



STATE OF THE COLLEGE

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Assembly Hall, Inn at Virginia Tech

Julia M. Ross, Paul and Dorothea Torgersen Dean of Engineering

Good morning!

Thank you to everyone joining us on the Blacksburg campus or remotely via the live stream from the National Capital Region, Roanoke, and beyond. I sincerely appreciate you taking the time to be here today. Welcome!

Since joining the Virginia Tech community, I have spent a great deal of time getting to know university leadership, department heads, faculty, staff, students, alumni, and industry partners.

It was crucial for the success of the college, that I first and foremost, listen. To LEARN about Virginia Tech culture and to LISTEN and understand what makes this institution and college unique.

Thank you -- for spending that time with me and putting up with all my questions. Thank you -- for the warm Hokie welcome and for having difficult and important conversations about our future. Thank you -- for being transparent, open, and honest. Thank you -- for your tireless dedication that is *critical* to the success of the college and the university.

I am humbled and honored to lead this extraordinary college forward.

During our time together this morning, I'd like to reflect back to you what I have heard and to share a *few* of the many great things we have to celebrate in the college. I will also share



with you my thoughts on a collective vision, a synthesis of the many conversations I've had - of *where* we can go together and *how* we can get there.

[A nod to history]

As a land-grant university, we have a responsibility to produce the workforce of tomorrow and the fundamental and applied research to drive the economy and help it flourish.

Our history is the strong foundation that we must build upon to create and imagine the global land-grant university of tomorrow. To purposefully address grand challenges of today at their fundamentals and to face them with confidence.

But in order to push Beyond Boundaries and become something more -- to DO more, we must be willing to take some risks and try new things. And that can be difficult, particularly given the many challenges presented by the current higher education landscape.

We are proud of how far we've come, but we need to be willing to step out of our comfort zones and be the driving force for what we want to achieve...for our students to achieve. And let's never forget, our future lies with our undergraduate and graduate students. At the end of the day, they are why we are here.

We are in the business of transforming lives...

[Research]

...and, changing the world. Our research is making a difference every day as we confront the most complicated 21st century challenges head-on.

Leading the research effort from our young faculty, is this talented group. This year the college is excited to have 11 National Science Foundation CAREER and 5 Young Investigator award winners who are transforming their fields.

Will you all stand to be recognized?

Our faculty are on the cutting-edge of research, *improving lives, imagining and creating* the future.

Just a few examples:

- Dan Stilwell, professor of electrical and computer engineering along with Craig Woolsey, Kyriakos Vamvoudakis (vām vou DA kīs) and Eric Paterson, all of the Kevin T. Crofton Department of Aerospace and Ocean Engineering, are studying the integration of unmanned underwater vehicles with manned hosts, providing a preview of future naval capabilities
- The Autonomous Systems and Intelligent Machines Laboratory led by Azim Eskandarian, the Nicholas and Rebecca Des Champs Chair in Mechanical Engineering, is developing intelligent machines, that can operate autonomously or semi-autonomously *and* interface with humans to perform useful tasks.

- Our sincerest thanks to alumnus Nick Des Champs and his wife Becky who endowed the department head position earlier this year. Your generosity is helping Azim and the department propel autonomous research forward.
- Marc Edwards, University Distinguished Professor in the Department of Civil and Environmental Engineering and his team of researchers have improved public health and well-being in cities like Flint, Michigan and Washington D.C. by uncovering lead contamination in drinking water systems, identifying at-risk communities, and working to mitigate that risk.
- Nina Stark, also of the civil and environmental engineering department is a 2018 NSF CAREER AND Office of Naval Research Young Investigator awardee. Nina is assessing the damage to coastlines after catastrophic events, like hurricanes.
- Jonathan Boreyko, assistant professor in the department of biomedical engineering and mechanics with Brook Kennedy, associate professor of industrial design in the College of Architecture and Urban Studies, designed a highly efficient “fog harp” with assistance from students in mechanical engineering and engineering mechanics. Apparatuses like this are used to make clean water and caught the attention of researchers and media around the world!
- Nino Ripepi and Michael Karmis from mining and minerals engineering are improving our understanding of the geology and gas resource potential of deep shale reservoirs by drilling a 15,000-foot well in southwest Virginia. Their work will produce research-driven and industry-proven best practices for monitoring a horizontal shale well.

Our Centers and Institutes are thinking big and providing critical research infrastructure.

Here are two examples:

- The Center for Power Electronics, also known as CPES, has been at the forefront of core power conversion technologies and research. With the retirement of Fred Lee,

Dushan Boroyevich, of the Bradley Department of Electrical and Computer Engineering, has taken the helm. By combining the center's expertise with a global consortium of companies and government research sponsors, Dushan and the CPES team are seeking solutions for the new power grid of the 21st century. I would also like to note that Dushan was inducted into the college's Academy of Engineering Excellence last Thursday night. He is the first current faculty member elected to this distinguished group of alumni.

- Beginning with a vision in the late 90's to create an institute focused on interdisciplinary research, the college and university made strategic investments in what is now the Institute for Critical Technology and Applied Science, commonly known as ICTAS.

ICTAS recently celebrated its 10th anniversary and now encompasses three buildings on the Blacksburg campus, space in the National Capital Region, and growing collaborations in Roanoke. It helps drive research at the university by supporting interdisciplinary teams, providing funding, shared workspaces, and importantly, staff support. Early this year, Stefan Duma, a world-renowned expert on impact biomechanics, accepted the role as institute director. His own work has transformed the study of head and eye injuries and driven the development of safer equipment and procedures in sports, the automotive and consumer-products industries, and the military.

Thank you, Stefan and Dushan for your leadership!

- Located outside Petersburg, Virginia, the Commonwealth Center for Advanced Manufacturing (CCAM), is a partnership between industry, government, and Virginia academic research institutions focused on advanced manufacturing research and innovation.

With leadership from Jaime Camelio, professor in the Grado Department of Industrial and Systems Engineering who serves as Chief Technology Officer, CCAM provides a nexus for translational research with 29 corporate partners and four other state universities. Together, we accelerate the adoption of new manufacturing technologies with research that spans across multiple engineering disciplines. With this center, we can leverage experiential learning and practical opportunities that demonstrate impact and our value to society. Thank you Jaime for your leadership!

- Leveraging CCAM, a partnership with Rolls-Royce led to new technology developed by Romesh Batra, professor of engineering science and mechanics and Gary Pickrell, professor of materials science and engineering. The work continues to be advanced by Rolls-Royce employees Taylor Blair and Sunny Chang, former materials science engineering graduate students. Rolls-Royce estimates that the advances provide cost savings of \$1M annually from reduced manufacturing time. This is an important example of how the college creates impact and value for partner corporations.

So how will we move research forward? What areas should we consider? As many of you know, the university has designated a number of destination areas and strategic growth areas. The college participates in all of them and we will continue to do so. But there is more we should consider and I will outline a few examples here.

- The Virginia Tech - CCAM - Rolls-Royce partnership presents an opportunity and an example for how we might further grow the impact of our research and education. The needs of the advanced manufacturing industry are now driven by the fourth industrial revolution known as Industry 4.0 - the development of the “smart” factory involving the integration of automation and data exchange in manufacturing technologies. Work in cyber-physical systems, the internet of things, cloud

computing and cognitive computing are all key. We have the opportunity to leverage our investments in advanced manufacturing in coordination with our strengths in the HUME Center, The Discovery Analytics Center, robotics, and autonomy to address these challenges while also advancing the fundamental underpinnings. This should be done in the context of also aligning education and research with our industrial partners through integrated professional graduate offerings that yield further investment in research.

If we choose this path, we will leverage professional education net revenue to make strategic investments in research. This approach will directly benefit the state economy, provide new educational opportunities for working engineers and generate new resources for direct investment into our fundamental research enterprise.

- Another area with great potential for our college is in health and medicine, building on the growing emphasis in the life sciences at Virginia Tech. We are actively collaborating with partners at the Virginia Tech Carillion Research Institute, the Virginia Tech Carillion School of Medicine, and the Virginia-Maryland College of Veterinary Medicine. And we want to do more. VERY few institutions have strong engineering, medicine AND veterinary medicine - this trifecta of program and research strength provides incredible opportunity for both basic and translational research in biomedical science. Consider the success of biomedical engineering and mechanics faculty John Robertson, Rafael Davalos, and Scott Verbridge in collaboration with John Rossmeisl, a neurosurgeon and professor of neurology at the Virginia-Maryland College of Veterinary Medicine who are part of a team awarded a \$9.2M grant from the National Institutes of Health's National Cancer Institute to investigate approaches to treating glioblastoma, the most common and deadliest form of brain cancer in adults. Aligning with university priorities, a greater focus on health-related research will allow us to build new programs, provide new

opportunities for our faculty, establish new collaborations and significantly increase our funding from the National Institutes of Health to further diversify our funding portfolio.

- With the Hume Center for National Security and Technology, led by Charles Clancy, professor of electrical and computer engineering, the Discovery Analytics Center, led by Naren Ramakrishnan, professor of computer science, and several engineering departments located in the National Capital Region, we are looking to take advantage of the proximity to industry and government and expand our presence in the greater Washington area while leveraging our strengths in Blacksburg.
- And finally, as we continue to imagine Virginia Tech's future as a global institution, we look to our global partnership with the University of Nottingham as an example of what works. For over 10 years, we have partnered with Nottingham and now have more than 30 faculty, including joint faculty, and over 45 students from Virginia Tech and the University of Nottingham working together in eight research areas, ranging from human factors and virtual reality to manufacturing, power electronics, and gas turbine propulsion. As we continue to grow and strengthen this important global partnership, we will also look to the future for other strategic opportunities abroad. Glenda Scales, our associate dean of global engagement and chief technology officer and Jack Lesko, our associate dean of research and graduate studies -- thank you for your efforts supporting our global priorities.

[Graduate education]

In addition to leadership by dedicated faculty, our talented graduate students are central to these amazing research efforts. They are the ones in the lab every day making discoveries, repeating experiments, and crunching data.

Next week I will celebrate the current class of graduate students at my first spring commencement at Virginia Tech. With the graduate school, we will graduate approximately 119 doctoral and 340 master's engineering students!

- Let me tell you about one of those students -- the college's outstanding graduate student of the year - Alexandra Hyler.

Alexandra, a doctoral student in biomedical engineering and mechanics, earned a degree in chemical engineering before beginning her graduate education journey at Virginia Tech. Her work focuses on women's health, specifically on ovarian cancer, and was recently published in PLOS ONE. After graduation, Alexandra will continue her research at Cyto Recovery, a company currently headquartered in the Virginia Tech Corporate Research Center. Congratulations to Alexandra! Please, stand and be recognized.

We have so much to celebrate. But looking forward, we need to make sure we can fully support students like Alexandra with multi-year offers for PhD students at time of admission.

This will be critically important to our ability to remain competitive in attracting the best and the brightest graduate students to our programs.

Our program offerings must be distinctive and differentiate us from our competitors.

We must broadly prepare our graduate students for positions in academia AND industry. Our graduates pursue a diverse array of career paths and we must be flexible enough to support the breadth of their dreams.

In order to meet the needs of industry, we also need to consider our portfolio of graduate programs for working professionals. Whether in the National Capital Region, Blacksburg or elsewhere, how can better meet the growing demand for graduate education?

How will we do all this?

We will need to work together in intentional teams that focus our resources in strategic areas, aligning our hiring plans with our priorities. Stronger and comprehensive corporate engagement that includes integrated research, talent pipeline development, and philanthropy will be key to our success.

- Working closely with LINK, the university's newly structured business engagement center led by Brandy Salmon, we are expanding existing corporate relationships to include growing industry sponsored research, recruiting, and technology commercialization. We are excited that engineering alum, Justin Watts, has joined LINK as associate director of business development. Justin will support the College of Engineering in these efforts.

As a college, we will also need to strategically invest in research infrastructure, including collaborating across campus to develop core facilities. I look forward to working with my fellow deans and the institute directors to bring this vision to fruition.

Space, of course, is also a significant challenge for us. To be competitive with top programs and to perform state of the art research, we need state of the art facilities across ALL our engineering disciplines.

- So, I am thrilled that we are moving forward with the renovation of Holden Hall, which houses mining and minerals engineering and materials science engineering. The building is old, built in 1940. With state and philanthropic support, the college will commence with renovations in summer of 2019 to transform Holden Hall into a state of the art facility for the future. And then next on the list of space renovation and expansion will be the long-awaited Randolph Hall.

Over the coming year, my office together with the central administration, will continue to push this important priority forward to secure state funding.

To do all these things, we will need the support of the university, department heads, the development team, and critically, the talent of Ed Nelson, associate dean of administration and chief of staff. Ed, thank you for your hard work and commitment to Virginia Tech.

[Undergraduate education]

Next week we will also be graduating approximately 1,400 new engineers and computer scientists from our undergraduate class!

- One of those students is our outstanding undergraduate student of the year - Michael Sherburne. Michael is graduating with honors in electrical engineering and is a member of the Corps of Cadets, serving as squadron commander in Air Force ROTC, and platoon leader. As an undergraduate researcher, Michael works on dense plasma focus devices for the nuclear engineering program based in mechanical engineering. Among numerous accolades, Michael is a William C. McAllister Leadership Scholar and 21st Century Studies Fellow. After graduating, he will serve as a developmental engineering officer in the Air Force Institute of Technology where he will begin his graduate studies. Michael, please stand and be recognized.

Thank you Bill McAllister for your support for students like Michael. We are excited that this fall we are celebrating the 20th anniversary of the William C. McAllister Leadership Scholarship!

Michael is a great example of what we need from 21st century engineers.

We need students that commit to serving their community and world, grounded in Ut Prosim, making an impact on society. As with Michael's example, our students need to learn in a way that is immersive, practical, and hands-on, working to solve complex problems that can't be found in a textbook. We must embrace a supportive culture that connects classroom and research in the lab to experiences in the real world. And we need to remember that the learning that happens outside the classroom; experiential learning, can be as powerful as what we teach.

Here are a few brief examples of what are doing:

- We are providing global experiences with industry and universities abroad in the Rising Sophomore Abroad Program organized by engineering education. By giving students a taste of an international experience in countries like Australia, China, India, and New Zealand, we can increase students' comfort level with global travel and help them develop a more global perspective.
- If you've ever visited the Ware Lab, you know the work our students are doing there is incredible. Just recently David Wilson, president of Toyota Racing Development and mechanical engineering alumnus, came back to visit with the Baja team, which his company sponsors. Because of that sponsorship, the Baja team can compete with other US and international teams using skills they learned in a book and translating

them to the lab. Thank you to Toyota Racing and all of the countless industry partners that make these opportunities possible.

- Our ChemE Car team recently competed in the Mid-Atlantic Regionals at Princeton University, qualifying for the National competition at the AIChE Annual Meeting in Pittsburgh this fall. The team is made up of mostly chemical engineering students and one materials science student. Congratulations! We will be watching and crossing our fingers.
- In March, an interdisciplinary student team from computer science, computer engineering, and business information technology from the Pamplin College of Business, celebrated a victory at the fourth annual Deloitte Foundation Cyber Threat Competition for their analysis and incident response approach to a simulated cyberattack.
- Christine Ash, a junior biological systems engineering student, is co-oping with Sam Adams. She began her work in research and development and was eventually promoted to brewing supervisor. In her own words, Christine says she is walking away with confidence, adaptability, time management, prioritization -- skills that are applicable for the rest of her life. Our students should all have this experience.

These extracurricular activities, study and research abroad, service learning, entrepreneurship experience, undergraduate research, internships and co-op, participation in design teams, are known to be “high impact practices” - they have a profound impact on students and their development as engineers - and we are doing them all.

We know how to do this.

We’ve been doing it well for a very long time.

There is no need for radical change.

But we must scale our activities, so that ALL of our students have the opportunity to participate in *at least one* high impact experience. The National Academy of Engineering endorses the Grand Challenges Scholars Program to promote this type of learning. Establishing a program at Virginia Tech, something I advocate, is one way to raise awareness among our students and move us forward in scaling what we already do. However, to do this important work, we will need the support of industry and our generous donors.

We will also need to take what we learn and use it to transform our curricula. This will ensure that all our students benefit. It will be important for our departments to learn from one another and to translate and apply the research learning in engineering education to transform our programs and our pedagogy. This is how we will ensure we have some of the most innovative and effective programming in the country.

Here are some examples of how we are already moving in this direction:

- In an effort to broaden the range of careers students can pursue and the pool of students who choose the discipline, the Bradley Department of Electrical and Computer Engineering is changing both its curricula and undergraduate culture. With help from an NSF Revolutionizing Engineering Departments grant, ECE has reformulated every level of its undergraduate experience, creating a dozen new majors and offering a seven-course base common to all electrical and computer engineers. They will be emphasizing the breadth and strength of the department's sub-disciplines. With 90 faculty in the department, they are among only a handful of programs across the country that can offer majors in so many sub-disciplines. And, they are working to articulate the undergrad degree program into the graduate program in order to build a sustainable pipeline of students.

- This academic year, the Kevin T. Crofton Department of Aerospace and Ocean Engineering completed a 3-year redesign and reinvigorated their curricula to answer the needs of industry and government. And because students said they needed more flexibility in the design of their education. This flexibility is a key recommendation for improvement that I hear from our students and alumni. As a result, the department now has 9 concentrations; 5 in core technical areas and 4 in application areas.

And as you have probably seen in the news recently, computer science, and cybersecurity challenges are everywhere! We are fortunate at Virginia Tech to have computer science in the college of engineering as it has become central to so much of what we do. Moving forward, it will be important to grow our computer science department to enable it to integrate across the college and the campus. From artificial intelligence to data analytics to block chain technology, our enterprise needs to reflect the importance of computer science on the world of emerging technologies.

How are we going to expand these initiatives to scale in the college? It will take additional resources at the university level and investment in the College of Engineering. To accomplish our goals, we will need more state of the art space to expand student design and maker spaces. We will need more financial support for our students and the faculty and staff who teach and support them.

The university's current plan to grow to 30,000 undergraduates is an opportunity for us. This overall growth offers important rewards, including increased resources to the university and administrative efficiencies of scale. We will look to very modest growth in the College of Engineering, around select programs such as in construction engineering management and a new undergraduate major in biomedical engineering , which we hope will be approved at the state level very soon.

How will the College support these efforts?

- The work of our advancement team, led by Jeremy Weaver, will be critical. Jeremy joined us in January and we are thrilled to have him here to complement the strong existing communications, alumni affairs and development team. After a record fundraising year last year, we are looking to continue building on our momentum.
- We must grow philanthropic support for the college. In doing so, we will work to develop a more distributed advancement effort that includes collaboration and integration with our departments. One of the ways the university is trying to do this is through increasing donor participation. While Hokie alumni have great affinity for the university there is not a direct correlation reflected in philanthropy.
- This spring the university held its first ever Giving Day with the ultimate goal to increase participation. It was a huge success. The college efforts resulted in over \$200,000 from 761 donors, of which 135 are first time donors. These efforts will help achieve the President's goal of 22 by 22 - that's 22% alumni participation by 2022. Many donations went directly to departments.
- For example, the Myers-Lawson School of Construction received a \$10,000 gift from an engineering donor. The funds will support the Kevin P. Granata safety research program and will be used to save the lives of construction workers through innovative applied research.

Congratulations to the Myers-Lawson School and thank you to Erin Edwards, Angela Mills, and Lindsey Haugh and all the advancement crew for demonstrating the true impact of the Advancement model.

[Inclusive excellence]

My vision for the College of Engineering is one of inclusive excellence. Where students, faculty and staff from all backgrounds are welcomed and supported to meet their highest potential. It's very competitive to get into Virginia Tech engineering these days - ALL our students are quite capable of becoming engineers if they do the work. So, let us challenge the weed-out mentality and culture of exclusion that is historically a part of engineering - and rather, let us be known for very high standards and expectations, as a place of excellence, and also place that is welcoming and that supports the success of ALL students.

How might we do that?

- The New Horizon Graduate Scholars program is one way. Started as a pilot program in 2012, New Horizons addresses recruitment, funding, transition and support for graduate students from diverse backgrounds. Through these efforts, we have significantly increased the diversity of our doctoral programs. We look forward to welcoming 36 scholars next fall, our sixth cohort and the largest yet, surpassing the previous class of 24. With a total of 160 scholars in the program since inception, we need to expand these efforts so that even more students can participate. Thank you to Jack Lesko, Associate Dean for Research and Graduate Studies and Catherine Amelink, now with the Provost's Office, for your leadership and commitment to inclusive excellence.
- We must work with our faculty, staff and students to think deeply about what it means to live by our Principles of Community, to provide a culture and climate that is inclusive. The Inclusive VT initiative at the university is providing spaces and opportunities for these conversations. In the college, it will be important for us to

promote and encourage broad participation. We will also consider how we onboard new members of our community. Next year, we will be implementing new opportunities for professional development for faculty and graduate students around the mentoring relationship. Our goal is to develop a suite of programming over the next several years.

- Our Center for the Enhancement of Engineering Diversity (CEED) is celebrating its 25th anniversary, and thanks to the longstanding leadership and vision of Bev Watford, the center's director and our associate dean of academic affairs, CEED continues to create an environment of inclusivity, encouragement, and support for undergraduate engineering students. The living learning communities, Hypatia and Galileo, which bring together first-year and upper-class engineering students in a residential environment, building a community of peer support are one notable success. CEED also fuels the pipeline of students into engineering with innovative pre-college programs, bringing women and underrepresented minority students from all over Virginia to Virginia Tech. We know these initiatives work, but we cannot expand and scale them without state and philanthropic support.

Today, I am absolutely thrilled to announce a very specific way that we are expanding our efforts with new philanthropic support from the May Family Foundation, established by Joe May, an electrical engineer from the Class of 1962.

- With a \$5M gift, the May family's generous donation will establish a multi-year program to increase the number of first generation students from Virginia who enroll at, and graduate from, Virginia Tech. I think we can all agree with Joe, Bobby, Beth, and Elaine, that the ability to positively influence a student's educational path to an engineering degree begins way before the freshman year at Virginia Tech. So, with this gift, we will connect with students and their families beginning after the ninth-

grade year, working with them throughout their high school careers, and then supporting their transition into Virginia Tech through the completion of their first year.

- This multi-year engagement with first-generation students will transform the way we think about recruiting and supporting our students.

Joe and his family could not be here with us to celebrate but are watching the live stream. Can everyone give the Mays a big round of applause to show our appreciation? [lead applause]

My sincerest thanks to the May family for this amazing support.

This is so exciting to me because I sincerely believe we need every bright, smart young person out there with an interest in engineering working to solve our greatest challenges. And the best way to do that – to be really creative – is to have people coming together from all different backgrounds, with all different life experiences, bringing all different perspectives to the problem.

Colleagues, this is our time to do the hard work. We need the Virginia Tech College of Engineering to look more like the demographics of Virginia. If we are to really serve and fulfill our promise as a land grant university, we must diversify our faculty, staff, and student body.

[Conclusion]

As you can see from my comments today, there is much to celebrate, but there is also much to do.

We need to be BOLD.

Take some RISKS.

Let's not be afraid of failure, but rather, try new things, take measure of our success and then try again.

We are engineers after all!

To be successful, we will need more families like the Mays, dedicated and passionate about the hard work we are doing.

For the college to be a TOP philanthropic priority.

And we will need strong and thoughtful leadership.

We are fortunate in the college to have an incredibly talented and dedicated group of department heads. They are the ones on the front lines every day, working with and supporting our faculty and staff to move our most important initiatives forward.

Department Heads, please stand and be recognized for your leadership.



The conversation today is just a beginning meant to inform our planning as we discuss and debate the opportunities, priorities, and challenges.

We all have a role to play in our future success. And I am confident, that together we are stronger. Together we can propel this collective vision for the college forward. For our students. For their future and ours. For Virginia and the nation.

Together we will be the very BEST Virginia Tech we can be! Let's get to work!

I want to thank you for being here today. What better way to get started than with community and sustenance.

Now, please join me in the Holtzman Alumni Center for refreshments and to continue our conversation.

Thank you.

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