test flight. UAVs have the potential to transform agriculture, transportation, emergency response, and a variety of other fields.

through the FAA Modernization and Reform Act of 2012. While much of the testing to date has been conducted under defense programs, continued work on the integration of unmanned aircraft into the national airspace will be implemented through a combination of federal, state, and local government resources, along with academic institutions and private industry.

"With our partners, we firmly believe we can introduce this new technology the right way," said Jon Greene, interim director of the mid-Atlantic partnership and an associate director of Virginia Tech's Institute for Critical Technologies and Applied Science. "Separately, the team members have flown unmanned aircraft systems for thousands of hours, and now we have joined together to conduct unmanned aircraft systems research, development, and test and evaluation activities."

In addition to expertise, the mid-Atlantic region contains both uncongested and restricted airspace, land and water terrain, and access to sea-level and high altitudes. The region also has an extensive

The Rolls Royce Trent 1000 jet engine hanging in the atrium of Goodwin Hall is an inspiring symbol of the decade-old research and teaching partnership between Virginia Tech and the company. Rolls Royce donated the engine to the university.

agricultural base, which is considered the primary growth area for unmanned aircraft systems technology.

"We are creating technologies that could transform transportation, agriculture, emergency response — a wide variety of activities," said Craig Woolsey, an associate professor of aerospace and ocean engineering with the College of Engineering and the director of the Virginia Center for Autonomous Systems. "When people realize what they will gain through autonomous technology, we are going to see a drastic paradigm shift in the way we approach these activities. As happened with cellular devices, new industries will crop up, [and] new infrastructure needs will evolve. The economic impact will be enormous."

The world's most instrumented building

The university also brought groundbreaking technology to bear in construction of its Signature Engineering Building, now known as Goodwin Hall. The plan, spearheaded by Department of Mechanical Engineering faculty members Pablo Tarazaga and Mary Kasarda and their Smart Infrastructure Laboratory, is to turn the entire structure into a test bed to measure even the smallest vibrations and to track data related to building design and security, occupancy monitoring for emergency response, structural health monitoring, and more.

Roughly 240 accelerometers attached to 136 sensor mounts throughout the building's ceilings will detect information about where people are within the structure, measure normal structural settling and wind loads, and — vital for future engineering designs — track building movement resulting from earthquakes similar to the event that struck Virginia in 2011.

"My background is in structural vibrations and dynamic validation," said Tarazaga, founder of the infrastructure laboratory and an assistant professor. "We use these types of sensors in all kinds of systems, such as helicopters, satellites, automobiles, etc., and it struck me as the building was being constructed outside of my window in Durham Hall that we should do the same thing here."

The vibration accelerometers will be sensitive enough to infer foot traffic patterns, whether from two people or 40. Smart Infrastructure Laboratory members won't be able to identify who is walking but will pinpoint people by detecting their footfalls.

"The sensors measure small vibrations," said Kasarda, an associate professor. "These vibrations can tell us many things about the building instantaneously and over time. These movements can be related back to the health of the building, the human-structure interactions inside the building, how the building changes over time, and gauge the accuracy of the mathematical models of the building."

The data can help a variety of industries, from security companies to building designers and engineers. Structures are planned with weight-bearing loads in mind dependent on the number of foreseen occupants. This data can determine if those numbers are correct and inform future designs. And vibration detection is just the beginning. The lab already is making plans to add more sensors, such as instruments to measure air flow and temperature for energy-related research.

Output ports will be open for engineering and construction students to hook into and retrieve live data. "This is creating a hands-on field experience for engineering students within the university curriculum without them ever leaving campus," Kasarda said. "Students will use the data for very different classes with different outcome goals."

Distance learning recognized for excellence

Virginia Tech was recognized again for its efforts to transform education through distance learning when the National University Technology Network named the university the recipient of its 2013 Institutional Achievement Award. The network cited Tech's significant growth of enrollment and engagement of delivered courses, a well-planned system for effectiveness measurement and data indicating student satisfaction, and the university's innovative measures to provide faculty development and teaching incentives.

"By funding distance-learning research and establishing both the university's Enterprise Fund and Provost Course Development Fund, Virginia Tech not only develops distance-learning programs, but more importantly, seeks to improve the quality [of], expand access to, and minimize the cost of education," cited the panel.

The Moss Arts Center, home to the Center for the Arts at Virginia Tech, at dusk.

Building for the future

New and refurbished facilities are essential to housing and ushering in the future. None made as much of a splash in 2013-14 as the university's $100 million Moss Arts Center, named in tribute to artist and philanthropist Patricia Buckley Moss, whose $10 million donation in support of the center is one of the largest gifts the university has ever received.

Moss' honor was particularly fitting because of her prominence in the arts and her longtime advocacy for incorporating the arts into education. In her advocacy work, Moss, who is dyslexic, has cited her personal story of struggling in school — until an open-minded teacher recognized her artistic potential.

"The arts can change people's hearts, change their minds, and change their lives," Moss said. "That is why I am so excited about the impact this wonderful facility will make on thousands of people, young and old, across this entire region of our state."

Designed by the award-winning architectural firm Snøhetta, the 147,000-square-foot center is home to the Center for the Arts and the Institute for Creativity, Arts, and Technology, and represents the culmination of retired president Charles W. Steger's 14-year vision to increase the prominence of the arts at Virginia Tech, a goal he outlined in his inaugural address in 2000.

"The scope and scale of the work we now can bring to campus is unprecedented in this region," said Ruth Waalkes, the university's associate provost for the arts, who is also executive director of the Center for the Arts at Virginia Tech, which is responsible for programming and operations within the new facilities. The center will bring "new opportunities for learning, discovery, and engagement for our students" and will make "world-class arts experiences accessible and affordable for people across the region."

At the announcement of the naming of the center, Steger described the facility as symbolic of a much broader effort that has included the addition of the Institute for Creativity, Arts, and Technology; construction of Theatre 101; the addition of several graduate degree programs in the arts; renovation or construction of learning spaces for arts programs; and the hiring of additional faculty.

"Far from being peripheral, the arts are infused throughout the curriculum and campus experiences," Steger wrote. "Here, the nexus of art and technology imparts a flavor unique to our institutional character.

"The new high-tech Moss Arts Center and its living labs devoted to the Institute for Creativity, Arts, and Technology are but the most visible physical symbols. Beneath the sur-

face, the campus teems with unusual collaborations among the science, engineering, arts, and design (SEAD) disciplines. Indeed, we're 'SEADing' the future here."

Other openings

Another major opening was the College of Agriculture and Life Sciences' new Human and Agricultural Biosciences Building 1, where researchers and students from multiple disciplines collaborate on issues ranging from fermentation and food safety to bioprocessing and biofuels.

"The research activities and discoveries made in the new building will become the cornerstone of programs that will directly benefit the citizens of the commonwealth and the agriculture, food, and health industries," said Alan Grant, dean of the college. "The work that is happening in the new building will bring the promise of a healthy planet, healthy food, and healthy people."

The $53.7 million building is the first of four planned for the Human and Agricultural Biosciences Precinct.

Summer 2014 also saw completion of the Signature Engineering Building, now known as Goodwin Hall, which has been part of the college's capital plan since 2007. "The Signature Engineering Building will serve as the centerpiece of the College of Engineering, and a teaching tool for our students," said Richard C. Benson, dean of the college.

The building benefited from a $25 million gift from Alice and Bill Goodwin, the largest donation in Virginia Tech history.

Top left: The The Cube Gallery in the Moss Arts Center is a highly adaptable space for research and experimentation, immersive environments, intimate performances, audio and visual installations, and experiential investigations.

Above: The Anne and Ellen Fife Theatre in the Street and Davis Performance Hall gives the university a top-notch, modern space for arts presentations of all kinds.

Below: Students relax, study, and collaborate in the new Human and Agricultural Biosciences Building 1, the first facility in the new Human and Agricultural Biosciences Precinct.

Philanthropy fuels transitions and maintains traditions

The generosity of Virginia Tech's many donors helped fuel some of the university's longstanding traditions while making possible transformative moments for our institution.

In 2013-14, University Development raised $80.08 million, including $5.22 million for the Center for the Arts – the largest yearly total ever raised for that center and the world-class facility that houses it, which opened Nov. 1, 2013.

The College of Engineering, which opened its Signature Engineering Building, now known as Goodwin Hall, during the fiscal year, raised $15.76 million — the most received by an academic designation. Intercollegiate Athletics raised $19.7 million, which was the most received by any designation.

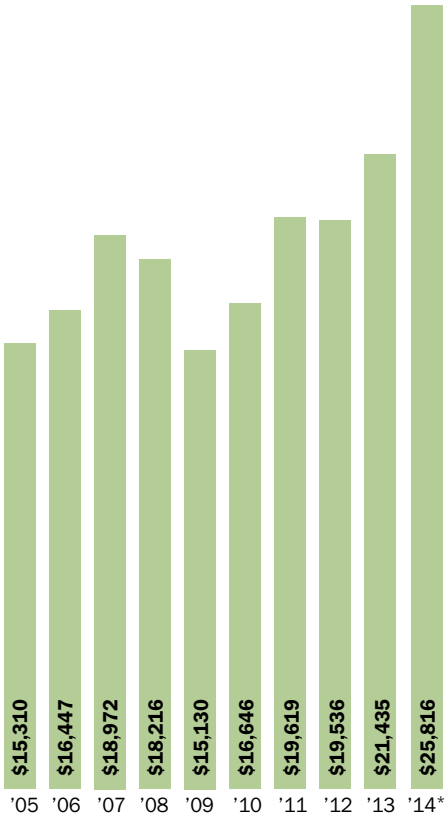
Multiple colleges or programs had large increases in gift income, including the Corps of Cadets. Donors gave a record $4.06 million to the corps, which was 72.5 percent more than in the previous fiscal year.

The College of Liberal Arts and Human Sciences realized a 39.2 percent increase and its highest level of gift income since fiscal year 2006-07. Other designations that saw large increases were the College of Architecture and Urban Studies (46.3 percent), Inclusion and Diversity (15.1 percent), Student Affairs and Parent Support (26.3 percent), and University Libraries (17.9 percent).

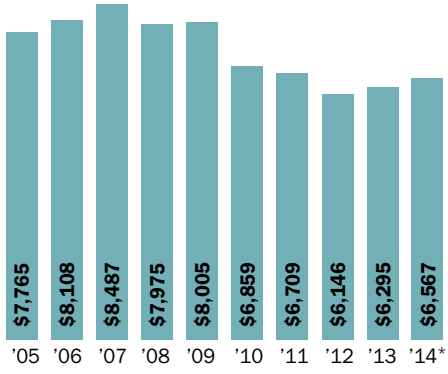
Undergraduate Education more than quintupled the amount it raised, compared to the previous fiscal year.

Giving to all eight college annual funds increased, helping Annual Giving notch its fifth consecutive year of increased revenue. The $6.54 million in annual gifts, yet another record, was 32.2 percent higher than in the previous fiscal year.

While $37.69 million of gift income was directed toward current operations, a significant portion went to the endowment. The $17.56 million of endowed giving, along with earnings from the Virginia Tech Foundation's investments, propelled the market value of the foundation's endowed assets to a record high of $796.4 million as of June 30, 2014, providing a valuable stream of income to draw upon in years to come.



Endowment per Full-time Student



State Funding per Full-time In-state Student

NOTE: Figures in the state funding chart for all years will differ slightly from numbers in annual reports before 2008-09 because past figures have reflected a method that used fall registration to calculate the full-time equivalent headcount. The numbers in this year's report instead of reflect an annualized head count. Figures are not adjusted for inflation.

Source: Virginia Tech Office of Budget and Financial Planning

* Fiscal years

Timeline

JULY

Turner Place best new facility

Virginia Tech's acclaimed dining program once again earns top honors when Turner Place at Lavery Hall wins recognition from both the National Association of College and University Food Services and Food Management magazine as the best new dining facility in the country. Judging criteria includes services, facility design, menu, marketing, nutrition, wellness, customer satisfaction, and sustainability.

Living-learning community focuses on entrepreneurship

The university takes applications for a living-learning community that will focus on entrepreneurship. Led by a faculty director from the Pamplin College of Business and located in a stand-alone house at 2475 Oak Lane, the "Innovate" living-learning community gives 35 students the chance to immerse themselves in the many facets of entrepreneurship.

Researchers form 7,000-mile partnership

A team of faculty members from Virginia Tech wins a grant from the Obama-Singh 21st Century Knowledge Initiative to create a new international program to promote collaborative research on sustainable infrastructure development. To that end, Tech and the Indian Institute of Technology in Kanpur form a partnership to launch an international program that includes a series of meetings, workshops, research collaborations, and graduate student exchanges.

AUGUST

Moss is named a Fellow

Renowned artist Patricia Buckley Moss is named a Fellow of Virginia Tech's outreach programs and the university's Center for Organizational and Technological Advancement, where her prominence in the arts, wide network of contacts, and extensive experience as an advocate for incorporating the arts into education will be major assets.

Grant to help expand careers

The university is named one of 10 academic institutions to receive a first-of-its-kind grant from the National Institutes of Health to help prepare graduate students and postdoctoral scholars for biomedical research careers that could take them beyond conventional academic research, including industry, government, business, and other venues. The 10 institutions will share approximately $3.7 million for the current fiscal year. The Broadening Experience in Scientific Training awards are for five years.

University expands to Newport News

After more than a year of planning, Virginia Tech and the University of Virginia unveil a jointly operated Newport News center. The Virginia Tech Hampton Roads Center, Newport News, is the latest in the growing body of Virginia Tech's commonwealth campus centers. The educational emphasis in Newport News will be on customized professional development training for clients in industry and government.

SEPTEMBER

Vet med in-state costs low

Virginia and Maryland residents have access to one of the most-affordable veterinary educations in the country, according the Veterinary Information Network. Rankings of 31 veterinary schools in the United States and the Caribbean place the Virginia-Maryland College of Veterinary Medicine in the No. 3 spot for total in-state cost. The college also ranks No. 1 for affordable living expenses.

Tech takes care of veterans

Virginia Tech is rated among the top 20 percent of higher-education institutions for supporting military-connected students and their families, according to Victory Media, a group that supports military personnel in their transition to civilian life. The 2014 Military Friendly Schools list features 1,868 colleges, universities, and trade schools that excel in academic and personal support. In May 2012, the university opened the Office of Veterans Service as a comprehensive resource for veterans and their dependents.

Police, emergency management work together

The university renames the Southgate Center the Public Safety Building and reopens it to house the Virginia Tech Police Department and the Office of Emergency Management, although the dispatch center remains in the Sterrett Facilities Complex. In time, space in the Public Safety Building will be renovated to create a security center to house the dispatch center and provide space for personnel to monitor security cameras on a continuous basis.

Band plans for storage, practice facility

The popular Marching Virginians band celebrates its 40th anniversary and to mark the occasion, the Virginia Tech Board of Visitors approves phase one of a 4,300-square-foot building for instrument storage and percussion practice, and an attached 3,500-square-foot pavilion that will provide covered space for the full band to practice. The project also includes a lighted practice field.

Tech cracks top 25

For the first time ever, Virginia Tech moves into the top 25 public universities nationally as ranked by U.S. News & World Report in its annual survey of undergraduate programs. The move to No. 25 among public schools is a bump up from No. 28 in the 2013 survey. Among overall public and private universities, Virginia Tech ranks 69th in the nation, a move up from 72nd.

OCTOBER

State court reverses April 16 verdict

The Virginia Supreme Court overturns a jury verdict against the university in a wrongful-death suit brought by the parents of two students who were killed in the 2007 campus murders. The Supreme Court concludes in its ruling that "Based on the limited information available to the commonwealth prior to the shootings in Norris Hall, it cannot be said that it was known or reasonably foreseeable that students in Norris Hall would fall victim to criminal harm." While this was the ruling that Tech and the commonwealth had sought, the university also recognizes that "The court's actions can never reverse the loss of lives nor the pain experienced by so many families and friends of victims."

University a fit place to attend

Virginia Tech lands the top spot in The Active Times list of 50 Fittest Colleges in America 2013. The rankings are based on fitness, health, and wellness factors, including athletic facilities, team sports participation, campus dining, and overall quality of student life.

Dining introduces gluten-free options

Dining Services extends traditional southern hospitality to those with food-sensitivities by opening its first-ever gluten-free line. One of the first recipes Chef Randall Van Dyke adapts for the new line in Dietrick Hall is southern-style pork chops and white gravy. Greater awareness of gluten sensitivity had led to more requests for gluten-free products and dining options.

NOVEMBER

Upper Quad transformation underway

Members of the Virginia Tech Corps of Cadets and others from the university community gather at the flagpole on the Upper Quad to bid a final farewell to Rasche Hall. Built in 1894 and later expanded in the 1950s, Rasche Hall has been home to cadets for more than a century. But the residence hall is razed as the first step in the redevelopment of the Upper Quad, which will see the replacement of Rasche and Brodie with brand new residence halls that will house more than 1,000 cadets. In addition, the plan calls for a new corps leadership and military science building, along with preservation of Lane Hall.

Police chief to retire

Virginia Tech Chief of Police Wendell Flinchum announces he will retire in 2014. Flinchum began in the department in 1983 while a Virginia Tech student and worked his way through the ranks before becoming chief in 2006. Flinchum led the department through the tragedy of April 16 and the 2011 loss of one of the university's own officers, Deriek W. Crouse. Under his leadership, the department received accreditation through the International Association of Campus Law Enforcement Administrators in 2010.

Athletic director steps down

Athletic Director Jim Weaver, who oversaw Virginia Tech's entry into the Atlantic Coast Conference, decides to retire due to health reasons. During Weaver's tenure, which started in 1997, the university also significantly expanded athletic facilities, including the Merryman Center sports medicine and conditioning complex, two Lane Stadium projects, and the Hahn Hurst Practice Facility for basketball. Improvements were made to softball, baseball, soccer, and lacrosse fields, as well.

Tech recognized for broad view of diversity

Virginia Tech is one of 56 colleges and universities honored with a 2013 Higher Education Excellence in Diversity award from INSIGHT Into Diversity magazine, the oldest and largest diversity-focused publication in higher education. The award recognizes colleges and universities in the United States that demonstrate an outstanding commitment to diversity and inclusion. Tech was selected for the award because of the university's diversity and inclusion initiatives and ability to embrace a broad definition of diversity.

Hokie heads national FFA

Brian Walsh of Woodstock, Va., a sophomore in the College of Agriculture and Life Sciences majoring in agribusiness, is elected president of the National Future Farmers of America (FFA). Walsh will take a year off from school and spend it traveling nearly 150,000 miles in more than 40 states to meet with CEOs of major agricultural businesses, interact with high-level politicians, advocate for industry, and inspire the next generation of agricultural leaders.

DECEMBER

Research moves into the top 40

With more than $454 million in research and development expenditures for fiscal year 2012, Virginia Tech remains the No. 1 academic research institution in Virginia in the National Science Foundation's annual survey of more than 900 universities. In addition, the university's research program rises one slot to No. 40 in the nation. Tech's continued research growth comes at a time when investment in higher education research and development was flat across the nation.

BOV picks 16th president

The Virginia Tech Board of Visitors appoints Timothy D. Sands as Virginia Tech's 16th president, effective June 1, 2014. Sands will succeed Charles W. Steger. Sands comes to Tech from his role as executive vice president for academic affairs and provost at Purdue University.

JANUARY

New minor explores diversity, engagement

To prepare students for success in an increasingly global society, the College of Liberal Arts and Human Sciences starts offering a minor in diversity and community engagement. The program examines diversity in local and international contexts while exploring how identities and social categories affect understanding of social, civic, and work situations. The program's foundation is Virginia Tech's Principles of Community.

Highty-Tighties march in Richmond

The Highty-Tighties represent the Corps of Cadets and the university at the Governor's Inaugural Parade for Governor-elect Terry McAuliffe. The Highty-Tighties have marched in numerous presidential and gubernatorial inaugural parades during their 117 years, including the past five for Virginia governors.

Translational program gains praise

A new graduate program garners national acclaim before it even enrolls its first student. The Ph.D. in translational biology, medicine, and health is a semi-finalist in the Association of American Medical Colleges' Award for Innovative Institutional Partnerships in Research and Research-focused Training competition. The program partners seven colleges and 17 departments across the university to develop six tracks of study: cancer; development, aging, and repair; health implementation science; immunity and infectious disease; metabolism and cardiovascular science; and neuroscience.

FEBRUARY

Building from 3-D

The university hosts a first-time, university-wide competition for students to design on-demand, remote-controlled 3-D printed aircraft and ground vehicles. Up for grabs in the Spring 2014 Additive Manufacturing Grand Challenge is $15,000 in cash prizes. The goal is to build an operational, remotely piloted ground or air vehicle made entirely or almost entirely from 3-D printed, or additive manufacturing, materials.

Tech back in Peace Corps rankings

With 39 alumni serving as Peace Corps volunteers, Virginia Tech is 22nd among large schools in the Peace Corps' 2014 rankings of the top

volunteer-producing colleges and universities across the country. Since the Peace Corps was established in 1961, about 640 Virginia Tech graduates have traveled abroad to serve as volunteers.

Vet med nets record-breaking applicant pool

The Virginia-Maryland College of Veterinary Medicine attracts a record-breaking applicant pool of more than 1,400, amounting to the third-largest pool of prospective students in North America, according to figures from the Association of American Veterinary Medical Colleges. Despite little change in the total number of students applying to veterinary schools nationwide, the college sees a 15 percent spike in the number of applications over the previous year.

General Assembly recognizes Steger

The Virginia General Assembly honors President Charles W. Steger for more than three decades of service and devotion to Virginia Tech. The resolution's patrons include delegates Joseph R. Yost, Richard L. Anderson, David L. Bulova, James E. Edmunds II, Gregory D. Habeeb, William J. Howell, Johnny S. Joannou, R. Steven Landes, Robert D. Orrock Sr., Nick Rush, Thomas Davis Rust, and Edward T. Scott.

MARCH

Students become liaisons to BOV

The Virginia Tech Board of Visitors selects new undergraduate and graduate student representatives who will serve as liaisons between the student body and the board. Austin Larrowe, of Woodlawn, Virginia, is a fourth-year University Honors student majoring in applied economic management and agricultural sciences, and Ashley Francis, of Blacksburg, Virginia, is a master's degree student in public health in the Virginia-Maryland College of Veterinary Medicine.

Tech's police dog retires

Boris, the Virginia Tech Police Department's apprehension and narcotics detection K-9 and the model for the Virginia Police Canine Memorial outside the vet med college, retires for health reasons after serving five years on campus. Boris is adopted by the family of his police department handler.

Recycling made easier in dining halls

Virginia Tech Dining Services develops a website to make recycling an easier process for students. Introduced in Turner Place at Lavery Hall, Sit & Sort educates diners on waste systems and how different items should be properly disposed. The site is meant to be a resource for customers to use while still sitting at their table.

APRIL

Spiller to take over at CLAHS

Elizabeth Spiller, associate dean of the College of Arts and Sciences at Florida State University, is named dean of the College of Liberal Arts and Human Sciences at Tech. She will begin her new position on July 1. At Florida State, she also had served as director of the History of Text Technologies Program and associate chair of the Department of English, where she has been a faculty member since 2007.

Researchers gain governance voice

Research faculty members at Virginia Tech have a new channel to take part in university governance after University Council passes a resolution allowing the Virginia Tech Commission on Research to include three new representatives — two research faculty members and a postdoctoral associate. With increasingly heightened recruitment of research faculty and postdoctoral associates, representation on the commission is important. The action accomplishes a goal recommended in 2012 by a special research faculty task force.

MAY

Former commandant passes away

Retired U.S. Air Force Lt. Gen. Howard M. Lane Sr., commandant of the Virginia Tech Corps of Cadets from 1980 to 1989, dies. Lane enlisted in the Army Air Corps as an aviation cadet in 1942 and eventually became a highly decorated fighter pilot who flew combat missions in World War II, Korea, and Vietnam. He retired from active duty in 1980.

Tech maintains environmental ranking

For the fifth consecutive year, Virginia Tech ranks among the most environmentally responsible universities in the United States and Canada, according to the Princeton Review. Tech earns a "green rating" score of 98.

Top honor goes to Quisenberry

G. Robert "Bob" Quisenberry, of Richmond, Virginia, receives Virginia Tech's highest honor, the William H. Ruffner Medal. Quisenberry earned his bachelor's in statistics from what is now the College of Science, and currently is president of Quisenberry & Warren Limited, a management-consulting firm. An enthusiastic volunteer on behalf of his alma mater, Quisenberry was an inaugural member of the College of Arts and Sciences Roundtable Advisory Board. He is a former chair of the College of Science Dean's Roundtable and remains active in that volunteer organization. In November, he was among the 12 alumni inducted into the inaugural class of the College of Science Hall of Distinction.

JUNE

Switzerland center renaming honors Steger

Virginia Tech's main international facility in Riva San Vitale, Switzerland, formerly known as the Center for European Studies and Architecture, is renamed the Steger Center for International Scholarship in honor of former university President Charles W. Steger for his vision of broadening the university's global presence and for his efforts years ago to establish the facility. Donors gave more than $2.6 million in gifts toward recent renovations and expansions in tribute to Steger. In remarks about the renaming, Steger credits founding director Olivio Ferrari and his widow Lucy Ferarri for much of the success of the center.

Education initiative gains coordinator

Stephen Biscotte is named coordinator of the general education initiative, a campus-wide effort to reinvent Virginia Tech's general education curriculum, which is currently known as the Curriculum for Liberal Education. The university's strategic plan, "A Plan for a New Horizon," calls for revision of the Curriculum for Liberal Education "to embrace alternate pathways to general education and to incorporate computational thinking and informatics/digital fluency as basic skills for all students …"

Medical school fully accredited

The Virginia Tech Carilion School of Medicine receives full accreditation from two key organizations after graduating its first class of 40, making it the nation's newest fully accredited medical school. The accreditations come from the Liaison Committee on Medicine Education, the nationally recognized accrediting authority for M.D. programs in the United States and Canada; and the Southern Association of Colleges and Schools, one of the nation's six regional accrediting bodies.

University Highlights

		2009-10	2010-11	2011-12	2012-13	2013-14
Student Admissions	**Total Applications Received (Includes Transfers)**					
	Undergraduate	23,781	22,942	23,736	23,101	21,738
	Graduate	9,397	9,190	9,465	9,544	9,622
	Offers as a Percentage of Applications					
	Undergraduate (freshmen only)	65.3	65.1	64.8	69.0	69.6
	Graduate	34.1	33.4	33.3	31.2	31.1
	New Enrollment as a Percentage of Offers					
	Undergraduate (freshmen only)	38.5	41.6	40.1	40.7	42.0
	Graduate	63.6	60.9	61.1	62.5	60.9
Total Student Enrollment (head count)	**Enrollment by Classification**					
	Undergraduate	23,558	23,690	23,700	23,859	24,034
	Graduate and first professional	7,312	7,316	7,236	7,228	7,171
	Enrollment by Campus					
	Blacksburg campus	28,432	28,687	28,650	28,836	29,071
	Northern Virginia Center	1,077	1,078	1,040	1,018	925
	Other off-campus locations	1,361	1,241	1,246	1,233	1,209
	Enrollment by Residence					
	Virginia	21,557	21,475	21,371	21,478	21,319
	Other states	7,047	7,198	7,198	6,975	7,038
	Other countries	2,266	2,333	2,367	2,634	2,848
	Degrees Conferred					
	Undergraduate	5,523	5,705	5,825	5,604	5,722
	Graduate and first professional	2,038	2,045	2,163	2,041	2,163
Faculty and Staff	Full-time instructional faculty	1,364	1,306	1,368	1,422	1,427
	Other faculty and research associates	1,913	1,826	1,954	2,083	2,263
	Part-time, temporary faculty (P14 faculty)	224	273	264	249	238
	Support staff	3,603	3,461	3,449	3,509	3,519
	Total faculty and support staff	7,104	6,866	7,035	7,263	7,448
	Percent of instructional faculty tenured	62.8	61.9	61.7	61.1	62.0

University Financial Highlights

For the years ending June 30, 2010—14 (all dollars are in millions; square feet in thousands)

		2009-10	2010-11	2011-12	2012-13	2013-14
Revenues, Expenses, and Changes in Net Position	Operating revenues	$ 715.1	$ 780.7	$ 832.4	$ 900.0	$ 937.5
	Operating expenses	967.3	1,025.5	1,076.3	1,155.5	1,229.2
	Operating loss [1]	**$ (252.2)**	**$ (244.8)**	**$ (243.9)**	**$ (255.5)**	**$ (291.7)**
	Non-operating revenues and expenses [1]	291.8	324.2	279.3	296.0	318.5
	Other revenues, expenses, gains, or losses	90.1	48.8	76.6	105.8	74.3
	Increase in net assets	**$ 129.7**	**$ 128.2**	**$ 112.0**	**$ 144.2**	**$ 101.1**
University Net Position	Net investment in capital assets	$ 734.9	$ 794.6	$ 867.3	$ 992.2	$ 1,055.0
	Restricted	$ 135.3	$ 137.0	$ 156.0	$ 158.3	$ 164.9
	Unrestricted	$ 178.5	$ 245.3	$ 265.6	$ 282.6	$ 314.3
Assets and Facilities	Total university assets	$ 1,654.0	$ 1,844.3	$2,046.0	$ 2,209.1	$ 2,282.1
	Capital assets, net of accumulated depreciation	$ 1,095.5	$ 1,196.6	$1,339.5	$ 1,517.0	$ 1,557.3
	Facilities-owned gross square feet	9,011	9,166	9,276	10,078	11,139
	Facilities-leased square feet	863	913	871	1,183	1,805
Sponsored Programs	Number of awards received	2,516	2,400	2,589	2,272	2,443
	Value of awards received	$ 312.4	$ 274.0	$ 294.1	$ 271.1	$ 303.6
	Research expenditures reported to NSF [2]	$ 398.2	$ 450.1	$ 454.4	$ 496.2	N/A
Virginia Tech Foundation	Gifts and bequests received	$ 86.9	$ 98.5	$ 67.9	$ 77.0	$ 81.1
	Expended in support of the university	$ 126.5	$ 124.4	$ 135.5	$ 146.0	$ 155.9
	Total assets and managed funds	$ 1,023.6	$ 1,155.1	$1,210.7	$ 1,302.7	$ 1,488.7
Endowments (At Market Value)	Owned by Virginia Tech Foundation (VTF)	$ 452.7	$ 541.0	$ 536.7	$ 594.1	$ 692.0
	Owned by Virginia Tech	44.4	52.7	51.6	59.6	96.8
	Managed by VTF under agency agreements	6.0	7.0	6.5	7.0	8.0
	Total endowments supporting the university	**$ 503.1**	**$ 600.7**	**$ 594.8**	**$ 660.7**	**$ 796.8**
Student Financial Aid	Number of students receiving selected types of financial aid					
	Loans	12,896	13,133	13,081	12,506	12,279
	Grants, scholarships, and waivers [3]	27,134	27,469	19,535	19,762	19,996
	Employment opportunities	8,514	9,007	9,331	9,935	10,329
	Total amounts by major category					
	Loans	$ 139.9	$ 147.0	$ 157.2	$ 154.5	$ 155.5
	Grants, scholarships, and waivers	155.7	174.2	185.4	192.0	204.1
	Employment opportunities	63.4	69.5	71.2	76.7	80.3
	Total financial aid	**$ 359.0**	**$ 390.7**	**$ 413.8**	**$ 423.2**	**$ 439.9**

(1) The university will always be expected to show an operating loss since significant recurring revenues are shown as non-operating. Major revenue sources reported as non-operating include state appropriations, gifts, and investment income. These revenue sources are used for general operations in support of the learning, discovery, and engagement missions of the university.

(2) Total research expenditures reported to the National Science Foundation for the current year were not available at publication date.

(3) Grants, scholarships, and waivers for fiscal years 2010 and 2011 include undergraduate Virginia residents who received ARRA tuition mitigation grants.

2013-14 Virginia Tech Board of Visitors

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Prepared by the
Office of University Relations
Virginia Tech, Blacksburg, VA 24061
VT/1114/14M/EL/UR2014-0250

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