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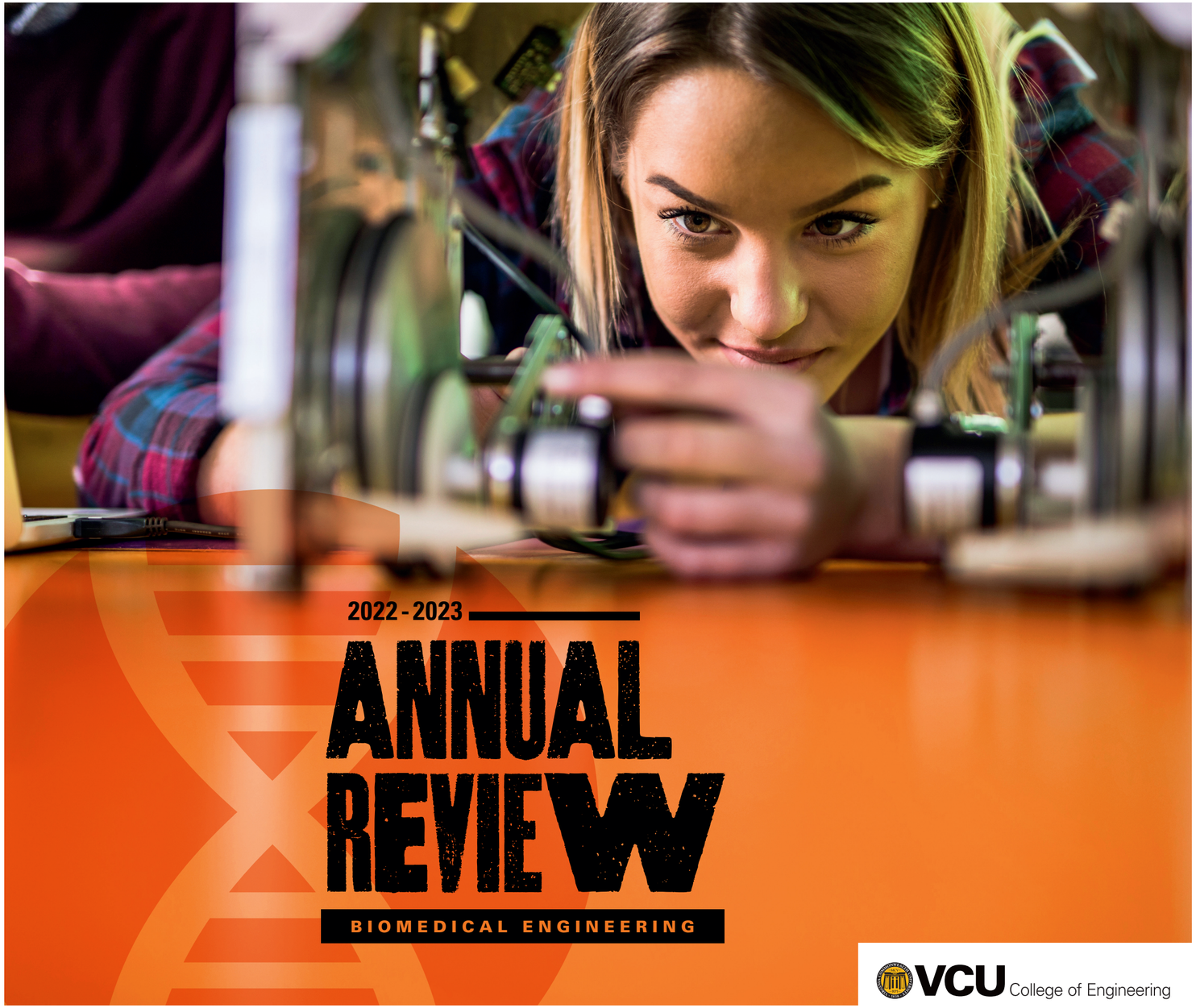


2022 - 2023

ANNUAL REVIEW

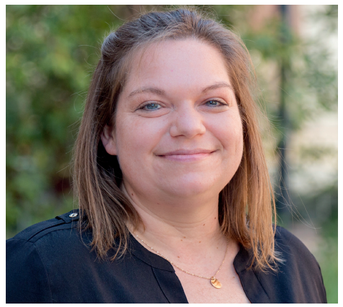
BIOMEDICAL ENGINEERING

VCU College of Engineering

BIOMEDICAL ENGINEERING

BIOMEDICAL ENGINEERING FACULTY

ADVANCE RESEARCH WITH HELP FROM NEW AWARDS



Left to right (top to bottom): Priscilla Hwang, Ph.D., Jennifer Jordan, Ph.D., Michael McClure, Ph.D., Carrie Peterson, Ph.D., and Jennifer Puetzer, Ph.D.

Research faculty from VCU Engineering's Department of Biomedical Engineering (BME) are diligently working to advance their investigations with support from research grants and collaborations with the private sector.

Priscilla Hwang, Ph.D., Assistant Professor
Through funding from the National Science Foundation (NSF) CAREER Award, Hwang investigates how leader cells contribute to collective migration, a process important to human development and an enabler of progression in diseases like cancer.

Jennifer Jordan, Ph.D., Assistant Professor
Working with VCU's Pauley Heart Center, Jordan is also an associate director of the Undergraduate Cardiovascular Summer Research Program funded by the American Heart Association and NIH National Heart, Lung and Blood Institute. The program aims to provide funded research opportunities to students interested in cardiovascular research who come from disadvantaged or underrepresented communities.

Michael McClure, Ph.D., Assistant Professor
McClure researches muscle-specific collagen scaffolds called decellularized muscle matrices (DMM). Made possible by the VCU Commercialization Award, the grant allows his company, Sarcogenics, LLC, to refine DMMs for use in rotator cuff injuries needing surgical repair.

Carrie Peterson, Ph.D., Assistant Professor
Developing and testing a home-based, upper-limb rehabilitation program for individuals with tetraplegia after spinal cord injury is the focus of Peterson's work. Backed by the Department of Defense Spinal Cord Injury Research Program Investigator-Initiated Research Award, the funding provides for the participation of service members, veterans and civilians with spinal cord injury-related tetraplegia; hardware and software development for the rehabilitation program; and training for graduate students assisting with the project.

Jennifer Puetzer, Ph.D., Assistant Professor
Collagen fibers are the primary source of strength in tissues throughout the body, particularly tendons, ligaments and menisci. Unfortunately, these collagen fibers do not regenerate after injury or in engineered tissues, providing limited treatment options. Puetzer and her team use funding provided by the National Science Foundation (NSF) CAREER Award and a National Institutes of Health (NIH) R01 to investigate how mechanical cues drive cells to regenerate these fibers. The goal is to understand how cells know to create hierarchical collagen fibers and what drives them to make bigger, stronger fibers. This enables the body to produce functional replacements and better regenerate connective tissues throughout.

SANTIAGO LOPEZ IMMIGRATED TO THE U.S. AT A YOUNG AGE WITH A PASSION FOR STEM THAT CULMINATED IN A PRESTIGIOUS NSF FELLOWSHIP

Santiago Lopez is a recipient of the 2023 National Science Foundation Graduate Research Fellowship. The grant will help support his research as a doctoral student at Vanderbilt University. His research — looking at the tumor environment and how its environment triggers cancer metastasis — builds upon his work at VCU as an undergrad.

Lopez's current research focuses on looking at cell-to-cell junctions and how altering these junctions affects the cells' behavior — an interest that a VCU biomaterials class helped solidify.

"I was really interested in cellular interactions with different materials and implants and how our immune system responds to these different phenomenons," he said. "Everything just clicked for me in that class and I had an amazing teacher — [**Jennifer Puetzer, Ph.D.**, assistant professor of biomedical engineering] — that not only explained the concepts really well but also challenged us to think of solutions for problems currently in the world."

The summer after his sophomore year, Lopez investigated cancer heterogeneity in breast cancer cells at Vanderbilt as part of the NSF Research Experiences for Undergraduates.

"My experience at VCU engineering has had its ups and downs, but overall it helped give me the toolbox necessary to solve today's biggest problems," Lopez said. "VCU engineering sculpted me to become the best engineer and scientist that I could be."

Priscilla Hwang, Ph.D., holds her team's "cancer-on-a-chip model," a microfluidic model of breast cancer.

FUELED BY NATIONAL CANCER INSTITUTE GRANT, PRISCILLA HWANG, PH.D., FURTHERS STUDY OF CANCER CELL MIGRATION

Priscilla Hwang, Ph.D., assistant professor in the Department of Biomedical Engineering, is studying metastasis and the microenvironments cancer cells live in. She is partnering with Gregory Longmore, M.D., and Amit Pathak, Ph.D., on a new phase of research fueled by a grant from the National Cancer Institute (NCI).

When cancer metastasis occurs, it often means that a group of cancer cells is moving. Hwang and her partners' research combines biomedical and mechanical engineering with molecular biology in hopes of developing a comprehensive understanding of how and why groups of cancer cells move together.

Early on in their research, Hwang and the team borrowed electrical engineering concepts to design a "cancer-on-a-chip model," a microfluidic model of breast cancer. Researchers draw out their blueprint and etch it on a silicon wafer to make a mold. They can then make copies of the print and insert breast cancer cells into this constructed environment and get different cells to move by adding different signals.

"From the first phase, we identified certain cells that can drive or initiate migration," says Hwang. "Now, this new grant from the National Cancer Institute is focused on investigating what those actual pathways are that might be regulating the phenomenon that we've observed."

When there are clusters of tumor cells moving together, there are many different types of cells wrapped up in the cluster, such as stromal helper cells or immune cells. Hwang and her fellow researchers want to understand how different signaling pathways in the various cells within the moving cluster work separately or together to contribute to metastasis.

Scan to learn more about Biomedical Engineering at VCU.