

NEW FACULTY



Priscilla Hwang, Ph.D.

Assistant Professor
Department of Biomedical Engineering

Education: Ph.D. in biomedical engineering from Duke University; postdoctoral research at Washington University

Research Interests: 3D microphysiological systems to investigate musculoskeletal pathologies and cancer progression

GROWTH

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.

Barbara D. Boyan, Ph.D., the Alice T. and William H. Goodwin, Jr. Dean of the college, said that the future of engineering was built into the design of the state-of-the-art research hub.

"This building speaks to the future," she said. "It's full of modern concepts, with a first-floor makerspace, labs for the way computer science is going to be, and for advanced, collaborative engineering."



Henry J. Donahue, Ph.D.

Alice T. and William H. Goodwin, Jr. Endowed
Chair and Professor
Chair, Department of Biomedical Engineering
Co-director, VCU Institute for Engineering and Medicine

FROM THE CHAIR

VCU's Department of Biomedical Engineering's graduate program has been named a top-ranked graduate program by U.S. News & World Report.

Through leading in education and research, we provide the pipeline for trained and experienced biomedical engineering professionals. That's one way we're transforming Richmond, Virginia, into a premier hub for biomedical innovation and education.

With a new non-thesis M.S. and dual M.D.-Ph.D. program in biomedical engineering and faculty members specializing in novel bioimaging, mechanobiology, regenerative medicine, man-machine interface and rehabilitation engineering, our department's ties to the VCU School of Medicine expand opportunities for undergraduate students to be exposed to clinical and pre-clinical research spanning molecules, cells and tissues.

We are fostering collaboration across the VCU campus and taking a convergent approach to science, engineering and medicine.



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FACULTY ACCOMPLISHMENTS

- 5 NIH R01 Principal Investigators
- 4 AIMBE Fellows
- 3 NSF CAREER Award recipients
- 1 NIH MIRA recipient
- 2 NAE members

RESEARCH FUNDING

- Up 427% over the last 5 years
- \$3.5M in NSF grants
- \$1.8M in NIH grants

AREAS OF RESEARCH

- Mechanobiology
- Rehabilitation engineering
- Assistive technology
- Immunoengineering
- Computational mechanics and modeling
- Human/computer interfaces
- Musculoskeletal engineering
- Magnetic Resonance Imaging



VCU College of Engineering

601 West Main St.
Box 843068
Richmond, VA 23284-3068

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VCU College of Engineering



2019 - 2020 Annual Review

VCU Engineering
Engineers Make It Real.

BIOMEDICAL ENGINEERING

NEWS/RESEARCH

Examining macrophage response to biomaterials

René Olivares-Navarrete, D.D.S., Ph.D., an associate professor in the Department of Biomedical Engineering, 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.

The long-term goal is to understand what factors promote faster recovery in patients with medical implants.



Cell mechanics of tissue organization

Daniel E. Conway, Ph.D., associate professor in the Department of Biomedical Engineering, 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. The study suggests that mechanically disrupting the nuclear linker of nucleoskeleton to cytoskeleton (LINC) complex destabilizes the acini. "If you disrupt the structure mechanically, the cells — and by extension, the tissue — are disturbed," he said.

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.



NEWS/RESEARCH

Groundbreaking eye-tracking technology

Technology invented at VCU by a team led by **Paul A. Wetzel, Ph.D.**, associate professor of biomedical engineering, 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.

In 2016, the Michael J. Fox Foundation for Parkinson's Research awarded the researchers a \$1 million grant to test the device. More recently, the team has licensed the technology — through VCU Innovation Gateway's tech transfer — to RightEye LLC, a startup based in Bethesda, Maryland.

Photo by Clement Briff, courtesy of VCU Innovation Gateway



Next-level VR: brain signal feedback

Dean Krusienski, Ph.D., professor in the Department of Biomedical Engineering, is investigating how to make virtual reality (VR) environments responsive, in real-time, to the user's state of mind.

His project to develop techniques that incorporate feedback from brain signals into VR interactions has received a two-year grant from the National Science Foundation and its Cyber-Human Systems and Integrative Strategies for Understanding Neural and Cognitive Systems programs.

"We are trying to estimate a user's cognitive state while they are performing in an interactive virtual reality environment," he said. "The ultimate goal is to (enhance) the VR experience based on our estimation of the cognitive state."

STUDENTS

Engineering M.D.-Ph.D. student receives NIH award

Jefferson Overlin (B.S.'15), the first student accepted into a new dual M.D.-Ph.D. program in biomedical engineering, has received a grant from the National Institute of Arthritis and Musculoskeletal and Skin Diseases at the National Institutes of Health (NIH) to fund his research.

Overlin is researching the role of immune system cells in the formation of new tissues required for bone fracture healing. His adviser is **René Olivares-Navarrete, D.D.S., Ph.D.**, an associate professor in the Department of Biomedical Engineering.



Biomedical engineering student selected for Lindau

Biomedical engineering Ph.D. student **Brooke Danielsson** is one of 660 young researchers worldwide — and only 37 Americans — named as a Young Scientist for the Lindau Nobel Laureate Meeting in Lindau, Germany.

Danielsson investigates how the nucleus in endothelial cells responds to force. Her adviser is **Daniel E. Conway, Ph.D.**, associate professor in the Department of Biomedical Engineering.

Originally scheduled to begin June 28, 2020, the 70th Nobel Laureate Meeting will now take place in 2021 because of the COVID-19 pandemic.



STUDENTS

Biomedical engineering Ph.D. student wins NIH award

Franck Kamga Gninzeko (B.S.'17), a VCU biomedical engineering doctoral student, has received a prestigious dissertation award from the National Institutes of Health.

Kamga Gninzeko researches the influence of aging in lung injury in the lab of **Rebecca Heise, Ph.D.**, associate professor in the Department of Biomedical Engineering. The R36 grant will provide two years of support for his project, "Senolytic Drugs as Therapy in an Aging Model of Ventilator-Induced Lung Injury (VILI)."

When a patient is on a mechanical ventilator, "my hypothesis is that the hostile environment caused by VILI exacerbates or precipitates the cells to grow older very quickly," he said.



Student named 2020 Goldwater Scholar

Madison Bates, a junior majoring in biomedical engineering, has been selected for the Goldwater Scholarship, the premier national scholarship for undergraduate science, technology, engineering and math students.

The Goldwater Scholarship Program, which honors the late Sen. Barry M. Goldwater, was designed to foster and encourage outstanding students to pursue research careers in mathematics, the natural sciences and engineering.

Bates has been conducting research with **Jennifer Puetzer, Ph.D.**, assistant professor in the Department of Biomedical Engineering. Bates' project is focused on collagen development in musculoskeletal tissue engineering, which is the field she plans to pursue in graduate school.

Photo courtesy of Madison Bates

