ANNUAL REPORT

Bringing Ideas to Life

16

VCU Innovation Gateway

VIRGINIA COMMONWEALTH UNIVERSITY

Bringing Ideas to Life 16

Annual Report

COVER PHOTO:
DISTILLATION APPARATUS

Mission

To facilitate commercialization of university inventions; to foster a culture of innovation and entrepreneurship at the university; and to promote regional economic development and new venture creation.

LinkedIN: VCU Innovation Gateway

Facebook: VCU Innovation Gateway

Twitter: @VCUInnovation

Design: BN Design & Advertising
Photography: Karl Steinbrenner

Dear Colleagues and Friends,

2016 was a remarkable year for the VCU Innovation Gateway as we endeavored to bring a world-class recognition and value to VCU and its inventors. Among this year's achievements were a record-breaking number of invention disclosures, which grew by 40%. Our numbers were uniformly up across the board including royalties, licensing deals, patent applications, collaborations and industry engagements.

In January 2016, a new VCU-invented product reached market – Vanguard Cr Lyme, a Lyme disease vaccine for dogs, manufactured and sold by Zoetis. This product was developed as a result of a sponsored research by the company in Dr. Richard Marconi's laboratory. This is the only product on the market that provides a full protection against all predominant strains of Lyme disease in North America and Europe. And this collaboration between VCU and the company continues - for the development of vaccines for other parasite-inflicted diseases.

One of the most noteworthy successes in the past year was that a VCU start-up company, Sanyal Biotechnology, was selected as one of the Best University Start-ups in the country and invited to present at the US Congress in Washington, D.C. In this annual report, you will learn more about Sanyal Biotechnology and its founder, Dr. Arun Sanyal. The company was launched as a result of our Entrepreneur-in-Residence program; it was incubated in and graduated from the Virginia BioTechnology Research Park and it is a telling example of the close collaboration between VCU and the Park.

Another remarkable accomplishment was the establishment of the Quest Commercialization Fund. Over the last three years, VCU Innovation Gateway facilitated the successful applications for more than 20 proof-of-concept grants that brought up to VCU researchers close to $1.4 million in funding. This success led to the creation of the Quest Commercialization Fund established by President Rao. This VCU fund supports faculty projects in the range of $15,000 to $50,000. The goal is to de-risk the inventions and to make them available quicker to the public in the form of new products or services. This past year, 9 projects were funded for a total of $300,000. One of the funded projects is highlighted in this report.

During the year, we continued to build our strategic industry engagement program to enhance technology commercialization. This program focusses on active marketing of the university research assets and capabilities to attract industry partners at the early stages of the innovation cycle. We had a record number of industry meetings – 40, which is more than 100% increase over the last year. This program has proven very successful in diversifying the funding sources for VCU researchers and it has generated a substantial value to VCU by spawning collaborations, sponsored research, licensing activities and new venture creation.

VCU is an integral part of the regional innovation system. The Innovation Gateway continues to partner with the Virginia BioTechnology Research Park and its Innovation Council to increase entrepreneurial activities in RVA and to support the economic growth in our region.

We are grateful to the members of the VCU Commercialization Advisory Panel for their help with designing commercialization strategies, identifying potential licensees, industry partners, and investors. We are grateful to our talented VCU inventors – faculty, staff and students who are willing to tackle problems and work tirelessly to find solutions. Their innovations reflect VCU's commitment to the community and the world.

Sincerely,

Francis L. Macrina, Ph.D.
Edward Myers Professor of Dentistry and
Vice President for Research and Innovation

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

16 FISCAL YEAR AT A GLANCE

2.3 Million Licensing revenues

133 Invention disclosures

18 Licenses/ Options

58 Research support agreements

4 Start-ups

157 Patents filed

13 Patents issued

40 Industry engagements

DEPARTMENTS WITH TEN OR MORE INVENTION DISCLOSURES

14	Biomedical Engineering
19	Mechanical and Nuclear Engineering
11	Chemical and Life Sciences Engineering

DEPARTMENTS WITH FIVE TO NINE INVENTION DISCLOSURES

6	Chemistry
5	Electrical and Computer Engineering
9	Internal Medicine
7	Radiation Oncology
9	Human Genetics

11	College of Humanities and Sciences
2	Massey Cancer Center/ VCU Medical Center
3	School of Allied Health Professions
2	School of Business
3	School of Dentistry
2	School of Education
48	School of Engineering
54	School of Medicine
1	School of Nursing
17	School of Pharmacy
1	School of Social Work
1	Wilder School of Government and Public Affairs
1	Research and Education
1	VCU Life Sciences

VCU PATENTS

9/2/15 — Patent No. 2309849

M. Ross Bullock M.D.
Bruce Spiess M.D.
Deborah P. Thompson

Method Of Treating Traumatic Brain Injury

10/6/15 — Patent No. 9,150,581

Frank Carroll Ph.D.
Pauline Ondachi Ph.D.
Hernan A. Navarro Ph.D.
M. Imad Damaj Ph.D.
James H. Woods Ph.D.
Emily M. Jutkiewiz Ph.D.

Nicotinic Receptor Compounds

11/25/15 — Patent No. 2276879

Gary L. Bowlin Ph.D.
David G. Simpson Ph.D.
James R. Bowman Ph.D.
Stephen W. Rothwell Ph.D.

Electrospun Dextran Fibers and Devices Formed Therefrom

2/2/16 — Patent No. 9,248,174

Jason A. Carlyon Ph.D.

OmpA as a Vaccine/Diagnostic Target for Anaplasma Phagocytophilum and Other Anaplasmataceae Pathogens

2/16/16 — Patent No. 9,260,473

Shijun Zhang Ph.D.
Tai Liang Guo Ph.D.

Bivalent Multifunctional Ligands Targeting AB Oligomers, Oxidative Stress, Biometals and Cell Membrane/Lipid Rafts as Potential Treatment Agents for Alzheimer's Disease

3/1/16 — Patent No. 9,271,738

Kevin R. Ward M.D.
Mark Licata Ph.D.

Device for Control of Difficult to Compress Hemorrhage

3/15/16 — Patent No. 9,283,244

Devanand Sarkar Ph.D.
Paul B. Fisher Ph.D.

Treatment of Cancer by Inhibiting Activity of Expression of Late SV-40 Factor

4/12/16 — Patent No. 9,308,414

Peter E. Pidcoe Ph.D.
Jessica C. Bradford Ph.D.

Elliptically Based Robotic Gait Trainer (EBRGT)

4/26/16 — Patent No. 9,321,802

Shunlin Ren M.D. Ph.D.
William M. Pandak Ph.D.

Nuclear Sulfated Oxysterol, Potent Regulator of Lipid Homeostasis, for the Therapy of Hypercholesterolemia, Hypertriglycerides, Fatty Liver Diseases and Atherosclerosis

6/14/16 — Patent No. 9,364,551

Matthew Hartman Ph.D.
Martin M. Dcona Ph.D.
Deboleena Mitra Ph.D.

Light-Enabled Drug Delivery

6/14/16 — Patent No. 9,364,183

Jacob Park
Matthew Standard
Dianne Pawluk Ph.D.
Linda Thurby-Hay Ph.D.
John Clore M.D.
Amber Spain Ph.D.

Haptic Glucometer Guide

6/28/16 — Patent No. 9,376,472

Richard T. Marconi Ph.D.
Christopher Earnhart Ph.D.

Polyvalent Chimeric OspC Vaccinogen and Diagnostic Antigen

6/28/16 — Patent No. 9,379,162

Supriyo Bandyopadhyay Ph.D.
Jayasimha Atulasimha Ph.D.
Ayan K. Biswas Ph.D.

Magneto-Elastic Non-Volatile Multiferroic Logic and Memory with Ultralow Energy Dissipation

The Billy R. Martin Innovation Award

Fighting Lyme Disease

Ticks are a huge concern for humans and animals alike. They bite, burrow and breed before we know it. They are also highly sophisticated little Lyme disease factories. Fortunately, for food sources like us and our pets, VCU's newest Inventor of the Year has them in his sights.

Richard Marconi, Ph.D., professor of microbiology and immunology at the VCU School of Medicine, has developed a multipronged vaccine that affords a targeted attack at Borrelia burgdorferi that causes Lyme disease. The vaccine blocks transmission and triggers antibodies that eliminate the chances of causing the disease in the first place. The unique design of the vaccine suggests it is the most effective product of its kind on the market.

"The best approach to minimizing disease in canines as well as in humans is to block infection in the first place," said Marconi. The vaccine developed in his lab at VCU has been exclusively licensed by Innovation Gateway to an industry partner for use in dogs. Now, with a 97 percent success rate in dogs, a human vaccine isn't far behind.

The great majority of the Lyme disease cases have been in the Eastern U.S., but now it is rapidly spreading to the mid-western states. The CDC estimates up to 300,000 cases in the U.S. last year.

For the development of this vaccine, Marconi was honored with the annual Billy R. Martin Innovation Award. "The recognition that this award brings serves as a motivating force that drives me and everyone in my lab to approach every day of research with excitement and commitment," Marconi said.

CARRIE ROTH, RICHARD T. MARCONI, PH.D., MICHAEL RAO, PH.D., FRANCIS L. MACRINA, PH.D., IVELINA METCHEVA, PH.D., MBA

"Dr. Richard Marconi's research celebrates the legacy established by Billy R. Martin and others who create new knowledge and constantly challenge themselves in terms of how that knowledge can be used to benefit society and the world. Like the namesake of the award, Rich embodies the pursuit of world-class research and its translation to society to improve the quality of life."

Francis L. Macrina, Ph.D.
VCU Vice President for Research and Innovation

Richard T. Marconi, Ph.D.

Jerome F. Strauss III, M.D., Ph.D.

A Breakthrough in Women's Health

Polycystic ovary syndrome (PCOS) is a relatively common genetic condition that affects almost one of every ten women of reproductive age.

The cysts in the ovaries, while not typically painful, if left unchecked, could cause hormonal imbalances leading to infertility, weight gain, an increased risk for Type 2 diabetes and heart disease.

For the most part, PCOS is difficult to diagnose, and requires a number of expensive tests before optimal treatment is prescribed. Existing therapies are focused on the individual symptoms, and not treating or even proactively pinpointing the genetic condition itself, until now.

Jerome Strauss III, M.D., Ph.D, Dean of the VCU School of Medicine, and his collaborator, Jan McAllister, Ph.D. of Penn State University, have identified a cost effective non-invasive diagnosis of the disorder. By recognizing a new diagnostic protein marker in the mouth, DENND1A, testing procedures can be administered orally, also opening the door for the development of therapeutic antibodies.

VCU Innovation Gateway has helped secure industry partners that are currently developing further both the diagnostic and therapeutic uses of this technology.

"Polycystic ovary syndrome is a major women's health concern. I am very excited that the novel diagnostic and therapy of this disease have been moved forward to clinical development with expert help from the Innovation Gateway."

Jerome F. Strauss III, M.D., Ph.D.
Dean
School of Medicine

Medicine for All: Engineering Professor Creates Affordable AIDS Drugs

The Bill & Melinda Gates Foundation puts its money behind its mission - to help those with the greatest of need. For the third year in a row, the foundation has looked to VCU's Medicine for All initiative.

Led by B. Frank Gupton, Ph.D., chair and professor of VCU chemical and life science engineering, the multidisciplinary program works to reduce the cost of AIDS drugs manufacturing, to benefit developing countries. The latest grant of $5 million was awarded for the development of more cost-effective methods to produce Dolutegravir, a new HIV/AIDS therapy.

"Our expectation is that this will become a first-line treatment. It's a new member of an old class of AIDS drugs, and it seems to be much more effective," said Gupton, Ph.D.

The foundation has previously twice funded the VCU researcher's work to bring down the cost of first-line treatments nevirapine and tenofovir, respectively. As patients develop a resistance to first-line drugs, the affordability and availability of new therapies comes into play.

Medicines for All collaborates closely also with the Clinton Health Access Initiative, Timothy F. Jamison, Ph.D., chair of the Department of Chemistry at MIT, and Brian Marquardt, Ph.D., head of the Center for Process Analysis & Control at the University of Washington.

B. Frank Gupton, Ph.D.

"The project is already making an impact in the world. We are looking to expand the program to include other pharmaceuticals important for global health."

B. Frank Gupton, Ph.D.
Chair and Professor
Department of Chemical and Life Science Engineering

Shining VCU Startup: Sanyal Biotechnology's DIAMOND Mice Help Fight Liver Diseases

One of the nation's best university startups may soon have a serious mouse problem: keeping up with the demand for their special DIAMOND mice.

Sanyal Biotechnology, launched in 2015, was one of the finalists to present to Congress at 2016 DemoDay, an event in Washington D.C. to recognize promising new university ventures and raise awareness of the importance of biotech research. The company was a product of the Entrepreneur-in-Residence program that Innovation Gateway implemented as one of a series of initiatives to support entrepreneurship and startup creation at VCU.

Sanyal Biotechnology originated from the ground-breaking research by Arun Sanyal, M.D., professor in the VCU School of Medicine and president, chair and chief medical officer of Sanyal Biotechnology. The company breeds mice called DIAMOND, an acronym for Diet Induced Animal Model of Non-alcoholic fatty liver Disease. DIAMOND mice develop liver disease similar to that found in obese humans, due to high-fat, high-sugar Western diets. The mice are modeled specifically to form a liver condition known as NASH, or non-alcoholic steatohepatitis. NASH is a leading cause of liver-related mortality and can lead to cirrhosis of the liver and liver cancer, for which there's no cure. Since the DIAMOND mice already have advanced liver problems, pharmaceutical companies can better test and understand faster how their drugs perform on people.

Dr. Rebecca Caffrey, CEO of Sanyal Biotechnology, said "As an Entrepreneur- in-Residence, I was charged with identifying start-up opportunities based on faculty inventions. I worked side-by-side with the Innovation Gateway team and interacted with a plethora of talented researchers. Dr. Sanyal's invention addresses a giant unmet market need and could help cure millions of patients."

"The lack of appropriately validated pre-clinical models is a major barrier to development of effective therapies and we are very hopeful that this model will remove this barrier and accelerate drug development for those afflicted with this disease."

Arun Sanyal, M.D.
Professor
Department of Internal Medicine

Arun Sanyal, M.D.

Aerogels- The Shape of Things to Come

The Persian Gulf-states scorching temperatures could not deter two scientists from pioneering new ways to keep the region cool. Massimo Bertino, Ph.D., associate professor of physics and Khaled Saoud, Ph.D., assistant professor of physics in the Liberal Arts & Sciences Department VCU-Qatar have developed a method of faster, larger and stronger aerogel production, which could lead to many uses including thermal insulation that reduces energy consumption.

“Our technology is the result of many years of hard work including a number of students, with whom I had the privilege to work” Dr. Massimo Bertino said.

The team was supported by the Qatar National Research Fund to develop cost-effective, scalable procedures for fabricating custom-shaped aerogels—ultra-light, highly porous, thermally insulating materials. Aerogels are mechanically fragile, so their adoption has been slow and generally limited. As it turns out, their sophisticated molding technology has yielded results that are twice as tough as Kevlar, with a production process that cuts costs in half.

Aerogels are now being considered for aerospace purposes, acoustic and shock insulation, environmental absorbents, as well as structural applications for architectural and engineering industries.

“We are now moving into commercialization and VCU Innovation Gateway’s functions are critical for our success.”

Massimo Bertino, Ph.D.
Professor
Department of Physics
VCU College of Humanities and Sciences

A Microchip Takes on a Mountain of Evidence

Forensic scientists are seeing big possibilities through tiny lenses. Tracey Dawson-Cruz, Ph.D., associate professor with the Department of Forensic Science, knows just how critical this work can be both for law enforcement and victims. Her team was awarded a grant from the VCU Commercialization Fund to develop and test a device that automates and expedites the processing of sexual assault evidence samples.

Currently, the backlog of sexual assault kits in the U.S. alone exceeds 400,000. With forensic labs able to provide data in less time and at less cost, the backlog in samples awaiting testing can be significantly reduced, avoiding critical delays in crime solving and prosecution.

This new microchip technology has the potential to change the way backlogged evidence information from sexual assault kits is analyzed and reported. “We were able to assemble a first-class team of chemical engineers, forensic scientists, molecular biologists, and micro-chip experts to develop this novel technology.” Dawson-Cruz said.

The Commercialization Fund is part of the VCU Quest Innovation Fund, which supports university inventions with up to $50,000 per project to improve their chances of commercialization. A total of $300,000 was awarded in the 2016-17 academic year.

“The VCU Commercialization Fund provides vital proof-of-concept funding that is crucial for bringing university inventions closer to commercialization.”

Tracey Dawson Cruz, Ph.D.
Associate Professor and Graduate Director
Department of Forensic Science

Tracey Dawson Cruz, Ph.D.

VCU Innovation Gateway Team

From Left to Right:

CINDY STRAIN
TRISHA MASSENZO
SUE PATOW
AFSAR MIR
CHRISTINE JEFFERSON
IVELINA METCHEVA
ZENA SINGH
BRITLIN O'SHEA
MAGDALENA MORGAN
RACHEL BEACH
AYANA SCOTT
LIVIA HORTON

VCU Commercialization Advisory Panel

David R Beauregard
Managing Director and Founder
Monument Square Advisors, LLC

Geoffrey D. Beecher
Mid Atlantic Sales Manager
Focal Therapeutics

L. Franklin Bost
Executive Associate Dean
VCU School of Engineering

Reinhold Brand
Industry expert

Brian Carney
Principal
Harbert Venture Partners

Rene Castro
Sr. Vice President
Corporate Strategy and
Business Development
McKesson Medical Surgical

William H. Daughtrey
Industry expert

Alex Euler
Investment Director
CIT Gap Fund

James Fort
Associate Director
Pain Management
Product Development
Pfizer Consumer Health

Jeffrey M. Gallagher
CEO
Virginia Bio

Mike Grisham
President and CEO
VBHRC/ The Catalyst

Michael Innes
Managing Director
Cary Street Partners

Mike McGinley
Managing Partner
New Dominion Angels

Eric Martin
Founding Partner
8oamps

T. Justin Moore, III
Partner
Hunton and Williams

Todd Nuckols
VP of Business Development
EnterBridge Technologies

Neil Patel
Sr. Vice President
Content Strategy & Development
The Martin Agency

Carrie Roth
President/CEO and
Executive Director
Virginia BioTechnology
Research Park

Dennis Schafer
Life Science Management

Laura Markley
Director of Investments
NRV

Mike Whitham
Patent Attorney
Whitham, Curtis & Cook

Sandy Williamson
Chairman
CapTech

Spencer Williamson
President and CEO
Kaleo

VCU Innovation Gateway
VIRGINIA COMMONWEALTH UNIVERSITY

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
www.research.vcu.edu/ott
(804) 828-5188