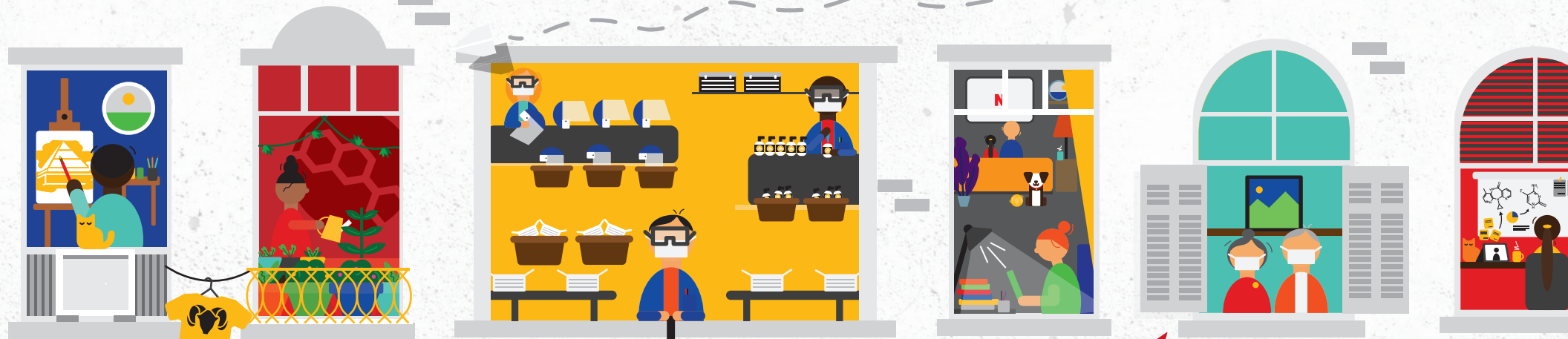
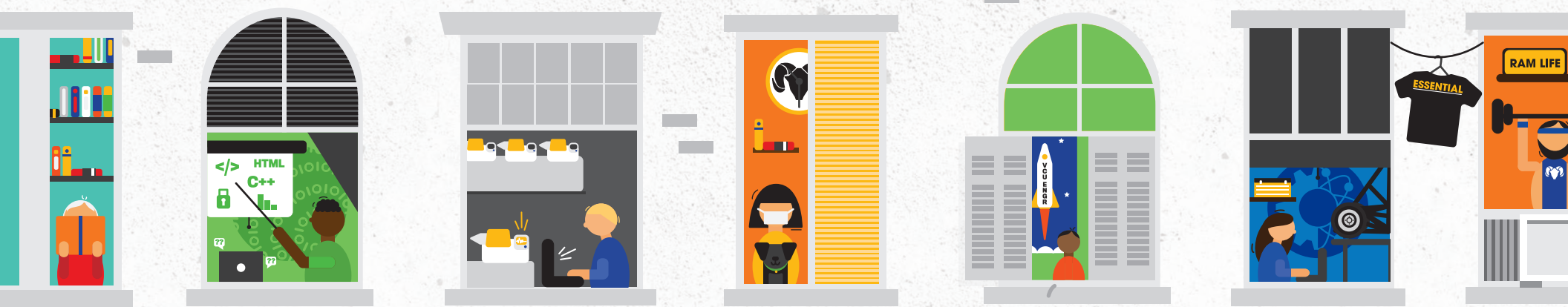


2019 - 2020 Annual Review

VCU Engineering

Engineers Make It Real.



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From the Dean



It is impossible to reflect upon 2020 without considering the impact of the novel coronavirus that changed our world. Even now, we're not entirely sure how COVID-19 will impact us long-term. What we do know is that engineers solve problems and this one is no different.

Like many, our engineers immediately responded to the shortage of medical and personal protective equipment by forming collaborations to design a do-it-yourself ventilator from 3D-printed parts, to disinfect facemasks for reuse, to create small-batch sanitizer and to create a predictive data model to track the coronavirus spread, allowing health systems to anticipate needed resources.

Our Medicines for All Institute formed new public-private partnerships this year to bring advanced manufacturing of critically needed pharmaceuticals back to the United States, producing drugs currently in short supply that Americans need most, right here at home.

At the same time, our faculty transitioned to remote teaching while our students adapted to an all-remote learning environment. Although COVID-19 changed the way we did things, it didn't slow us down.

We are on track to open our 133,000-square-foot Engineering Research Building in late 2020. Our faculty continue making research advances that better humanity, such as a cane that steers itself to guide those with visual impairment and technologies for early detection of Parkinson's disease. Our students continue earning national and international recognition, including selection to the prestigious Lindau Nobel Laureate meeting, and our biomedical engineering graduate program is among the top-ranked.

It's been a year of progress for VCU Engineering as we've advanced in research, in industry partnerships and in unexpected ways. I hope it's been a similar year for you.

Go Rams!



Barbara D. Boyan, Ph.D.

NAE, NAI, FAAS, FEASA, FAIMBE, FASBMR, FBSE, FITI, MAAOS
Alice T. and William H. Goodwin, Jr. Dean
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RESEARCH

HIGHLIGHTS

COMPUTER SCIENCE

Cyber researcher named CCI Fellow

The Commonwealth Cyber Initiative (CCI) named **Milos Manic, Ph.D.**, a CCI Fellow. Manic, a noted specialist in cybersecurity and artificial intelligence (AI), is widely published in cybersecurity/resilience, trust in AI, deep learning and energy/critical infrastructures. As a CCI Fellow, he will work to advance cyber research excellence in Virginia. The nine CCI Fellows represent the top echelons of cyber and artificial intelligence (AI) research in universities across the state.

Assessing risk of premature birth

Tomasz Arodz, Ph.D., is part of an interdisciplinary team that produced two major studies published May 29, 2019, in *Nature Medicine*. These studies provide a comprehensive profile of the vaginal microbiome during pregnancy, including correlations between microbiome composition and premature birth — groundbreaking research that may help assess the risk of preterm delivery, particularly among African American women. *Nature Medicine* is the highest-cited journal in preclinical medicine.

Digital forensics for national security

Irfan Ahmed, Ph.D., received a 2019 Ralph E. Powe Junior Faculty Enhancement Award presented by the Oak Ridge Associated Universities. This award will support Ahmed's research to develop digital forensic techniques for industrial control systems used to monitor and control pipelines, water systems, the power grid and other critical infrastructure essential to national security. Ahmed will work with the Oak Ridge National Laboratory on this project.

BIOMEDICAL ENGINEERING

Examining macrophage response to biomaterials

René Olivares-Navarrete, D.D.S., Ph.D., has received a \$1.76 million grant from the National Institute of Dental and Craniofacial Research at the National Institutes of Health to investigate how immune system cells control the body's response to biomaterials. He is investigating the process by which macrophages and a type of protein they produce may orchestrate cells to respond to different kinds of implant surfaces, become pro-inflammatory or anti-inflammatory and recruit stem and immune cells.

Cell mechanics of tissue organization

Daniel E. Conway, Ph.D., is studying the cellular- and tissue-level forces that maintain homeostasis in 3D epithelial structures. In one major study, he identified the importance of nuclear-cytoskeletal connections in regulating cellular contractility and maintaining tissue homeostasis. In a subsequent paper, he showed that osmotic gradients generate large mechanical forces in closed 3D tissue structures, and that these forces regulate fundamental cellular processes.

Groundbreaking eye-tracking technology

Technology invented at VCU by a team led by **Paul A. Wetzel, Ph.D.**, can assist a physician in diagnosing Parkinson's disease and other conditions. In a quick, non-invasive diagnostic test, an eye tracker analyzes the eye's natural movements. Wetzel and his collaborators won the university's 2019 Billy R. Martin Award for Innovation for the invention.

ELECTRICAL AND COMPUTER ENGINEERING

Simulations show electromagnetics at work

To make challenging electromagnetics concepts easier for students to understand, **Nathaniel Kinsey, Ph.D.**, has designed interactive, computer-based simulations that display electromagnetic problems as colorful, 3D images. The simulations, built using COMSOL Multiphysics software, let students rotate and scale electromagnetic fields. Students can change parameters to visualize and virtually interact with fields on screen. Kinsey and his novel teaching tool were featured in *IEEE Spectrum*.

Improving multi-source data fusion

Ruixin Niu, Ph.D., is optimizing sensor management in distributed networks, which drive many systems including telecommunications, traffic monitoring and robotic vision. Sensors in these networks have different modalities, so it's difficult to link data using physical models. Niu's lab is applying sophisticated signal processing/machine learning techniques to fuse information from sensors with different modalities. His method combines traditional tracking algorithms with deep learning neural networks for object detection and estimation.

Securing critical energy infrastructures

Sherif Abdelwahed, Ph.D., is helping safeguard industrial control systems in critical energy infrastructures, which are prime targets for cyber attacks. He is building a quantitative and automated methodology to assess and manage security risks of both the overall industrial control system and its supervisory control and data acquisition subsystems. Abdelwahed's method will integrate proactive and reactive security mechanisms to automate risk assessment and management.

CHEMICAL AND LIFE SCIENCE ENGINEERING

NSF awards grant for 'Alexa of chemistry'

Researchers in the Department of Chemical and Life Science Engineering are spearheading a multi-university project seeking to use artificial intelligence to help scientists come up with the perfect molecule for everything from a better shampoo to coatings on advanced microchips. Led by professors **James K. Ferri, Ph.D.**, and **D. Tyler McQuade, Ph.D.**, the team received nearly \$995,000 in National Science Foundation funding for the first phase. For the second phase, the group was able to vie for funding of up to \$5 million for two more years.

Saving the cities under the sea

Coral reefs are dying all over the world. **Nastassja Lewinski, Ph.D.**, is part of a multi-university team researching ways to help coral survive. Lewinski is receiving about \$333,000 over two years as part of a larger National Science Foundation grant to develop a line of similar coral cells and to investigate changes at the cellular level in coral biomineralization, symbiosis and wound healing. Her team is working toward developing materials that will arrange coral cells and polyps into integrated networks.

Gupta elected AIChE Fellow

Ram B. Gupta, Ph.D., has been elected a Fellow of the American Institute of Chemical Engineers (AIChE). Gupta, whose research focus areas include batteries, sustainable energy and materials, is the first faculty member at Virginia Commonwealth University to reach AIChE's highest grade of membership. The honor reflects a member's distinctive professional achievements and accomplishments.

MECHANICAL AND NUCLEAR ENGINEERING

A filter that kills airborne pathogens

Wei-Ning Wang, Ph.D., is developing a cost-efficient antimicrobial heating, ventilation and air conditioning filter that kills airborne pathogens. The filter is made by inducing growth of iron oxide nanowires on iron mesh. When these nanowires receive a low direct voltage, they produce oxidants capable of killing most pathogens. The electrical fields at the tips of these nanowires produce joule heating and electroporation effects to further deactivate pathogens. This innovation received a 2019 Commonwealth Research Commercialization Fund Award.

Analysis for accident tolerant fuels

To advance nuclear power safety, **Jessika Rojas, Ph.D.**, is working with the U.S. Department of Energy on testing protocols for accident tolerant fuels (ATF). These fuels can tolerate severe loss of active cooling in the reactor core for a considerably longer period of time than other fuel systems. Rojas is using advanced materials examination techniques to characterize ATF cladding surfaces. The results will enhance models for ATF surface chemistry and thermal performance.

In-vitro correlations for personalized aerosol therapy

Laleh Golshahi, Ph.D., received the 2019 International Society for Aerosols in Medicine Young Investigator Award. Her work on in-vitro pediatric aerosol therapy research has resulted in important contributions to pulmonary drug delivery. She has authored more than 30 peer-reviewed publications, including the first description of a child mouth-throat model for standardized testing of aerosol medicine delivery devices.



SECURING THE DRUG SUPPLY CHAIN

Medicines for All Institute partners with industry for \$354 million contract

To prevent domestic shortages of critical medications, the Medicines for All Institute (M4ALL), based at VCU Engineering, has joined forces with pharmaceutical industry leaders to bring manufacturing of vulnerable pharmaceuticals and their ingredients back to the United States.

Phlow Corp., a Richmond-based public benefit corporation focused on the research, development and manufacturing of essential pharmaceuticals, leads the partnership and will incorporate M4ALL's advanced manufacturing technologies to produce active pharmaceutical ingredients for critical and short-supply medications. Civica Rx, a leading nonprofit pharmaceutical company and national supplier of affordable, generic medications, and AMPAC Fine Chemicals, with its Virginia-based pharmaceutical ingredient manufacturing operation, complete this new end-to-end pharmaceutical supply chain consortium to help reduce U.S. dependence on overseas drug manufacturers.

The U.S. Department of Health and Human Services announced a four-year contract with Phlow Corp. for \$354 million to accelerate this initiative. The total contract value awarded to Phlow is up to \$812 million, which includes a four-year base award of \$354 million with an additional \$458 million included as potential options for long-term sustainability. Phlow Corp. was co-founded by M4ALL CEO **B. Frank**

Gupton, Ph.D., and Eric Edwards, M.D., Ph.D., both VCU alumni.

"The timeliness of this partnership cannot be overstated," said VCU Engineering Dean **Barbara D. Boyan, Ph.D.** "The ability to provide critical generic pharmaceuticals – for the treatment of COVID-19 now and in the post-pandemic world – that are manufactured in the United States is invaluable for ensuring the health care of Americans. We look forward to sharing the resources of the Medicines for All Institute with Phlow, Civica and AMPAC to meet these challenges."

"The creation of the Medicines for All Institute and its evolution into this larger network of activity is a perfect example of the benefits possible by creating strong public-private partnerships," Boyan said.

M4ALL was founded within VCU Engineering in 2017 to expand access to safe, effective and affordable medications. To do this, the institute's engineers use advanced manufacturing technologies that significantly curb waste, cut costs and reduce pollution.

M4ALL is a pioneer in the development of continuous flow processing, a method of producing active pharmaceutical ingredients uninterrupted. This eliminates the inefficient stops and starts of manufacturing these ingredients batch by batch, as they are commonly produced. Active pharmaceutical ingredients manufactured through continuous flow processing generate less waste and their quality tends to be higher and more consistent.

"Not only are we bringing significant benefit to society, but we are also driving sustainable economic development by providing a highly skilled workforce for the future."

— Barbara D. Boyan, Ph.D.

NAE, NAI, FAAS, FEASA, FAIMBE, FASBMR, FBSE, FITI, MAAOS
Alice T. and William H. Goodwin, Jr. Dean
VCU College of Engineering

Gupton said since its inception the institute has actively trained engineers and scientists in low-income countries, especially in Africa, and implemented its processes there.

Gupton sees including domestic drug manufacturers in the institute's network as an important next step.

"The Medicines for All Institute is a global initiative that focuses on increasing access to health care for those who need it most. This new U.S.-driven effort will allow us to focus on creating a more robust and sustainable supply chain of essential medications in our country," Gupton said.

"The COVID-19 event has made us acutely aware of our current vulnerability in this area. My colleagues and I are grateful for the opportunity to play a part in addressing this effort to fix the acute and chronic health care challenges that are facing us today by bringing pharmaceutical manufacturing back to the U.S."

— B. Frank Gupton, Ph.D.

Chief Executive Officer, Medicines for All Institute
Floyd D. Gottwald Junior Chair in Pharmaceutical Engineering
Chair, Department of Chemical and Life Science Engineering
VCU College of Engineering

An easier-to-build ventilator

An interdisciplinary team designed a ventilator that hospitals, health systems or makerspaces can produce using a few tools and a 3D printer. **Charles Carlin, Ph.D.**, director of makerspaces for VCU Engineering, and lab technician **Adam Hamel** worked with VCU Health experts to produce a ventilator that can be assembled from readily available, off-the-shelf parts, plus components that can be 3D-printed using open-source programs and plans.



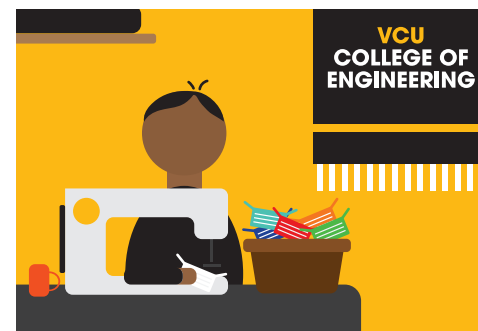
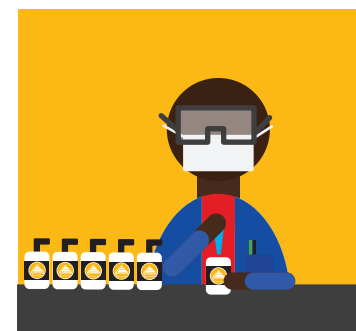
Decontaminating masks with light

To shore up the supply of critically needed N95 masks, VCU Engineering researchers helped develop a method that uses high-intensity ultraviolet light to decontaminate masks. While other approved methods of mask decontamination — such as using alcohol or steam — can work, they can also compromise the integrity of the masks after one or two uses. VCU's process makes the masks reusable multiple times. Additionally, the process can be easily implemented by other institutions.



Sanitizing hands, streamlining drug manufacturing

When the pandemic emptied store shelves of in-demand products, **Thomas D. Roper, Ph.D.**, figured his lab could help with one of them: hand sanitizer. Now, VCU's own Ram-Sanitizer — complete with an icon of the university's ram mascot — is a reality. Roper is also leading a project to create an alternative drug manufacturing process with a miniaturized environmental and industrial footprint. The project was recently deemed mission-critical by the U.S. Department of Defense.



Harnessing supercomputers in the race against COVID-19

Michael H. Peters, Ph.D., is using powerful supercomputers at NASA's Ames Research Center in California's Silicon Valley to investigate the "spike" protein of the novel coronavirus that causes COVID-19. Through advanced computer simulations, Peters is seeking to understand the mechanistic action of the spike protein, which plays an important role in attaching to human cells and infecting the body. He has identified a possible factor that may be able to restrict an important action of this key protein.



COVID-19 CHALLENGE

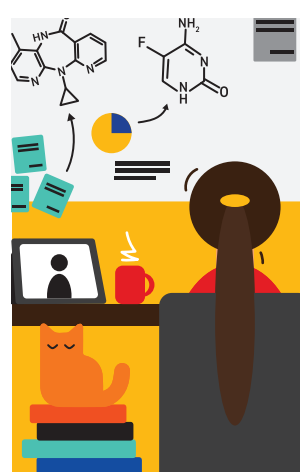
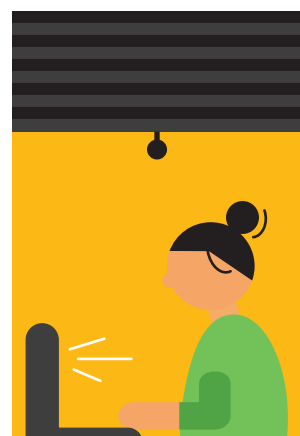
ACCEPTED

History will remember 2020 as the year of the coronavirus — and a moment when researchers came together to meet an unprecedented challenge. Here are a few of the ways Ram Engineers joined forces across disciplines and institutions to make a difference for humankind.



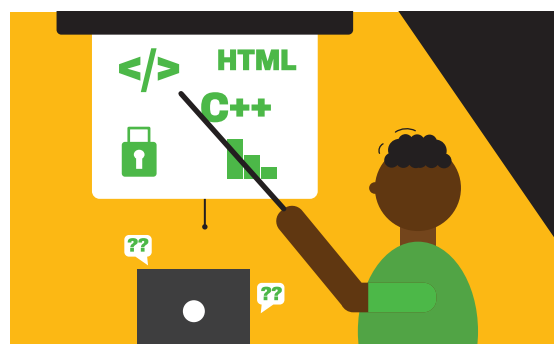
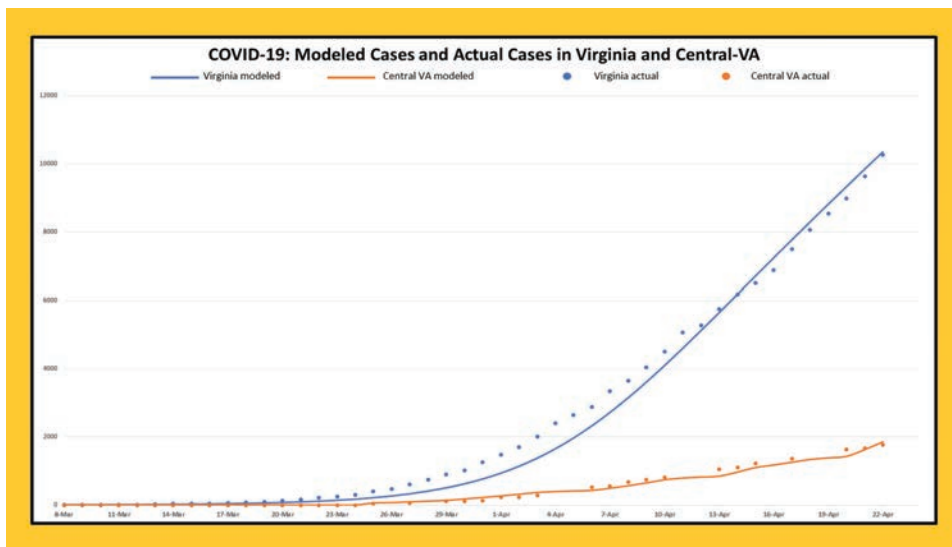
Improving domestic chemical manufacturing

James K. Ferri, Ph.D., received a grant from the National Science Foundation to develop a new methodology to facilitate production of active pharmaceutical ingredients in the U.S., instead of overseas. Beginning with remdesivir, a potential therapeutic to treat COVID-19, Ferri is collaborating with Procter & Gamble Company and the U.S. Department of Energy's Rapid Advancement in Process Intensification Deployment Institute to identify the raw materials available in the U.S., processing requirements and domestic manufacturing facilities.



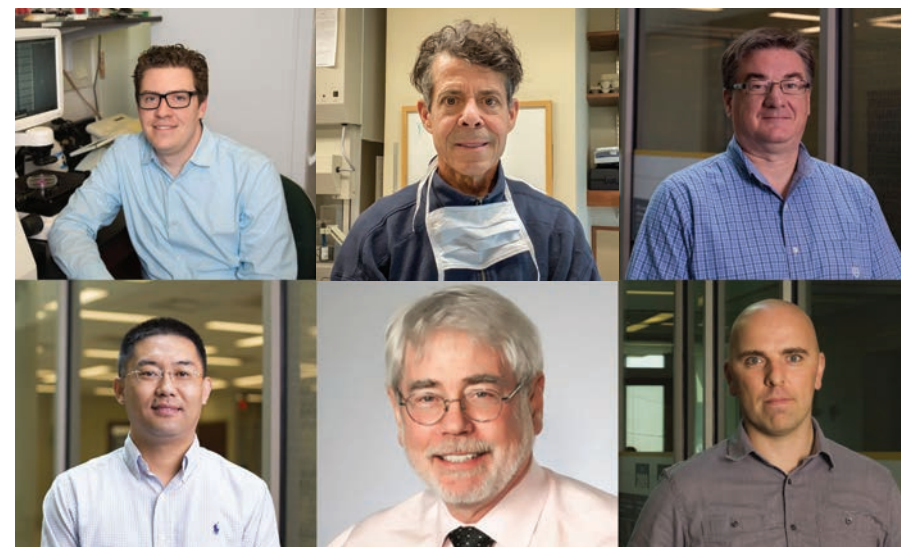
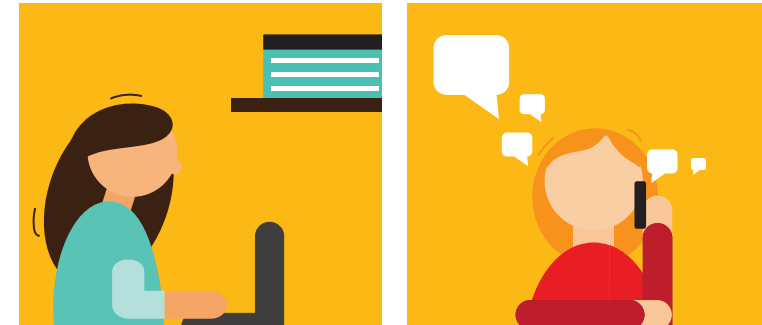
Fighting disease with data

Winning the war against COVID-19 requires data — and plenty of it. To fortify Central Virginia's arsenal, **Preetam Ghosh, Ph.D.**, and health care experts at VCU designed a data model to better understand and track the spread of the disease across Central Virginia. It comprises region-specific hospitalization data as well as epidemiological models that chart characteristics of the disease such as the incubation period, transmissibility and its ability to present without symptoms.



Sprinting for solutions

VCU Engineering students and alumni answered the call for novel ideas to fight the new coronavirus for the VCU da Vinci Center's Healthcare Sprint competition. Innovators had two weeks to team up and design solutions. Prototypes included an at-home COVID-19 test kit and a wellbeing app that promotes first responders' resilience.



Rapid research

Several engineering and computer science researchers received VCU Rapid Research Grant funding for high-impact, fast-turnaround investigations that address aspects of the global pandemic. Examples include an antiviral face mask that captures and kills pathogens (including the new coronavirus) on the mask's surface and a statistical model that uses microbiome data to help predict the severity of COVID-19 in current patients.

Computing is fundamental

The popular new Fundamentals of Computing specialization quickly gives non-computer-science students today's most in-demand technology skills, plus a credential from the Greater Washington Partnership and hiring advantages with major employers.

Internet ecosystem innovation

As a founding member of the Internet Ecosystem Innovation Committee, an independent group promoting the formation of new global internet nexus points, VCU Engineering is developing innovative curricula and experiential programs to expand the digital workforce across Virginia.

A HIGH-TECH WORKFORCE

From Virginia to the Silicon Valley, employers are asking for a high-tech workforce. VCU Engineering is providing it, with pipeline programs that make tech mavens even better — and bring new talent into the field.

[100%]

Leading Central Virginia

VCU took the lead in creating the Central Virginia node of the Commonwealth Cyber Initiative, which supports Virginia's international preeminence in cyber-related research, education and engagement. **Erdem Topsakal, Ph.D.**, professor and chair of VCU's Department of Electrical and Computer Engineering, directs the node.

Expanding tech internships

With support from the State Council of Higher Education in Virginia, VCU Engineering launched the Tech Talent Internship Pipeline program in partnership with local technology companies. It places computer science and computer engineering students in new summer internship positions.

GO Virginia

With funding from GO Virginia, a bipartisan, business-led economic development initiative, VCU Engineering and other partners are evaluating current tech talent programs across Richmond and surrounding counties.



Vertically Integrated Projects: From ideas to inventions

Diving into real-world research isn't just for upper-level students. VCU Engineering was the first in Virginia — and one of 24 universities nationwide — to join the prestigious Vertically Integrated Projects (VIP) Consortium. VIP@VCU gives undergraduate students opportunities to work with graduate students and faculty on innovative, large-scale research projects.

Over the course of several years, students get to see results from their efforts: some develop new apps and inventions. One group of biomedical and mechanical and nuclear engineering students has designed a device aimed at preventing the life threatening condition of collapsed lung. The team has recently filed a patent application for its device and is currently testing prototypes.

Dean's Undergraduate Research Initiative

VCU Engineering undergraduates don't have to wait to be on the forefront of discovery. Sophomores and juniors are eligible for research fellowships through the Dean's Undergraduate Research Initiative (DURI). These students work with faculty, graduate student and postdoctoral mentors to design and execute an original, yearlong research project. These mentors also gain managerial and coaching skills.

DURI fellows work to develop new knowledge that makes a difference in people's lives. A 2019-20 DURI fellow in biomedical engineering investigated how varying the architecture and surface characteristics of 3D-printed bone and dental implants affects basic cellular signaling mechanisms that promote bone formation. The results will help optimize biomaterial design and improve implant integration.

Dean's Early Research Initiative

Who says high school students can't make research contributions to the engineering field? Not VCU Engineering. The signature Dean's Early Research Initiative (DERI) brings high school students into the labs to conduct university-level research projects with mentorship from faculty and graduate students.

This year, one DERI fellow used a non-invasive, patient-specific technique to demonstrate that stiffness of the abdominal aorta, associated with hypertension, generally increases with age, with a sharp increase around age 60. The project received a first place award from the American Society for Nondestructive Testing.

Of the 23 DERI fellows in the 2019-20 cohort, 14 applied — and were accepted — to VCU Engineering.

VIRTUAL 2020 CAPSTONE DESIGN EXPO

Capstone Design Expo made history in 2020 with its first-ever virtual awards ceremony held May 8, 2020. The year's six winning teams — one per department, plus a multidisciplinary team — presented their projects via Zoom video conference to an audience of more than 140.

Department winners were selected by panels of faculty, alumni and industry experts.

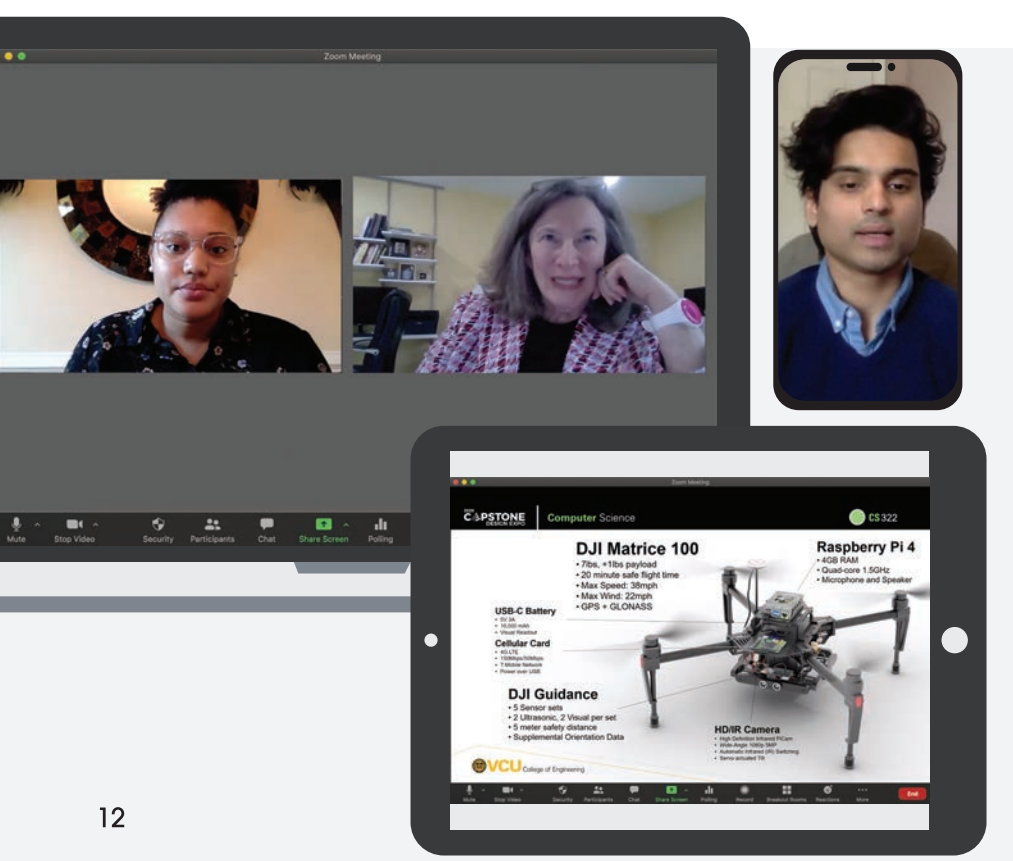
Dean's Choice award winners were selected by the college's senior leadership team.



DEAN'S CHOICE AWARDS

FIRST PLACE
High-Speed, Low-Environmental-Impact, One-Way Underwater Communications System
Team: Ciarra Cartwright Elliott, James Forsberg, Erwin Karincic, Jonathan Lundquist
Department: Electrical and Computer Engineering

SECOND PLACE
Surgical Delivery of a Regenerative Biologic for ACL Repair
Team: Chasity Kay, Neeha Gambhirrao, Rohani Patel, Anupama Pathak, Ushna Arora
Department: Biomedical Engineering



DEPARTMENT AWARDS

Biomedical Engineering:
Surgical Delivery of a Regenerative Biologic for ACL Repair
Team: Chasity Kay, Neeha Gambhirrao, Rohani Patel, Anupama Pathak, Ushna Arora

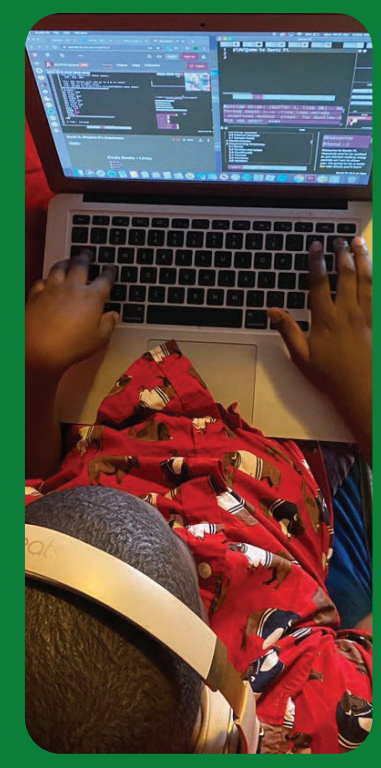
Chemical and Life Science Engineering:
Rapid, Point-of-Care Test for Diagnosing Acute Cardiac Ischemia
Team: Brenda Mauricio Arce, Collin Rodrigues, Ernesto Tinoco Benitez

Computer Science:
Drone-Delivered Naloxone
Team: Anthony Caliri, Tyler Griggs, Tin Vu

Electrical and Computer Engineering:
High-Speed, Low-Environmental-Impact, One-Way Underwater Communications System
Team: Ciarra Cartwright Elliott, James Forsberg, Erwin Karincic, Jonathan Lundquist

Mechanical and Nuclear Engineering:
3D-Printed Aeroshell with Integrated Force Measurement
Team: Zach Clarke, Stephen Holtz, Cecily Sheffield and Andrew Wingfield

Multi Department:
Design Control Methodologies for the Tribofilm Structure on Engine Surfaces
Team: Youngbin Kim, Edwin Winfield, Kaylyn Hardy, Karlitza Molina-Santiago, Mary Sprague



Code Beats: Learning computer programming through hip-hop

A multidisciplinary team of VCU faculty members is turning to hip-hop as an effective — and more importantly, fun — way to teach basic computer science concepts. In a project called Code Beats, students of **David C. Shepherd, Ph.D.**, associate professor in the Department of Computer Science, designed a curriculum targeted for middle school students. Dozens of young aspiring musicians made their own beats in online camps held in the spring.



Sparking early STEM interest

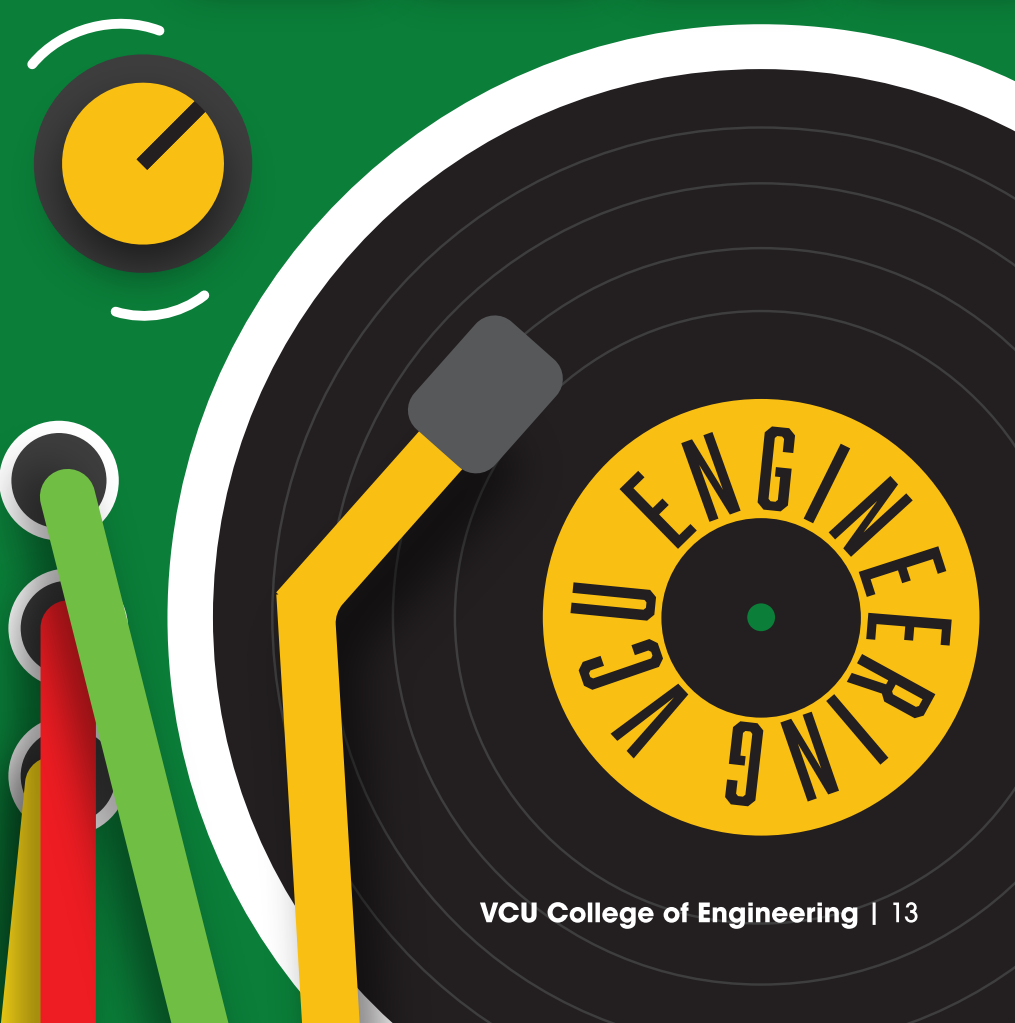
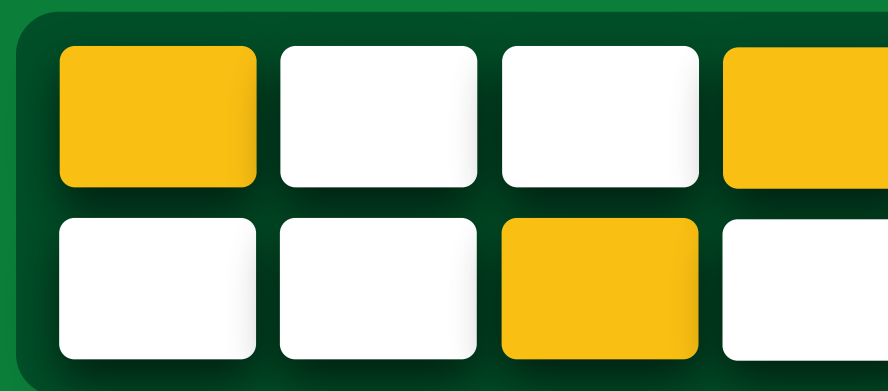
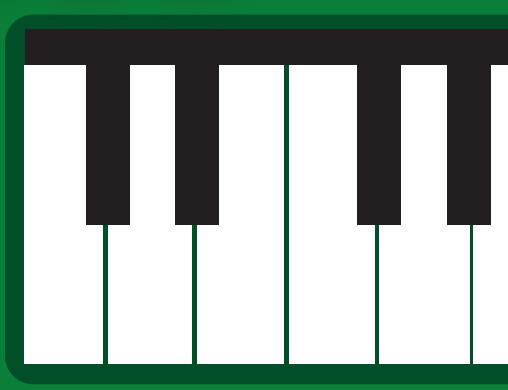
From strengthening ties with a local elementary school to leading innovative learning approaches for middle school students, VCU Engineering continues to lay the groundwork for interest in STEM among the K-12 set.

Thanks to VCU's Engineering in Vision program and a new computer lab, students at John B. Cary Elementary School in the city of Richmond harnessed distance learning to see the world of engineering and virtually visit labs at the college. For her efforts, **Jenilee Stanley-Shanks**, director of government and community outreach, was honored in 2019 as the elementary school's volunteer of the year.

Before the COVID-19 pandemic shuttered schools, VCU Engineering sent dozens of student, faculty and staff volunteers throughout the greater Richmond area to 16 events, reaching more than 3,000 students.

Even after additional in-person Innovation Days and other programs were canceled, VCU Engineering provided free resources to the community. The office created and distributed an Early Engineers-at-Home Handbook for children in grades K-8 and a book of paper airplane designs.

Next up? A new mentorship program for local middle school students.





John D. Leonard II, Ph.D., formerly executive associate dean for finance and administration, became executive dean of the VCU College of Engineering in July 2019.



Gregory E. Triplett, Jr. Ph.D., formerly associate dean for graduate studies and research in engineering, became senior associate dean for academic affairs in the VCU College of Engineering in July 2019.

New Engineering Research Building topped off

The college marked a milestone in the construction of its new \$93 million, 133,000-square-foot Engineering Research Building with a topping-off ceremony Oct. 15, 2019. Approximately 150 spectators cheered as a final beam — signed by students, faculty and members of the community — was hoisted into the air and placed atop the building, which is set to open in late 2020.

Makerspace for large-scale projects opens

The college unveiled its new Maker Garage on Sept. 19, 2019. Faculty, students and members of the VCU Engineering Dean's Society were on hand for a first look at the college's makerspace for students' large-scale engineering and high-performance transportation projects. Situated in a former auto shop, the old-meets-new facility has metalworking and woodworking equipment, a state-of-the-art waterjet cutter and multiple student work areas.

Biomedical engineering, nuclear graduate programs in top rankings

VCU's Department of Biomedical Engineering's graduate program has been named a top-ranked graduate program by U.S. News & World Report. VCU Engineering's nuclear engineering program also rose in the rankings to No. 18 from No. 20. It is among VCU's graduate programs ranked in the top 50.



The Department of Biomedical Engineering's graduate program is top-ranked, according to U.S. News & World Report.

VCU Engineering honored for diversity and inclusion efforts

The VCU College of Engineering has been awarded a Bronze Award by the American Society for Engineering Education Diversity Recognition Program. The Bronze Award, the highest level awarded in 2019, acknowledges VCU Engineering's commitment to bringing women and underrepresented minorities into the field and places the college among the nation's leaders in inclusive excellence.

Transgender VCU alumna shares her story about identity

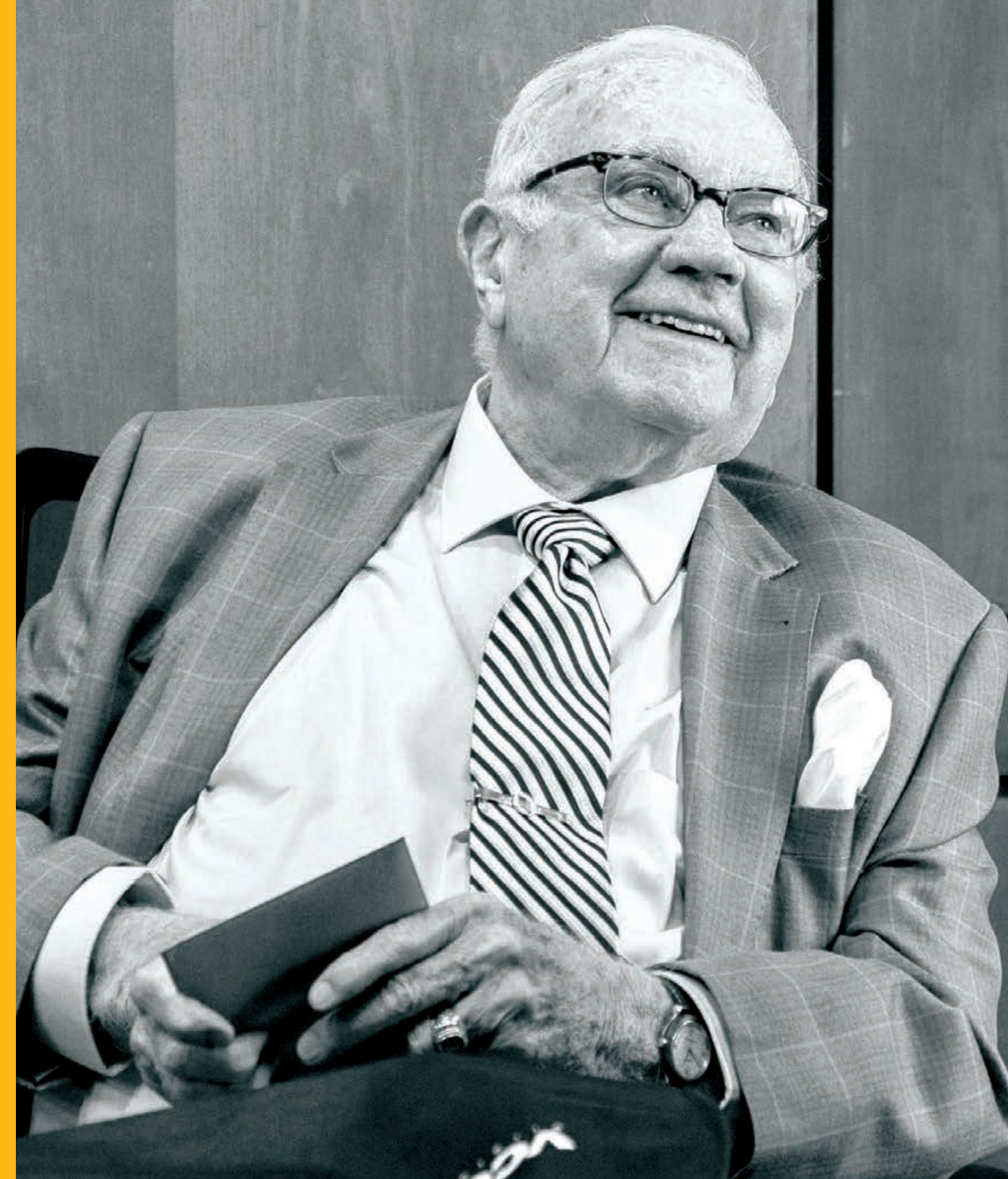
VCU Engineering built upon its annual tradition of celebrating women in engineering by honoring all people who bring diversity to the field. Former software entrepreneur **Rhonda Williams (A.S.'68)**, who earned a degree in engineering technology the year before the Richmond Professional Institute became VCU, shared her experience as a transgender person at an event about Identity and Culture. "If you are different," she said, "let people see who you are."

Applications open for new pharmaceutical engineering Ph.D. program

VCU Engineering has teamed up with VCU School of Pharmacy to create the nation's first Ph.D. program in pharmaceutical engineering. The program will train students in drug product development such as continuous manufacturing and drug-containing nanomaterials. Applications are now being accepted.

VCU named National Center of Academic Excellence in Cyber Defense Education

The Department of Homeland Security and the National Security Agency designated VCU a National Center of Academic Excellence in Cyber Defense education. This recognition is based on VCU Engineering's Bachelor of Science in computer science with a concentration in cybersecurity, which teaches 22 knowledge units covering 326 topics. VCU's Cybersecurity Center, directed by **Milos Manic, Ph.D.**, was also instrumental in securing this designation.



Remembering a philanthropy LEADER

C. Kenneth Wright, longtime benefactor of VCU College of Engineering, passed away in August 2019. He established the Wright Engineering Access Scholarship, VCU Engineering's flagship scholarship program, in 2017 with a historic \$5 million gift.

A self-made man, Wright was devoted to helping determined young people make their lives all they could be. He was especially passionate about creating opportunities for military veterans, returning students, community college transfer students, first-generation and immigrant students — the so-called nontraditional students whose numbers are large at VCU Engineering.

To date, Wright's gift has funded 108 scholarships to engineering students. Some graduates are even perpetuating their benefactor's legacy with their own gifts to the college.

Help a future engineer cross the FINISH LINE

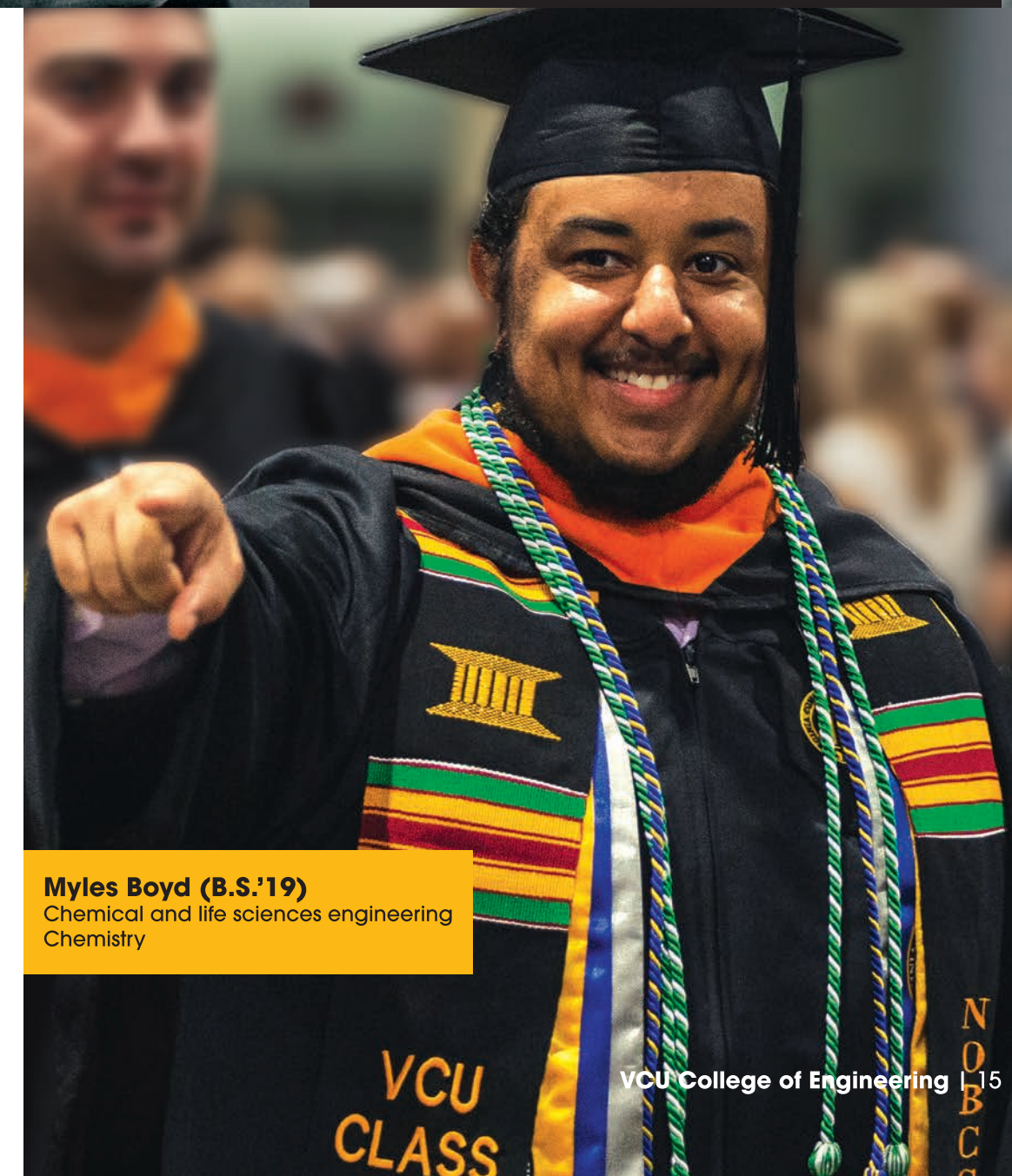
Each year, about 40 hardworking VCU Engineering students put their education on hold because of unforeseen financial hardships.

You can help.

VCU Engineering's Completion Grant Fund helps students in need cross the finish line to a high-value degree.

Your gift at any level to the Completion Grant Fund will help a dedicated student complete their education.

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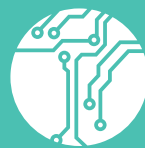
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