ANNUAL REPORT

Bringing Ideas to Life

10

VCU TECH TRANSFER

Virginia Commonwealth University

Bringing Ideas to Life

10 Annual Report

Cover Photo:

Electrospinning the basic components of the FASTCLOT™ hemostatic bandage

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Mission

VCU Tech Transfer's mission is to foster a culture of innovation at the university and to protect and commercialize inventions created by the VCU research enterprise for the benefit of society.

Vision

VCU Tech Transfer's vision is to bring world-class recognition and value to VCU and its members through commercialization of intellectual property developed at the university.

Dear colleagues and friends,

Research, by its very nature, is a collaborative process, although that has not always been the case. Over the centuries, research had been a solitary undertaking. Images of a lone scientist toiling in an isolated laboratory come to mind.

But this has changed, and innovation is the better for it. Today, we recognize that the act of discovery is enhanced by tapping the talents, insights and acumen of a cross-section of researchers. In all manner of endeavor – scientific and technological, in business and education – collaboration is providing greater direction, focus and clarity in unlocking new discoveries and breakthroughs.

This past year underscored the exponential power of working together. In the office of research and in Tech Transfer specifically, our emphasis on building effective partnerships is paying dividends. Within the university itself, there are strong interdisciplinary alliances where researchers from disparate fields are collaborating on bold new initiatives. We continue to build bridges to the business community, tapping the resources of entrepreneurs, venture capitalists and angel investors. These relationships are vital in helping bring VCU-spawned inventions to the marketplace and creating new ventures and quality jobs in the region.

We are deeply grateful for the wisdom and counsel we receive from our board of directors. The university's support also has been tremendous. The interview with Dr. Michael Rao in this report shows that this support starts right at the top. The VCU president's commitment to research and technology commercialization will help propel us to the top tier of the country's innovative public research universities.

We are proud of our successes, and in the pages to follow are some extraordinary examples of innovations that have been conceived at Virginia Commonwealth University. They reflect

the diverse range of exploration taking place across research disciplines in the university community as well as the different phases of an invention's life cycle – from the spark of an idea to its commercial application.

Most of all, they represent the achievements of work undertaken together.

For all the work that lies at the foundation of these partnerships, we offer our sincere gratitude and appreciation,

Francis L. Macrina, Ph.D.
Vice President for Research

Ivelina Metcheva, Ph.D., M.B.A
Director, VCU Tech Transfer

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FISCAL YEAR AT A GLANCE

Licensing Revenues	$1,077,477
Invention Disclosures	101
License Agreements	13
Other Research Support Agreements	12
Patents Filed	106
Patents Issued	9
Material Transfer Agreements	167
Non-Disclosure Agreements	62

DEPARTMENTS WITH 10 OR MORE INVENTION DISCLOSURES

Emergency Medicine
Internal Medicine
Medicinal Chemistry

DEPARTMENTS WITH 5-9 INVENTION DISCLOSURES

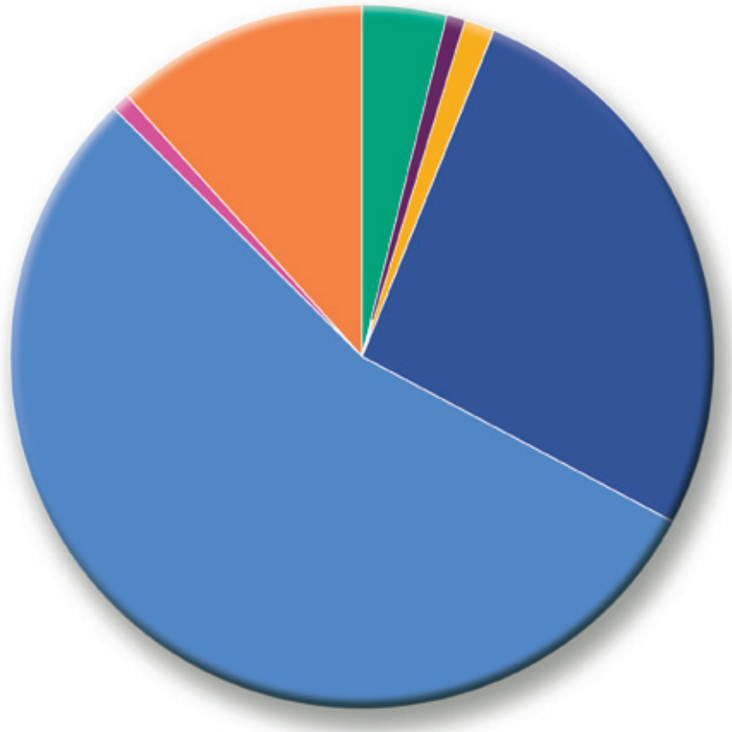
Biomedical Engineering
Chemical and Life Science Engineering
Chemistry
Computer Science
Electrical and Computer Engineering
Human and Molecular Genetics
Mechanical Engineering
Microbiology and Immunology
Pharmacology and Toxicology
Surgery

VCU PATENTS ISSUED

Issue Date	Patent No.	VCU Inventors	Title
08/10/2009	CA 2,353,962	Richard A. Glennon, Ph.D.	Selective 5-HT6 Receptor Ligands
08/25/2009	US 7,579,373	Nicholas P. Farrell, Ph.D. John D. Roberts, M.D. Alexander Hegmans, Ph.D.	Targeted Bisplatinum Polyamines as Pro-Drugs: Selective Release of Platinum
10/13/2009	US 7,601,739	Richmond Danso-Danquah, Ph.D. James C. Burnett, Ph.D. Donald J. Abraham, Ph.D.	Compounds Having Antiestrogenic and Tissue Selective Estrogenic Properties, and Compounds with Anti-Androgenic Properties for Treatment of Prostate Cancer and Androgen Receptor Dependent Diseases
10/27/2009	US 7,610,153	Chris Gennings, Ph.D. Margaret Shih, Ph.D. W. Hans Carter, Jr., Ph.D.	Multi-Drug Titration and Evaluation
11/10/2009	US 7,615,373	David G. Simpson, Ph.D. Gary L. Bowlin, Ph.D. Gary E. Wnek, Ph.D. Marcus E. Carr, Jr., M.D., Ph.D. Jamil A. Matthews, M.D.	Electroprocessed Collagen and Tissue Engineering
11/30/2009	US 7,616,771	Martin L. Lenhardt, Au.D., Ph.D.	Acoustic Coupler for Skin Contact Hearing Enhancement Devices
05/04/2010	US 7,709,257	John G. Tew, Ph.D. Mohey Eldin El Shikh, Ph.D.	Models for Vaccine Assessment
06/01/2010	US 7,727,558	Raphael Ottenbrite, Ph.D.	Polymeric Delivery Agents and Delivery Agent Compounds
06/01/2010	US 7,727,225	William C. Broaddus, Ph.D.	Coaxial Catheter Systems for Transference of Medium

College of Humanities and Sciences	6
School of Allied Health Professions	1
School of Dentistry	2
School of Engineering	39
School of Medicine	80
School of Nursing	1
School of Pharmacy	17

DISTRIBUTION OF INVENTION DISCLOSURES



The Billy R. Martin Innovation Award

The 2010 Billy R. Martin Innovation Award was presented to Kevin R. Ward, M.D., in recognition of his pioneering work in developing a wide range of novel and significant inventions vital to the care of critically ill and injured patients. Dr. Ward is professor and associate chair of VCU's Department of Emergency Medicine, where he also serves as a director of research. He is also a founder and senior fellow at the VCU Reanimation Engineering Science Center (VCURES), a multidisciplinary team of researchers which includes investigators from 30 departments and the majority of VCU's schools and colleges.

As one of VCU's most prodigious inventors, over the past decade Dr. Ward has generated more invention disclosures (65), patent applications (121), and licensed inventions (13) than any other VCU researcher or inventor. Among his inventions are: a modified Raman spectroscopy method for measuring oxygen levels in tissue; a noninvasive monitor of central venous pressure; a device to prevent ventilator-induced pneumonia; and numerous haemostatic methods.

Dr. Ward has played a vital role in helping harness the expertise and innovation from the cross-section of researchers within VCURES. He has nurtured and accelerated their work resulting in further development and commercialization of intellectual property. Dr. Ward states "the motto of VCURES is *Restoring Life through Innovation and Collaboration*. The challenges of improving outcomes in critical illness and injury, especially in the area of combat casualty care, require a team approach. VCU is so rich in expertise and collaborative spirit that it is possible to make science fiction a reality. This award is really an award to the entire VCURES enterprise."

In presenting the award with VCU's president Dr. Michael Rao, vice president for research Dr. Francis Macrina commended Dr. Ward's "amazing intellect, vast curiosity and incredible energy," noting that his inventions "are a credit to not only his intellect, but to his leadership and, above all, his commitment to saving lives."

Kevin R. Ward, M.D.

"I have worked with physician scientists who drive innovation and create great inventions all over the world throughout my long career in medical products development and launches. It is rare to find someone with the instincts and ability that Kevin has demonstrated in developing ideas, motivating people and building multidisciplinary teams to translate clinical needs into practical product solutions with real commercial value. As an 'IP engine' he is remarkably creative, collaborative and a real asset to the field and the university."

— **Donna J. Edmonds**
CEO and President
Virginia Biosciences Commercialization Center

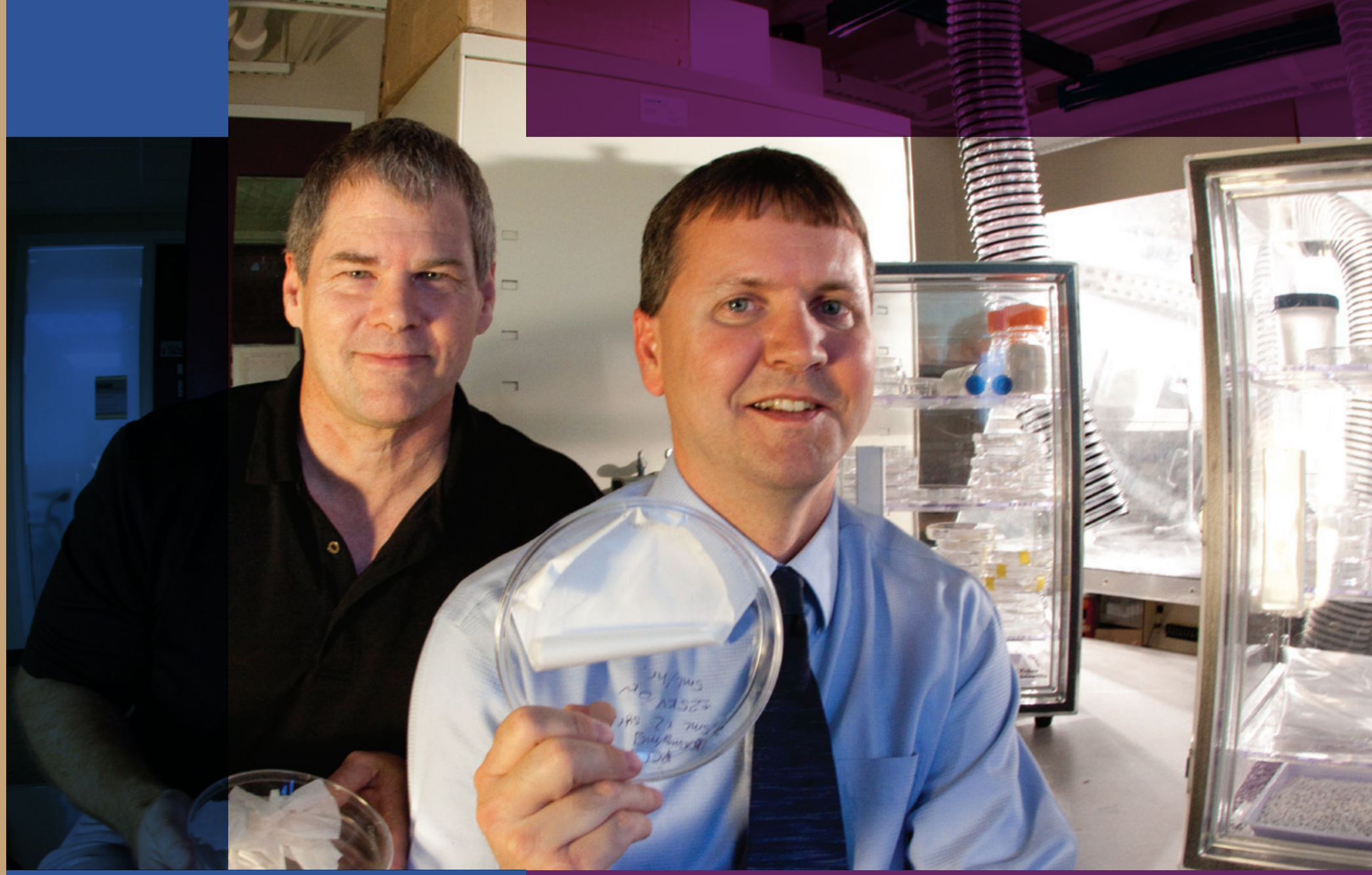
"Our partnership began after Gary and I were introduced to each other by VCU Tech Transfer soon after I arrived at VCU in 1998," Dr. Simpson said. "Given our disparate backgrounds, we bring a different set of perspectives and knowledge base to our research and that collaborative thinking has helped unlock much of the innovation that we've created together."

David Simpson, Ph.D.
Associate Professor
Department of Anatomy and Neurobiology

"Licensing this exciting technology through VCU Tech Transfer was a very efficient process, involving the inventors in all aspects from the initial invention disclosure, patent application, marketing and finally license negotiation. We now look forward to additional trials, FDA approval, and field/clinical use of the first product line."

Gary L. Bowlin, Ph.D.
Professor
Department of Biomedical Engineering

From left to right:
David Simpson, Ph.D.
Gary L. Bowlin, Ph.D.



Hemostatic Bandage

Breakthrough in staunching blood flow in wounds holds promise for military

You might call David Simpson and Gary Bowlin blood brothers. Or more to the point, the two researchers - Dr. Simpson from the VCU medical school and Dr. Bowlin from engineering –are working to staunch the flow of blood from open wounds.

The long-time collaborators have invented a new bandage that not only curtails blood which is actively gushing from arterial wounds as large as six millimeters in diameter, but also accelerates the healing process. In fact, apply the hemostatic bandage directly to a wound, and the blood starts clotting instantaneously.

The idea for the bandage grew out of work the researchers were doing in electrospinning, a process which uses an electrical charge to draw very fine fibers from a liquid. They eventually developed a way to apply the body's natural clotting agent fibrinogen, along with the sugar dextran for bulk, into a bandage. The process is not unlike the way cotton candy is made. The VCU researchers collaborated with Dr. Stephen Rothwell of the Walter Reed Army Medical Center to test and refine the bandage.

The new invention has been licensed by St. Teresa Medical Inc., a start-up medical device company. The St. Paul, Minnesota-based company plans to launch the bandage under the FASTCLOT™ name into military and civilian trauma markets.

Q & A WITH
Dr. Michael Rao

VCU Tech Transfer: Dr. Rao, in your discussions with the faculty, students and staff, you have talked about the importance of VCU's research enterprise. Why is the commitment to research so important for VCU and how are you trying to strengthen it?

Dr. Rao: VCU's research programs have grown impressively over the past decade. VCU's stature as a first-class academic institution is directly linked to the quality of our research efforts. We must continue to nurture research within VCU and to integrate it into our educational mission. This integration fosters discovery-based learning which enhances the quality of the education students receive at VCU. It engages both students and faculty and adds value that can only be achieved at a research university. Perhaps most important, our graduates enter the workforce well-prepared to make innovative, high-impact contributions in their chosen fields. A key strategy in strengthening VCU's research is to promote interdisciplinary collaboration and include as much of the VCU community as possible in the enterprise. It has become clear that major advances in knowledge frequently come from the innovative efforts of collaborative teams. We are working to promote a culture that encourages and rewards collaborative research.

VCU Tech Transfer: When it comes to supporting innovation, what is your long-term vision for the university?

Dr. Rao: We have an obligation to turn research results into marketable products and quality, high-paying jobs. Therefore, I am continually striving to instill in my colleagues a true appetite for discovery and innovation. Innovation is a major theme in our efforts to recalibrate VCU's strategic vision in the VCU 2020 plan. My vision is for VCU to be an ideal environment to encourage all members of the VCU community, from undergraduate students to senior faculty researchers, to actively participate and be enabled in the innovation process.

This involves creating successful outcomes from the innovation process, including dissemination of knowledge and commercialization of intellectual property to benefit society.

VCU Tech Transfer: Where does research and commercialization fit into VCU's priorities?

Dr. Rao: Our increased emphasis on research and commercialization fits ideally with the highest priorities of any vigorous urban research university. VCU has already built an extensive research infrastructure that we can capitalize on to further our research mission. A critical component of that research mission is to see that our innovative basic research results get translated into products and services that benefit our society and our community. VCU was recently honored to receive a Clinical and Translational Science Award from the National Institutes of Health to support our efforts to translate our basic medical research into therapies, treatments and products that benefit society. My priority is to make commercialization of intellectual property a major objective across the university. Our emphasis on technology commercialization will strengthen VCU's contribution to the creation of high-paying jobs in the region and the Commonwealth.

VCU Tech Transfer: Dr. Rao, before coming to VCU, you played an active role in pushing commercialization and economic development. What role do you see yourself playing in those activities here at VCU?

Dr. Rao: It is essential for the president of any urban research university to help his or her colleagues to connect the dots between learning, research, discovery, and innovation. We have to reach out and educate VCU faculty, staff and students about innovation and commercialization. We already have fairly broad participation in these processes in schools and departments across our university, but we need to continue to expand our efforts. We also must establish mechanisms to incubate promising new basic research developments so that they can mature and are attractive to potential commercialization partners. We are working to establish a "gap" fund that we will use for proof-of-concept or prototype development on our most promising VCU technologies. We need to focus priorities and resources on facilitating commercialization. It is also important to regularly measure return on investment in an economic development context.

VCU Tech Transfer: What do you see as VCU's strengths in research and development, and where do particular challenges lie?

Dr. Rao: VCU has strength in a variety of areas with cancer research and substance abuse research comprising a major part of our grants portfolio. A number of other areas also come to mind: rehabilitation; neuroscience including traumatic brain injury; molecular and behavioral genetics; cardiology; transplantation; critical care; and community projects focused on youth development, health disparities, and research ethics. We have growing strengths in energy and environmental research. Sustaining our research enterprise in an uncertain economic environment will be a major challenge. We plan to meet this challenge using multiple strategies and we are well along in preparing a strategic research plan for VCU which will guide us over the next several years. There are three important elements of that plan to help us address this challenge. The first is to promote inter-school collaborations to increase our research power and our ability to compete for funding. Second, is to place a premium on hiring the very best research- focused faculty and leaders. Third, is to continue to build and improve an infrastructure to support the needs of our multifaceted research programs.

VCU Tech Transfer: How important is the commercialization of inventions spawned at VCU to the university?

Dr. Rao: VCU is many things to many people. The university has become synonymous with excellence in so many fields – the biosciences, the arts, engineering, business, medicine. Moving higher on that list is VCU's reputation as an "innovation" university committed to discovery and creativity. Our inventors are our greatest asset and a source of pride to the university as a whole. We will continue to support and nurture their work. It distinguishes the university and for that we are all grateful. Innovation – cultivating discovery, creativity, originality and inventiveness – is among the university's core values. We will strive to establish VCU as a pre-eminent urban public research university which fosters discovery and innovation.

VCU Tech Transfer: As VCU continues to broaden its commercialization of research, what will this mean for the university's innovators?

Dr. Rao: The achievements of VCU Tech Transfer are impressive, especially in the context of a down economy. The continued growth speaks volumes about the power of innovation and VCU's commitment to research and innovation. VCU is committed to extending our resources, including funding and people to provide the best possible support to technology commercialization going forward. We will be working to secure a deeper investment in innovation. We aim to work as a team, university-wide, to identify and implement incentives that advance ideas to a point where their market value is fully realized.

VCU Tech Transfer: One of the challenges to the commercialization of new discoveries is enlisting the support of venture funding and entrepreneurs. Is there a role the university can play in attracting these valuable partners?

Dr. Rao: We need to develop an adequate infrastructure to support the creation of new companies which would provide an opportunity to commercialize nascent stage university technologies. This infrastructure would need to engage and utilize not only the resources of the university, but also of the local community including entrepreneurs, venture capital and angel inventors for the commercialization of high- value university inventions through new venture creation. We will regularly communicate with investors and entrepreneurs in order to develop their appreciation for the valuable research and discoveries at VCU and to engage their help to harvest the value of the best ideas by turning them into marketable products that cure diseases and improve quality of life.

From left to right: Michael Rao, Ph.D., Kevin R. Ward, M.D. and Francis L. Macrina, Ph.D. at the 5th annual "Invented at VCU" reception

"This project has not only been instructional for the VCU design students, who have learned a great deal about the union of style and function in fashion design, but it also has been a labor of love. We have been pleased to be able to help add some comfort and style to the lives of some very courageous kids."

Kristin Caskey
Associate Professor
Department of Fashion Design and Merchandising

Karen Videtic
Professor
Department of Fashion Design and Merchandising

From left to right:
Karen Videtic
Kristin Caskey

Ask for Comfort

Fashion solution for kids with cancer

Children being treated for cancer at the VCU Medical Center can forget about having to wear those unsettling – and downright ugly – tie-in-the-back hospital gowns. Instead, young oncology patients are outfitted with a new line of stylish and comfortable clothing. Made with extra soft material, the garments have been specially designed with openings in all the right places, making it easier for the children to receive medication and chemotherapy without having to take anything off.

Three years in the making, the Ask for Comfort clothing line began in Kristin Caskey's fashion design class. Development of the clothing, designed with various styles and patterns, continued in the VCU student design studio and it was made possible by a grant from Cotton, Inc.

A start-up company has been created to commercialize the garments. Part of the profits from the sales will be used to support ASK, a nonprofit organization started by parents of pediatric cancer patients in Richmond, Virginia, whose mission is *Making Life Better for Children with Cancer.*

Ask for Comfort is live at
www.askforcomfort.com

"As we continue to see major changes in how healthcare is delivered in this country, we need to improve the efficiency of the physician-patient relationship. Our hope is that MyPreventiveCare will play a significant role in doing just that."

Alexander Krist, M.D.
Associate Professor
Department of Family Medicine

Alexander Krist, M.D.

Take Two and Log on in the Morning

MyPreventiveCare innovative website connects physicians and patients to forestall illness

New technologies are going a long way towards improving people's health, but now comes a technological innovation which allows patients and doctors to work more closely together to help prevent the onset of illness in the first place.

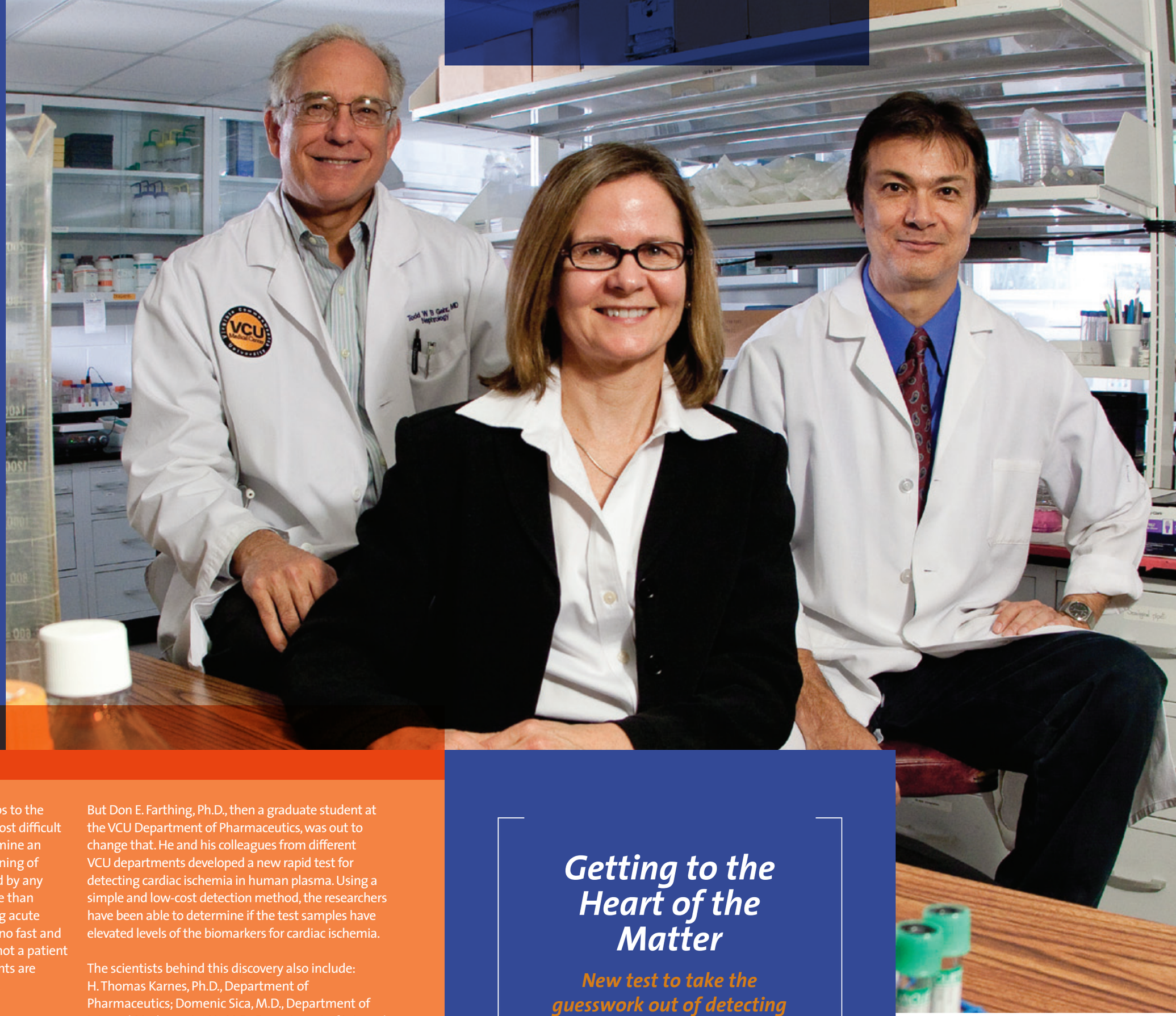
MyPreventiveCare is a web-based service that connects patients to their primary care physicians and gives them access to their electronic medical records. But that's not all. After logging in to the site, patients can find a set of preventive recommendations designed specifically for them by their doctors. There are also links to more useful information about their condition (e.g. high cholesterol, diabetes, elevated blood pressure). The site will even send out reminders to patients when they are due for tests and appointments.

The pioneering platform supported by more than $2 million in research grants was developed by physicians in the VCU Department of Family Medicine: doctors Alex Krist, Stephen Rothemich and Steven Woolf, along with their Northern Virginia collaborators. Early trials of the site indicate that MyPreventiveCare can have a positive impact not only on improving physician-patient communication, but also on patient health.

MyPreventiveCare is live at www.mypreventivecare.com.

"Our research in this area has been quite encouraging, and given the reliability and low-cost nature of the test we have developed, we are optimistic that this potentially life-saving discovery can become a standard test within emergency rooms across the country,"

Don E. Farthing, Ph.D.



From left to right:
Todd W.B. Gehr, M.D.
Lynne Gehr, M.D.
Don E. Farthing, Ph.D.

One of the most common reasons for trips to the emergency room also can be one of the most difficult to diagnose. Each year, ER physicians examine an estimated 7 to 8 million patients complaining of chest pain. Such symptoms can be caused by any number of conditions – some more severe than others, with one of the most serious being acute cardiac ischemia. Unfortunately, there is no fast and reliable test for determining whether or not a patient has cardiac ischemia, and too often patients are discharged without the proper diagnosis.

But Don E. Farthing, Ph.D., then a graduate student at the VCU Department of Pharmaceutics, was out to change that. He and his colleagues from different VCU departments developed a new rapid test for detecting cardiac ischemia in human plasma. Using a simple and low-cost detection method, the researchers have been able to determine if the test samples have elevated levels of the biomarkers for cardiac ischemia.

The scientists behind this discovery also include: H. Thomas Karnes, Ph.D., Department of Pharmaceutics; Domenic Sica, M.D., Department of Internal Medicine; Lei Xi, M.D., Department of Internal Medicine; Todd W. B. Gehr, M.D., Department of Internal Medicine; Lynne Gehr, M.D., Department of Anesthesiology.

Getting to the Heart of the Matter

New test to take the guesswork out of detecting cardiac ischemia

VCU Tech Transfer Team

[FROM TOP TO BOTTOM]

IVELINA METCHEVA, PH.D., M.B.A.
DIRECTOR

T. ALLEN MORRIS, PH.D., M.B.A.
ASSISTANT DIRECTOR

MAUREEN C. KELLY, PH.D.
LICENSING ASSOCIATE

CLARA A. SINE
OFFICE MANAGER

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CEO and President
Virginia Biosciences Commercialization Center

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Dean
School of Medicine
Virginia Commonwealth University

Mr. Michael Sugerman
Founder
Seven Consulting

EX-OFFICIO MEMBERS

Francis L. Macrina, Ph.D.
Vice President for Research
Virginia Commonwealth University

Ivelina S. Metcheva, Ph.D., M.B.A.
Director
VCU Tech Transfer
President
VCU Intellectual Property Foundation

About VCU

Virginia Commonwealth University is one of the state's largest universities with more than 32,000 students. Located on two campuses in historic downtown Richmond, Virginia, this vibrant, urban university offers 211 undergraduate, graduate and professional programs in 13 schools and one college. VCU also is home to one of the nation's leading academic medical centers and has received recognition from the Carnegie Foundation for its research activity and community engagement.

VCU ranks among the top 100 universities in the country in sponsored research, with awards of $255 million in fiscal year 2010. Twenty-seven of the university's graduate and professional programs are ranked among the best in the nation in *U.S. News & World Report's* "America's Best Graduate Schools."

Many of VCU's 2,000 full-time instructional faculty are recognized nationally and internationally for excellence in the humanities, arts, sciences, engineering, education, social work, business and the heath care professions. The late Dr. John B. Fenn was one of three international scientists to be awarded the 2002 Nobel Prize in chemistry.

The VCU Medical Center is the only academic medical center in Central Virginia. It offers state-of-the-art care in more than 200 specialty areas, including organ transplantation, head and spinal cord trauma, burn healing and cancer treatment at the VCU Massey Cancer Center, Virginia's first NCI-designated cancer center.

Together, VCU and VCU Medical Center are the largest single employer in the Richmond area with 17,000 employees and combined budgets of more than $2 billion. As an economic and urban leader, VCU has forged ties with industry in such innovative projects as the VCU da Vinci Center for Innovation and the Virginia BioTechnology Research Park. The research park encompasses more than 1.2 million square feet of space, housing 2,000 scientists, researchers, engineers and technicians in fields like drug development, medical diagnostics, biomedical engineering, forensics and environmental analysis.

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Virginia Commonwealth University

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