

ANNUAL REPORT

Bringing Ideas to Life

18



VCU

Innovation Gateway
Office of Research and Innovation

Bringing *Ideas to Life*

18

Annual Report



Letter from the VP for Research and Innovation and the Senior Executive Director

1

The Year at a Glance

2

Fresh Perspective

4

Inventor of the Year

6

Bringing us Back to Our Senses

8

A Forensic Breakthrough

10

Cross-Campus Teamwork and a Whole Lot of Heart

12

Dance Revolution: VR Ballet Teaches Plié and Empathy

14

A New Hope in the Fight Against Alzheimer's Disease

16

Machine Learning: Algorithms for Success

18

The VCU Technology Transfer Process

20

VCU Innovation Gateway Team

21

Mission

To facilitate commercialization of university inventions for the benefit of the public; to foster a culture of innovation at the university; and to promote new venture creation.

LINKEDIN: VCU INNOVATION GATEWAY 

FACEBOOK: VCU INNOVATION GATEWAY 

TWITTER: @VCUIINNOVATION 

COVER PHOTO: OLFACTORY SENSOR
DESIGN: BN DESIGN & ADVERTISING
PHOTOGRAPHY: KARL STEINBRENNER

Dear Colleagues and Friends,

We are excited to share with you VCU Innovation Gateway's thriving year 2018. This year, we secured 30 issued patents, a record number with 8 more than 2017 and 13 more than 2016. Royalties and other licensing revenues continued to grow at a steady pace. We helped inventors secure over \$1.6 million in proof-of-concept funding to bring inventions a step closer to market, nearly doubling the funding earned in 2017. We also helped researchers secure over \$600,000 in license-related sponsored research, tripling the amount from 2017.

We are proud to report several regulatory milestones achieved by our licensees: a medical device based on a hemostatic technology invented at VCU received FDA clearance and was introduced into the U.S. market, and two new therapeutic candidates have entered Phase II clinical trials.

The VCU Quest Commercialization Fund has delivered outstanding outcomes in its third year, attracting over \$5.5 million in follow-on funding from federal, state and industry sources; three option and license agreements executed; three new start-ups based on funded technologies; and one product in test manufacturing by a local company. Given the total investment of \$900,000 across 30 funded projects, these results represent an impressive return on investment.

In the past year, we have signed 18 licenses and options with another 10 pending completion. Four start-ups were launched based on VCU licensed inventions. One VCU start-up company, Polymer Exploration Group, was selected by the National Council of Entrepreneurial Tech Transfer (NCET2) to present at the University Start-ups Demo Day—the second VCU start-up to be selected. Over the past decade, Innovation Gateway has spun off more than 30 start-ups based on faculty inventions. These new companies have gained more than \$64 million in equity funding and have brought six products to market. We are very excited to collaborate with our newly established partner, VCU Ventures, to build on this success in the future.

Another notable achievement was the induction of Dr. Paul Fisher, Professor in the Department of Human and Molecular Genetics, Director of the VCU Institute of Molecular Medicine and the Thelma Newmeyer Corman Chair in Cancer Research at VCU Massey Cancer

Center, as a Fellow of the National Academy of Inventors (NAI) in 2018. He is now the second NAI Fellow at VCU, joining Dean Barbara Boyan. Innovation Gateway has also launched a local chapter of the NAI to recognize and celebrate VCU inventors. More than thirty inventors, each with two or more issued U.S. patents, were inducted as inaugural members of the local chapter by the NAI Executive Director in the spring of 2018.

Innovation Gateway has also grown as a mission-focused operation. We have expanded capacities in our core functions of IP management, evaluation, protection, marketing, de-risking and licensing of inventions, federal and license compliance, and industry engagement. Innovation Gateway continues to position itself to better serve VCU's growing needs as it focuses on facilitating innovation and the commercialization of translational and cross-disciplinary research. I hope that you will follow our new initiatives for streamlining licensing to industry and start-ups with business-friendly templates, pre-set terms for predictable licensing, one-click copyright licenses and express licenses for start-ups. These efforts will not only help enhance commercialization but also create a business-friendly image for VCU, to build strong and successful relationships with industry, investors and the regional innovation partners.

With sincere gratitude,

P. Srirama Rao, Ph.D.
Vice President for Research and Innovation

Ivelina Metcheva, Ph.D., MBA
Senior Executive Director
VCU Innovation Gateway

18

FISCAL YEAR AT A GLANCE

134
Invention
Disclosures

18
Options/
Licenses

4
Start-Ups

155
Patents
Filed

30
Patents
Issued

8
Copyrights
Filed

62
Industry
Engagements

2.7
Million
Licensing
Revenue

VCU START-UPS IN THE PAST 10 YEARS

30
Start-Ups

2
“Best University Startups”

\$64m
Equity Funding

6
Products to Market

DEPARTMENTS WITH TEN OR MORE INVENTION DISCLOSURES

- 14 Medicinal Chemistry
- 12 Chemistry
- 12 Electrical/Computer Engineering
- 12 Computer Engineering
- 12 Chemical/Life Science Engineering
- 10 Mechanical/Nuclear Engineering

Distribution of Invention Disclosures

24 College of Humanities
and Sciences

3 College of Health
Professions

4 School of Business

5 School of Dentistry

1 School of Education

43 College of Engineering

53 School of Medicine

1 School of Nursing

15 School of Pharmacy

1 School of Social Work

2 Office of Research

1 Da Vinci Center

3 VCU Health System

DEPARTMENTS WITH FIVE TO NINE INVENTION DISCLOSURES

- 9 Internal Medicine
- 8 Surgery
- 7 Microbiology/Immunology
- 7 Human and Molecular Genetics
- 6 Biomedical Engineering
- 5 Biochemistry
- 5 Forensic Science
- 5 Physiology

VCU PATENTS

6/19/18 Patent No. 10,000,453

B. Frank Gupton, Ph.D., Keith Ellis, Ph.D.
Chelation Directed C-H Activation Reactions
Catalyzed by Solid-Supported Palladium(II)
Catalysts

4/17/18 Patent No. 9,945,851

Jason Carlyon, Ph.D.
OMPA in vaccine compositions and as diagnostic
targets

2/6/18 Patent No. 9,884,936

Dwight Williams, Yan Zhang, Ph.D.
2- Substituted-5-Hydroxy-4H-chromen-4-ones
as novel ligands for the Serotonin receptor 2B
(5-HT_{2B})

9/19/17 Patent No. 9,765,017

Jurgen Venitz, Ph.D., Kevin Ward, Ph.D., Martin
Mangino, Ph.D., Martin Safo, Ph.D., Mohini
Ghatge, Ph.D., Richmond Danso-Danquah, Ph.D.
Allosteric Hemoglobin Modifiers with Nitric Oxide
Releasing Moiety

2/9/18 Patent No. ZL 201610412359.9

Shunlin Ren, Ph.D.
A Novel Cholesterol Metabolite, 5-Cholesten, 3-,25-
diol, Disulfate (25HCDS) for Therapy of Metabolic
Disorders, Hyperlipidemia, Diabetes, Fat Liver
Diseases, and Atherosclerosis

8/22/17 Patent No. 9,738,605

Shijun Zhang, Ph.D.
Hybrid Compounds of Curcumin and Melatonin
as Neuroprotectants for Neurodegenerative
Disorders

12/26/17 Patent No. 9,850,221

Bhaumik Patel, M.D., Nirmita Patel, M.D., Rajesh
Karuturi, M.D., Umesh Desai, Ph.D.
Sulfated and Unsulfated Flavonoid Oligomers as
Cancer Therapeutics

3/27/18 Patent No. 9,926,589

Andrey Mikheykin, Ph.D., Jason Reed, Ph.D.
Identification and Quantification of Multiple
Nucleic Acid Targets in Complex Mixtures

4/17/18 Patent No. 9,944,597

Ashutosh Tripathi, Ph.D., Chenxiao Da,
Glen Kellogg, Ph.D.
Polysubstituted Pyrroles Having Microtubule-
Disrupting Cytotoxic and Antitumor Activities and
Methods of Use Thereof

4/3/18 Patent No. 9,931,125

Kevin Ward, Ph.D.
Device for control of difficult to compress
hemorrhage

4/24/18 Patent No. 9,951,020

B. Frank Gupton, Ph.D.
Methods of making 2-Halonicotinonitriles

11/22/17 Patent No. 30030222

Devanand Sarkar, Ph.D., Jolene Windle, Ph.D.,
Paul Fisher, Ph.D., Siddik Sarkar, Ph.D.,
Swadesh Das, Ph.D.
Use of a truncated CCN1 Promoter for cancer
diagnostics, therapeutics and theranostics

10/18/17 Patent No. 3004872

Devanand Sarkar, Ph.D., Michelle Menezes, Ph.D.,
Paul Fisher, Ph.D., Swadesh Das, Ph.D.
MDA-9/Syntenin Promoter to Image and Treat
Metastatic Cancer Cells

9/19/17 Patent No. D797,944

Gauri Gulati, M.D., Kristina Bonovitch, Lisa Rettig,
Sharon Brinkley
Hands Free Breastfeeding Aid

7/11/17 Patent No. 9,701,985

Devanand Sarkar, Ph.D., Michelle Menezes, Ph.D.,
Paul Fisher, Ph.D., Swadesh Das, Ph.D.
MDA-9/Syntenin Promoter to Image and Treat
Metastatic Cancer Cells

9/5/17 Patent No. 9,750,823

Devanand Sarkar, Ph.D., Jolene Windle, Ph.D.,
Paul Fisher, Ph.D., Siddik Sarkar, Ph.D.,
Swadesh Das, Ph.D.
Use of Truncated CCN1 Promoter for Cancer
Diagnostics, Therapeutics, and Theranostics

6/12/18 Patent No. 9,994,865

Devanand Sarkar, Ph.D., Mitchell Menezes, Ph.D.,
Paul Fisher, Ph.D., Swadesh Das, Ph.D.
PEG-Prom Mediated Surface Expression of Avidin/
Streptavidin

4/24/18 Patent No. 9,951,114

Devanand Sarkar, Ph.D., Luni Emdad, Ph.D., Paul
Fisher, Ph.D., Praveen Bhoopathi, Ph.D., Swadesh
Das, Ph.D., Upneet Sokhi, Ph.D.
Recombinant Cancer Therapeutic Cytokine

10/3/17 Patent No. 9,777,123

Akul Mehta, Jay Thakkar, Ph.D.,
Umesh Desai, Ph.D.
Sulfated Beta-O4 Low Molecular Weight Lignins

9/26/17 Patent No. 9,771,400

Nicholas Kurland, Ph.D., Vamsi Yadavalli, Ph.D.
Photoactive Silk protein and fabrication of silk
protein structures using photolithography

4/17/18 Patent No. 9,943,347

Brian Smith, Jacob Park, Jennifer Wayne, Ph.D.
Robert Adelaar, Ph.D.
Medial Column (MECO) Fixation Device, Method,
and System

11/21/17 Patent No. 9,822,154

Xiaofei Yu, Ph.D., Xiang-yang Wang, Ph.D.
Immune Modulator for Immunotherapy and
Vaccine Formulation

9/12/17 Patent No. 9,758,459

Rami Al Horani, Ph.D., Umesh Desai, Ph.D.
Allosteric Modulators of Factors XIa as
Anticoagulant Agents

5/1/18 Patent No. 9,957,567

Janette McAllister, Ph.D., Jerome Strauss, M.D., Ph.D.
Compositions and Methods Relating to DENND1A

9/26/17 Patent No. 9,773,594

Ahmed Farghaly, Ph.D., Everett Carpenter, Ph.D.,
Kyler Carroll, Ph.D., Massimo Bertino, Ph.D.,
Meichun Qian, Ph.D., Shiv Khanna, Ph.D.,
Zachary Huba
Non-Rare Earth Magnetic Nanoparticles

11/1/17 Patent No. 9,480,439

Ashwin Belle, Ph.D., Jie Wu, Ph.D., Kayvan
Najarian, Ph.D., Kevin Ward, Ph.D., Rosalyn
Hargraves, Ph.D.
Segmentation and Fracture Detection in
CT Images

1/18/18 Patent No. 2013246435

Shunlin Ren, Ph.D.
A Novel Cholesterol Metabolite, 5-Cholesten,
3-,25- diol, Disulfate (25HCDS) for Therapy of
Metabolic Disorders, Hyperlipidemia, Diabetes,
Fat Liver Diseases, and Atherosclerosis

9/19/17 Patent No. 9,768,355

M Samy El-Shall, Ph.D., Saud Al-Resayes, Ph.D.,
Victor Abdelsayed, Zeid Abdullah Alotman
Production of Graphene and Nanoparticle
Catalysts Supported on Graphene Using Laser
Radiation

11/21/17 Patent No. 9,821,084

Robert Diegelmann, Ph.D., Kevin Ward, Ph.D.,
Marcus Carr, Ph.D., Gary Bowlin, Ph.D.
Mineral technologies (MT) for acute hemostasis
and for the treatment of acute wounds and
chronic ulcers

8/1/17 Patent No. 2,631,733

Richard Marconi, Ph.D., Christopher Earnhart, Ph.D.
Polyvalent chimeric OspC vaccinogen and
diagnostic antigen

Fresh Perspective



P. Srirama Rao, Ph.D.
Vice President for Research and Innovation

The Innovation Gateway team sat down with P. Srirama Rao, Ph.D., VCU's new vice president for research and innovation, to discuss his vision and agenda for innovation and technology transfer at VCU.

He comes to VCU from the University of Minnesota, where he was associate dean for research and professor in the College of Veterinary Medicine, with a joint appointment in the medical school as professor of medicine in the Division of Pulmonary, Allergy, Critical Care and Sleep Medicine. As an entrepreneur, Dr. Rao has co-founded both a pharmaceutical and a medical device company, bringing direct experience in translating technology from scientific discovery to a viable business.

What is your vision for increasing innovation and boosting technology transfer at VCU?

Innovation drives a research-intensive university, and as such VCU has an important role to transform society through the discoveries that we make. We have an obligation to taxpayers and to the community who help us to be who we are, and we aspire to be ever better.

The trend of decreased governmental funding for research presses us to be creative in encouraging new public-private partnerships. We need to create opportunities for our industrial partners to understand that VCU is easy to work with. This hasn't always been historically true for universities. I want to improve our processes for collaborating with partners to show that we can work well with industry, resulting in better, more creative licensing opportunities. We also need to support start-up activities. Start-ups are a vehicle that allows for further maturation of research and technologies that, while transformative, are often early-stage. Whether licensing to industry or a start-up, our goal is to get these innovations to the best partner to develop them further to a point where they can have an impact on society.

We want companies to be interested in partnering with VCU early on, recognizing that our ideas are sharp enough to risk investment. We are also working with faculty to validate and mature their technologies and move them to the next stage of development by providing or facilitating proofs of concept.

Are you planning any specific initiatives that would accelerate bringing VCU inventions from the bench to the public?

My agenda is focused on fast-tracking VCU's discoveries and innovations to the public, improving collaborations with industry partners, and increasing startup activity. We are enhancing technology commercialization

through a fourfold effort: streamlining licensing, accelerating IP validation and de-risking, building strong industry and investor relationships, and optimizing communication and marketing.

Streamlining licensing at VCU is a major opportunity. By adopting the best practices of our peers, we have an opportunity to similarly position VCU as a destination university for partnerships. Streamlined licensing includes adopting express licensing templates with investor-friendly terms, express licensing for software, as well as express licensing for our existing technology inventory. We are also rethinking industry engagement by optimizing licensing arrangements for industry-sponsored research. Having business-friendly licensing terms will incentivize more companies to collaborate with and sponsor research at VCU.

We are also growing and optimizing the VCU Commercialization Fund so that it continues to mature early-stage inventions into desirable opportunities for commercialization. Early-stage discoveries are risky business opportunities, there is uncertainty in how the market will react, and uncertainty in how robust a product based on the discovery might be. Proof-of-concept funding, like the VCU Commercialization Fund, serves an important role in reducing business risk to increase the value and desirability of early-stage discoveries. In addition to our own internal fund, we are expanding our efforts that support VCU faculty in seeking external proof-of-concept funding. We will continue to expand our Commercialization Advisory Panel that provides the voice of industry and investors on the value and commercial pathways for our early-stage inventions. Down the road, I'd like to see our Panel expand to become a network of successful alumni, industry experts, investors, and entrepreneurs that can help us bring VCU innovations to the public quicker.

We are also looking to provide VCU students experiential learning opportunities in technology transfer. Besides traditional research in laboratories or in communities, we have a unique opportunity to engage students by leveraging the resources of the VCU da Vinci Center and OVPRI's Innovation Gateway and VCU Ventures. We will focus on cultivating collaborations between these entities to have students participate in market research, customer discovery and market validation. I think in the near future, you'll see student teams pitching start-up concepts based on VCU discoveries at events like Pre-X, Innovation Challenge, and start-up weekends.

The 2018 Billy R. Martin Innovation Award

Inventor of the Year:

Robert F. Diegelmann, Ph.D.

Sometimes inspiration comes in waves, flashes or spurts. For Inventor of the Year, Robert F. Diegelmann, Ph.D., it happens in clumps.

Years ago, while cleaning up after the family cat, Diegelmann couldn't help but notice the litter's clumping properties—specifically the active ingredient that causes it, sodium bentonite. Chasing his curiosity led to an idea for a lightweight dressing packed into major wounds to stop severe bleeding in combat or mass casualty situations. This discovery is credited with saving thousands of lives.

Diegelmann, a professor of biochemistry and molecular biology in the School of Medicine, recently received the university's 2018 Billy R. Martin Innovation Award for his work on this technology and other innovations in wound healing and tissue repair.

At this year VCU Innovates reception, VCU President Michael Rao, Ph.D. praised Diegelmann's distinguished career. "He has made incredible contributions to wound healing and trauma for nearly 50 years, not just the years he has been here at VCU," Rao said.

Out-of-the-box thinking is Diegelmann's specialty. He's listed on nine patent applications and holds four U.S. and three foreign patents. He has also published more than 200 scientific articles and book chapters, two books and serves on the editorial board of the journal Wound Repair and Regeneration.



MICHAEL RAO, PH.D.
ROBERT F. DIEGELMANN, PH.D.
P. SRIRAMA RAO, PH.D.

"Throughout the course of my 47 years here at VCU, I have been very fortunate to have collaborated with many talented colleagues. One in particular, Kevin Ward, MD, Professor of Emergency Medicine, stands out among all of the rest. Kevin is one of the brightest clinical scientists I have ever met. He got me interested in combat Casualty Care, and together we developed state of the art technologies to stop life-threatening bleeds. These discoveries have now been translated to the civilian population where they are saving many lives. VCU Innovation Gateway made it all happen! Our research motto has been "simple solutions for complex problems."

Robert F. Diegelmann, Ph.D.

*Professor of Biochemistry
& Molecular Biology
Director, Laboratory of Tissue Repair
VCU School of Medicine*

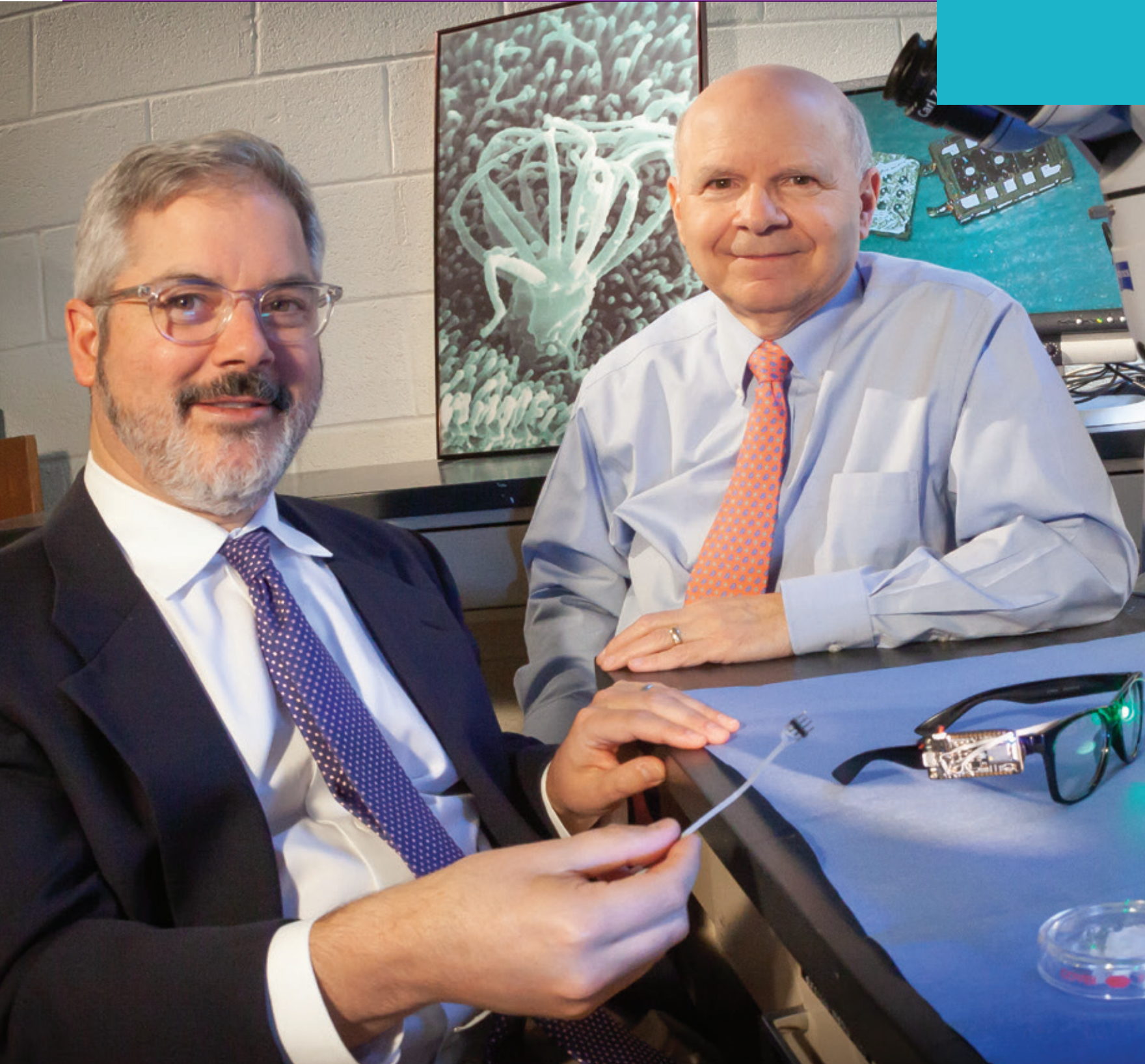


Robert F. Diegelmann, Ph.D.

“Over the past several years, the support of VCU Innovation Gateway has helped to transform the treatment of anosmia from the theoretical to the possible.”

Daniel H. Coelho, M.D., FACS
G. Douglas Hayden Associate Professor
Department of Otolaryngology
Head and Neck Surgery
School of Medicine

Bringing us Back to our Senses



Imagine finally taking time to smell the roses, and there were no scent. Same with the fresh cut grass of a golf course, your favorite perfume, a filet mignon grilled to perfection, the lavender shampoo in a newborn’s hair. Nothing. Well, you would likely be one of the 6.3 million Americans experiencing anosmia, or a total loss of smell.

Every whiff we take sets off a wondrous chain of events. Our brains first detect and categorize smells thanks to the central nervous system, which transmits electrical impulses to olfactory receptors in the nasal cavity. This information makes its way to the olfactory bulb at the bottom of the forebrain to higher functioning regions of the brain.

Without the ability to smell, our sense of taste suffers, and many develop emotional side-effects such as issues with self-confidence and depression. Few understand the complexities of anosmia better than Richard Costanzo, Ph.D., of VCU’s Smell and Taste Disorders Center, and Daniel Coelho, M.D., associate professor of head and neck surgery in the Department of Otolaryngology and medical director of the VCU Cochlear Implant Center.

Funded by the entrepreneur Scott Moorehead, who lost his sense of smell, the pair looked to the same principal for electrophysiology technology in hearing implants: an external sensor and internal processors. Only their implant sparks select parts of the brain not getting smell transmissions due to injury or disease. Small gas sensors detect odor molecules and send data to a microprocessor that taps electrical signals to stimulate the olfactory bulb. The result, a smell sensation.

“For the first time in over 3 decades of research we may have found a way to restore the sense of smell for millions of patients suffering from anosmia. VCU Innovation Gateway helped us to navigate the pathway from invention disclosure to a patent protected technology.”

Richard M. Costanzo, Ph.D.
Professor Emeritus
Department of Physiology and Biophysics
and Department of Otolaryngology
Head and Neck Surgery
School of Medicine

A Forensic Breakthrough

Christopher Ehrhardt, Ph.D.

The courts, common sense, and almost every crime show tells us that evidence collection hinges on the quality of recovered DNA at the crime scene. With any luck, the collected data reveal a clear and condemning signature of the suspect. What those shows overlook is that analyzing the same cell sample over and over again can destroy its value, along with the criminal case.

To put it simply, nondestructive cell sampling means better forensics. However, labs everywhere struggle to truly examine a sample without compromising its most crucial, microscopic information. Christopher Ehrhardt, Ph.D., an associate professor in the Department of Forensic Science in the College of Humanities and Sciences, has pioneered a method of taking a much closer look at cellular make-up. Ehrhardt analyzes and reconstructs key attributes of individuals who deposited cells, like their age and sex.

Using a standard benchtop microscope, Ehrhardt takes a snapshot of a cell encased within drops of water. He measures the size, shape and fluorescent properties using software programmed to recognize the cell characteristics.

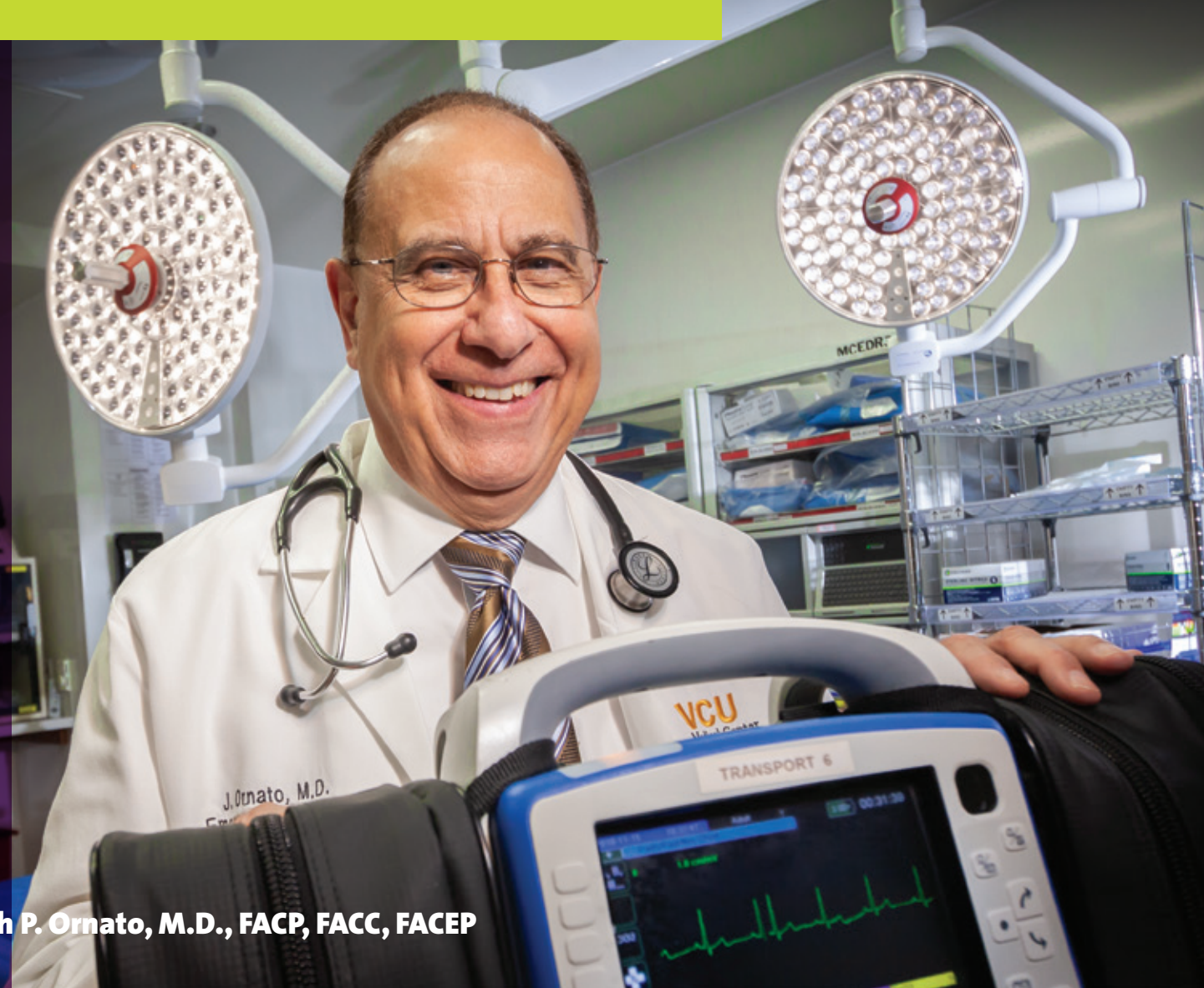
“This new procedure can be used to identify different cell types in a sample as well as potentially indicate some attributes of the individuals who deposited the cells, like age, sex and so forth,” Ehrhardt said. “And the best part is that the procedure is nondestructive. After imaging, the cells can be used to generate a DNA profile. This is really important since many samples have very little biological material, so the more information you can get without consuming the sample, the better.”



“Labs will be able to analyze aged or degraded forensic samples in a quick and nondestructive manner — and with much better results.”

Christopher Ehrhardt, Ph.D.
Assistant Professor, Department of Forensic Science
College of Humanities and Sciences

Cross-Campus Teamwork and a Whole Lot of Heart



Joseph P. Ornato, M.D., FACP, FACC, FACEP

One in four of us is at risk for heart disease within the next three years, increasing our risk of cardiac arrest over the same period. Half will experience cardiac arrest while alone, and only five percent of those will survive—unless help arrives quickly.

Undeterred by those numbers, three VCU units joined forces with a single goal: to save lives, motivated by the longtime vision of Joseph Ornato, M.D., chair of the VCU Department of Emergency Medicine and a certified internist and cardiologist. “Buildings have smoke alarms that mitigate the chance of serious damage to them, yet we don’t have similar protection,” he noted.

Collaborating as a capstone design team, entrepreneurial seniors from engineering and business created an easy-to-use bracelet that monitors a wearer’s heart rate and automatically calls 911 if cardiac arrest occurs. Branded as Cardian—a hybrid of “cardiac” and “guardian”—the device pairs with a powerful database that uses the web and apps to alert the patient, family, EMS, physicians and the hospital.

“Every minute that your heart is stopped, you lose a 10 percent chance that your life will be saved,” Ornato said. “In 10 minutes, you’re down to 10 percent.”

“Buildings have smoke alarms that mitigate the chance of serious damage to them, yet we don’t have similar protection,” – Joseph Ornato.

The Cardian team, under faculty adviser Erdem Topsakal, Ph.D., chair of the Department of Electrical and Computer Engineering, presented its device at the annual capstone design expo in 2018.

“Medical wireless telemetry will revolutionize health care in the next decade and beyond, and Cardian is just a start,” Topsakal said.

According to Bennett C. Ward, Ph.D., VCU Engineering’s director of project outreach and capstone design coordinator, one of the most remarkable benefits was the students’ commitment to make it real. All seven members stayed on the project after graduation.



Erdem Topsakal, Ph.D.

“Now that we have IRB approval, we are looking forward to testing our wearable cardiac arrest detector in the Electrophysiology Laboratory on patients during implantable cardioverter defibrillator (ICD) implantation.”

Joseph P. Ornato, M.D., FACP, FACC, FACEP
*Chairman, Department of Emergency Medicine
Professor, Division of Emergency Medical Services
Medical Director, Richmond Ambulance Authority*

"Innovation Gateway helped us realize the commercial potential in our project, Embodied Empathy, and provided valuable connections to innovators across campus and beyond."

Jill Brammer Ware
Assistant Professor
School of the Arts

Dance Revolution: VR Ballet Teaches Plié and Empathy

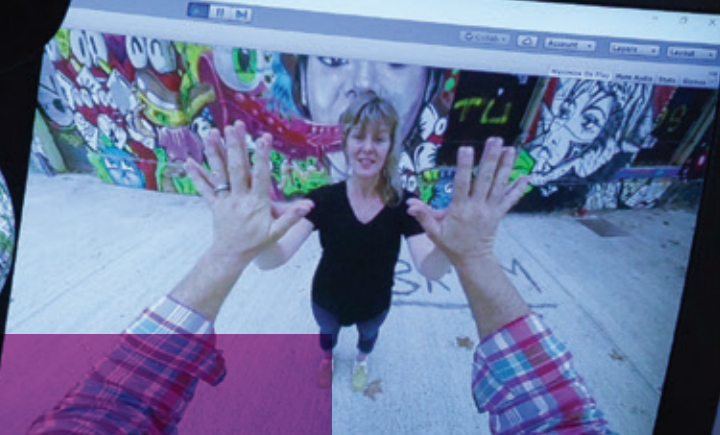
Jill Brammer Ware
John Henry Blatter

Learning ballet for the most part has been the same for generations. Observe the instructor's choreography, then perform each movement until perfected. With a high-tech twist, Jill B. Ware introduced a technique at her VCUarts class that may prove to be one of ballet's biggest leaps yet: Ware's students put on VR headset and become her.

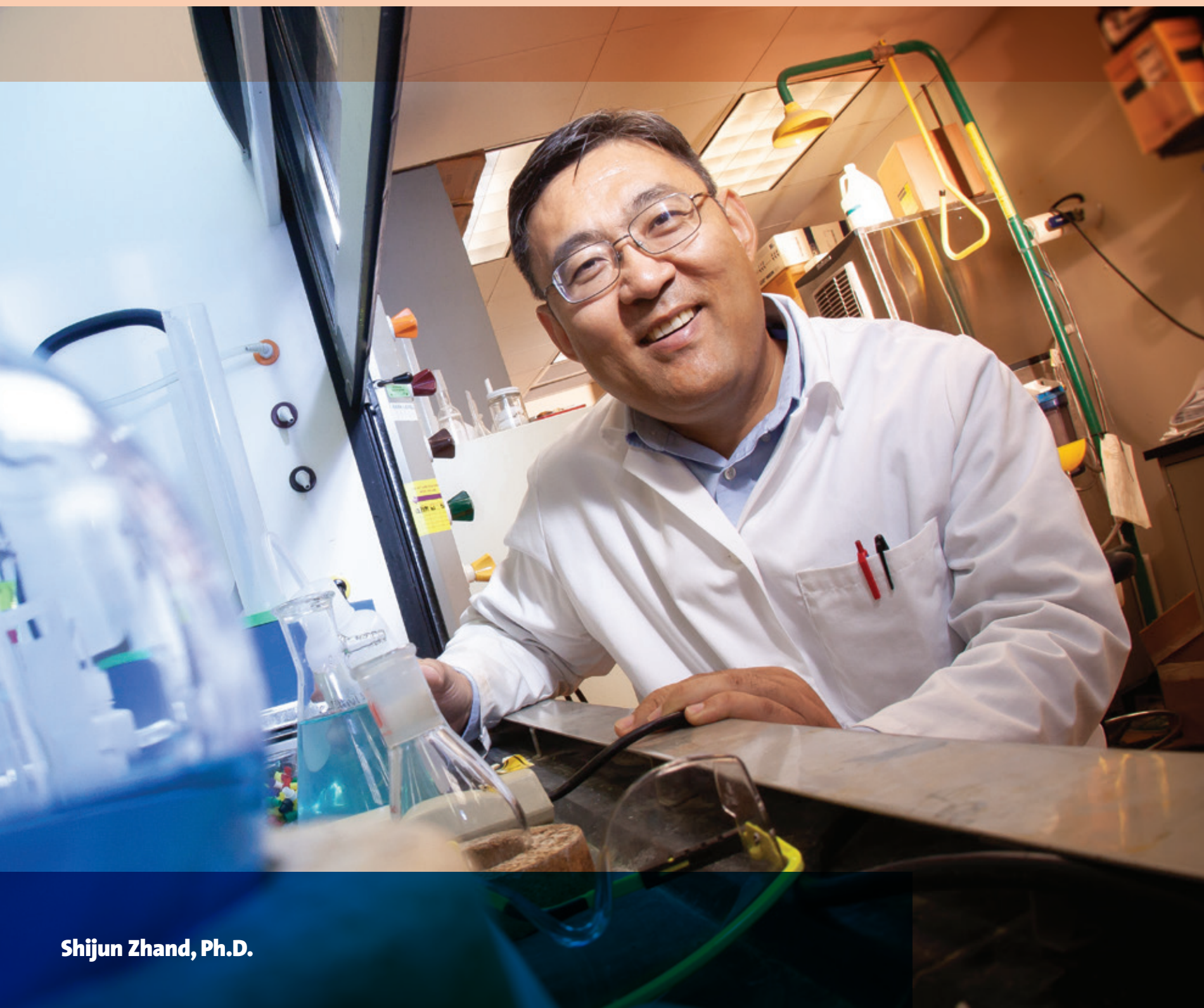
Ware and her colleague John Henry Blatter, an immersive installation artist, recently recorded a 220-degree video of her performing a standard plié combination for her Ballet Technique Level 1 course. Simple hand gestures helped students adjust to the first-person perspective before attempting more complicated moves. To grade performances, she slipped into their virtual shoes and embodied them.

"Students who lacked confidence suddenly commanded the space. I saw traditionally rigid dancers, embrace ideas of breath and flow that would take years to teach," Ware said.

While effective, this unique narrative dance experience wasn't designed entirely as a practice tool for the performance arts. The team sees boundless implications in sports or music instruction, such as students attempting to mirror a golf or baseball swing, or their chord progression on a piano.



A New Hope in the Fight Against Alzheimer's Disease



Shijun Zhang, Ph.D.

“Alzheimer’s disease is a devastating disease that desperately needs effective treatments to help the patients and their caregivers. Our technology will provide a new direction in developing novel compounds to fight this disease and VCU Innovation Gateway has been extremely helpful in securing the IP and promoting our technology along the journey.”

Shijun Zhang, Ph.D.
Associate Professor
Department of Medicinal Chemistry
School of Pharmacy

More than five million Americans are affected by Alzheimer’s disease, the leading cause of dementia. Many experts even predict those numbers to skyrocket in the coming years. As of now, the disease is irreversible, and current treatments only offer symptomatic relief. While there is no known cure, there is a new reason for hope.

Dr. Shijun Zhang has designed a hybrid compound of melatonin and curcumin to take on neurodegenerative disorders such as Alzheimer’s, multiple sclerosis and traumatic brain injuries. Specifically, his team created an inhibitor to block NLRP3 that causes inflammation of the nerve tissues.

Neuro-inflammation is a key symptom of Alzheimer’s disease and Zhang’s work has already shown to halt further swelling, potentially regulating one of the most prominent risk factors associated with the disease.

Zhang’s team is simultaneously working to overcome the limits of traditional single-target treatments. So far, these novel compounds are reported to address multiple risk factors at once for added neuroprotection, cell survival, improved absorption and reduced toxic side effects.

Machine Learning: Algorithms for Success

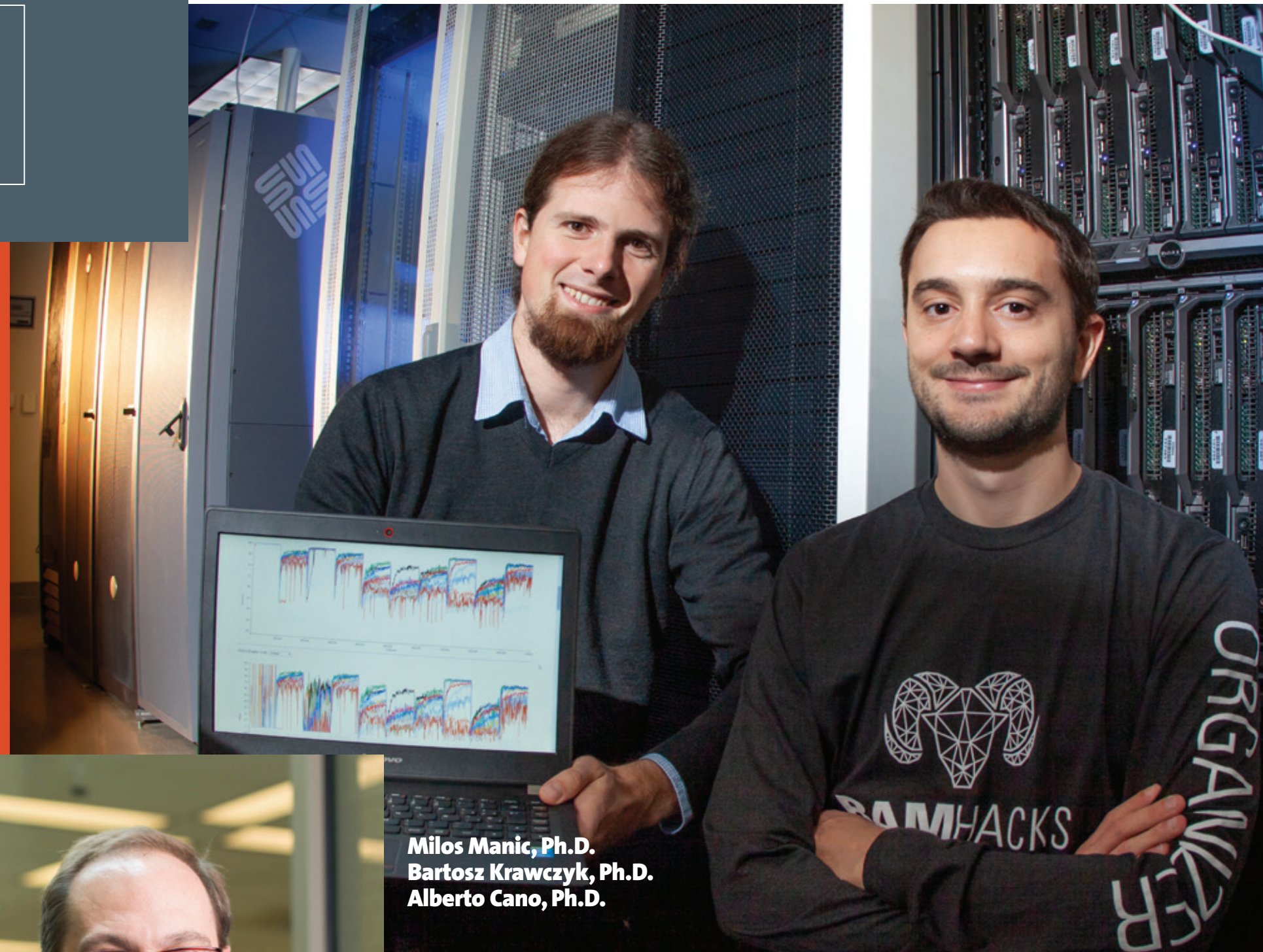
When it comes to decision-making, VCU researchers are teaching computers to take humans out of the equation. Machine learning enables computers to make smarter, faster choices on the fly. But don't get the wrong idea. This isn't to take over the world; it's to better work with it. Across campus, humans in computer science laboratories still provide the real brain power behind some of the industry's most recent advancements in machine learning.

Milos Manic, Ph.D., professor in VCU College of Engineering's Department of Computer Science, says humans and machines are already so interconnected that "everything is talking to everything." His work in artificial intelligence (AI) is ultimately designed with people in mind, from bolstering national cybersecurity to improving the efficiency of a building's energy. Manic is director of VCU's Modern Heuristics Research Group, which uses computer intelligence to drive immersive experiences that help users virtually step into their own 3D data sets for a closer look at a problem.

Bartosz Krawczyk, Ph.D., assistant professor of computer science, heads VCU's Machine Learning and Stream Mining lab. His research is focused on designing algorithms to mine and analyze high-speed data streams more accurately. He and his team are developing new machine learning methods that can autonomously improve their own performance and adapt to changes and novel patterns in incoming data.

Alberto Cano, Ph.D., assistant professor of computer science, heads VCU's High Performance Data Mining lab. His research is focused on designing fast, efficient and accurate algorithms capable of scaling to big data and huge collections of information. He and his students have developed new machine learning methods for high-performance computing platforms that can extract knowledge from terabyte-size databases in academia and industry.

Acknowledging that these technologies raise questions about how much to trust machines to do the right thing, these researchers emphasize that machines are as smart as you make them. Modern algorithms learn, act, improve themselves and are even capable of explaining their actions. "In the upcoming decade, machine learning will blend seamlessly into our daily lives," Cano said.



Milos Manic, Ph.D.
Bartosz Krawczyk, Ph.D.
Alberto Cano, Ph.D.

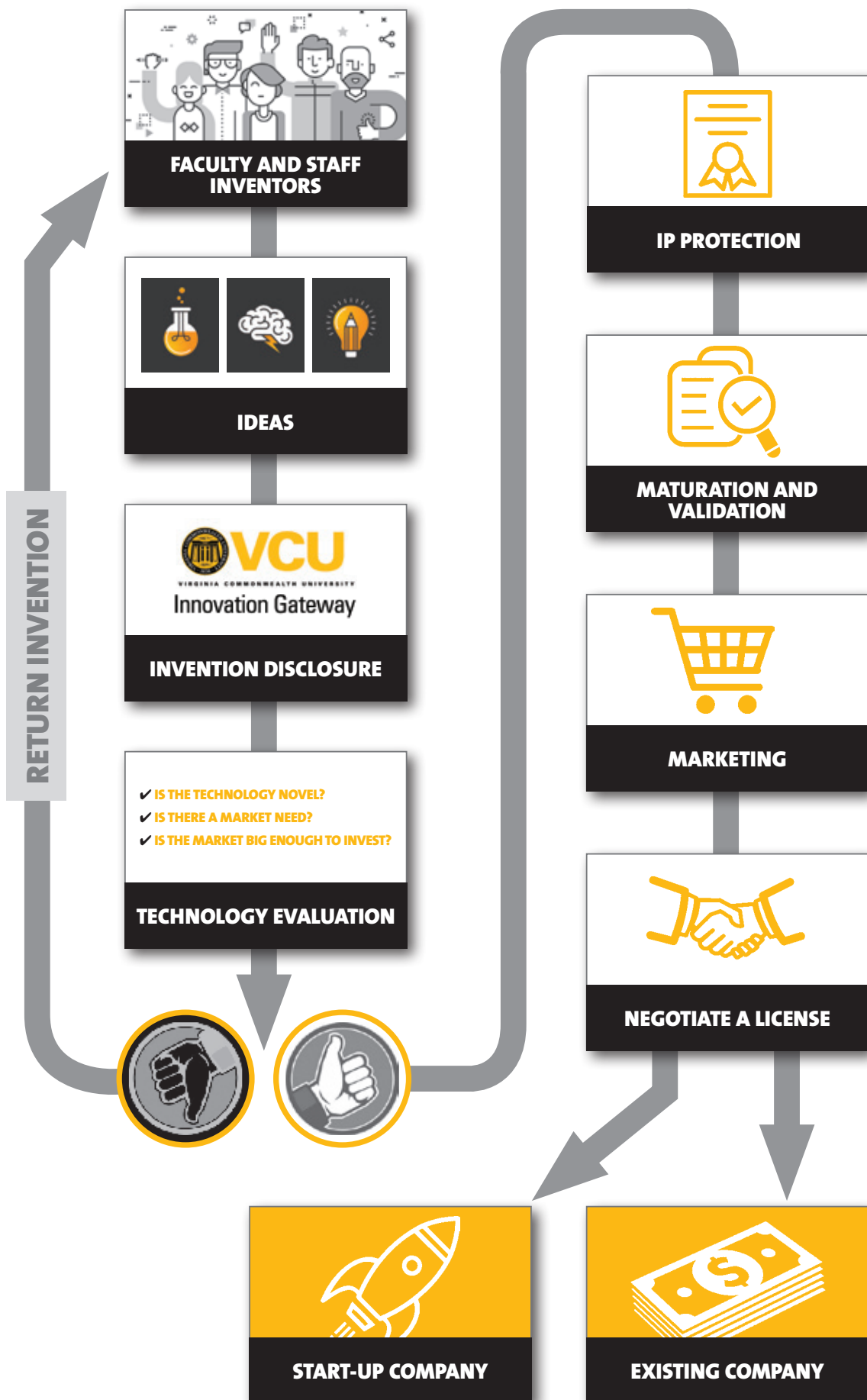
"Humans and machines are already so interconnected that "everything is talking to everything"

Milos Manic, Ph.D.
Professor
Department of Computer Science
College of Engineering

"In the upcoming decade, machine learning will blend seamlessly into our daily lives"

Alberto Cano, Ph.D.
Assistant Professor
Department of Computer Science
College of Engineering

The VCU Technology Transfer Process



VCU Innovation Gateway Team

Standing from left:

- Ann Boelzner
- Blaize Majdic
- Ivelina Metcheva
- Michael Mancini
- Livia Horton

Sitting from left:

- Afsar Mir
- Brent Fagg
- Magdalena Morgan



VCU

Innovation Gateway

Office of Research and Innovation

Non-profit Organization
U.S. Postage Paid
Permit Number 869
Richmond, Virginia

800 East Leigh Street, Suite 3000
P.O. Box 980568
Richmond, VA 23298-0568
<https://innovationgateway.vcu.edu/>
(804) 828-5188



VCU Commercialization Advisory Panel

Geoffrey D. Beecher
Mid Atlantic Sales Manager
Focal Therapeutics

Reinhold Brand
Industry Expert

Kevin Corby
Industry Expert

Alex Euler
Investment Director
CIT Gap Fund

Anthony Fung
CEO
GovInsight

Jeffrey M. Gallagher
CEO
Virginia Bio

Tracey Greene
Founding Executive Director
Charlottesville Angel Network

Laura Markley
Director of Investments
NRV

Kevin Passarelo
Shareholder
Buchanan Ingersoll & Rooney PC

Carrie Roth
President / CEO
Virginia Bio+Tech Park

Dennis Schafer
Director
Life Science Management

William Weber
Industry Expert

Vida Williams
Innovator in Residence
VCU da Vinci Center