

ANNUAL REPORT

Bringing Ideas to Life



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Bringing Ideas to Life

Annual Report

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Executive Director

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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.

COVER PHOTO:

*Synthesis of graphene
by laser irradiation*

Dear Colleagues and Friends,

Thanks in large part to the incredible work and creativity of the VCU researchers, 2011 was a strong year in VCU Tech Transfer. Our numbers were up across the board, with an increased number of deals, inventions, patent applications, and licensing revenues.

We are pleased to report that three medical devices, all based on VCU inventions, now have regulatory clearances. EViTAR™ I is a catheter for drug and cell delivery for patients with central nervous system tumors. The technology was developed by an inter-university collaboration that included one of our prominent neurosurgeons, Dr. Bill Broaddus, who is featured in this report. In addition, two other products are moving towards commercialization, EmergenOx (a device providing medical grade humidified oxygen in emergency situations) and Hemospray (a haemostatic delivery device for gastrointestinal bleeding). Both products are based on inventions by our researchers at the Virginia Commonwealth University Reanimation Engineering Science Center (VCURES).

Over the past year, VCU Tech Transfer has not only increased the volume of its activities but it has broadened the scope of its mission. We are not simply in the business of helping move VCU inventions to the market place. We see our expanded role as generating greater interest from the business and investment communities in partnering with VCU. We are building relationships on a number of fronts – from training sessions and boot camps for students and faculty, to working with our partners from VaBIO and other local organizations and companies to promote networking events where VCU inventors interact with local entrepreneurs and investors. Recently, we hired an Enterprise and Economic Development Executive who will facilitate entrepreneurial activities among VCU researchers as well as promote market-facing activities that will cultivate economic development in Richmond and across the Commonwealth.

VCU Tech Transfer plays a critical role at the university by helping to build vital partnerships with businesses, with the investment community, and with entrepreneurs. We believe that these are important bridges that must be carefully built and robustly maintained.

We also benefit from an exceptionally supportive environment here at VCU. This support starts with the president and the provost, whose vision to take the university to new heights has been crystallized in the VCU Quest for Distinction, our new strategic plan. An interview with both Drs. Rao and Warren is published in this report, and their message is one of optimism and inspiration.

The greatest value of VCU's research enterprise is in the ultimate application of our discoveries; and, we are working to create a better interface between the world of our research and the sphere of commercialization. To do this, we are deploying the same kind of energy, commitment and innovation that the VCU community of scholars invests daily in their research.

With our broadened mission, we truly believe that the university will be even more successful in the years to come.

We are looking forward to working with you over the next year.

With sincere gratitude,

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

Ivelina Metcheva, Ph.D., MBA
Executive Director, VCU Tech Transfer

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FISCAL YEAR AT A GLANCE

Licensing Revenues	\$1,229,000
Invention Disclosures	106
License Agreements	10
Other Research Support Agreements	10
Start-ups	2
Patents Filed	119
Patents Issued	10
Copyrights	3
Material Transfer Agreements	173
Non-Disclosure Agreements	68

DEPARTMENTS WITH 10 OR MORE INVENTION DISCLOSURES

Emergency Medicine	18
Biomedical Engineering	14
Radiation Oncology	10

DEPARTMENTS WITH 5-9 INVENTION DISCLOSURES

Chemical and Life Science Engineering	7
Internal Medicine	7
Chemistry	6
Pharmaceutics	5

VCU PATENTS ISSUED

ISSUE DATE	PATENT NO.	VCU INVENTORS	TITLE
8/24/10	US 7,781,580	RUEY-MIN LEE, PH.D.	STILBENE DERIVATIVES AS NEW CANCER THERAPEUTIC AGENTS
9/14/10	US 7,794,727	RICHARD T. MARCONI, PH.D. CHRISTOPHER EARNHART, PH.D.	POLYVALENT CHIMERIC OSPC VACCINOGEN AND DIAGNOSTIC ANTIGEN
5/24/11	US 7,947,262	CHRIS KEPLEY, PH.D., MBA	USE OF FULLERENES FOR THE TREATMENT OF MAST CELL AND BASOPHIL-MEDIATED DISEASE
8/10/10	US 7,771,793	KENNETH J. WYNNE, PH.D. BIAO DUAN, PH.D., PINAR KURT, PH.D. UMIT MAKAL, PH.D. STEPHEN GRUNZINGER, PH.D.	FUNCTIONAL POLYMERS VIA SURFACE MODIFYING AGENTS, AND METHODS FOR POLYMERIC SURFACE MODIFICATION
11/30/10	US 7,842,388	KENNETH J. WYNNE, PH.D. BIAO DUAN, PH.D., PINAR KURT, PH.D. UMIT MAKAL, PH.D., STEPHEN GRUNZINGER, PH.D.	FUNCTIONAL POLYMERS VIA SURFACE MODIFYING AGENTS
7/20/10	US 7,759,082	GARY BOWLIN, PH.D. DAVID SIMPSON, PH.D. MARCUS E. CARR JR., M.D., PH.D. GARY WNEK, PH.D., PHILIPPE LAM, PH.D.	ELECTROPROCESSED FIBRIN-BASED MATRICES AND TISSUES
5/3/11	US 7,935,298	MARK MCHUGH, PH.D. ZHIHAO SHEN, PH.D., DIANE GEE, PH.D. GARY HUVARD, PH.D.	METHOD OF PRODUCING FIBERS BY ELECTROSPINNING AT HIGH PRESSURES
6/21/11	CA 2,507,545	MARTIN K. SAFO, PH.D. DONALD ABRAHAM, PH.D. RICHMOND DANSO-DANQUAH, PH.D.	USE OF FURFURAL DERIVATIVES AS ANTI-SICKLING AGENTS
11/5/10	JAPAN 4,619,789	GARY BOWLIN, PH.D. DAVID SIMPSON, PH.D. MARCUS E. CARR JR., M.D., PH.D. GARY WNEK, PH.D.	SEALANTS FOR SKIN AND OTHER TISSUES
12/7/10	US 7,847,120		COMPOSITIONS OF ALLOSTERIC HEMOGLOBIN MODIFIERS AND METHODS OF MAKING THE SAME

College of
Humanities
and Sciences

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School of
Allied Health
Professions

4

School of
the Arts

1

School of
Dentistry

2

School of
Engineering

33

School of
Medicine

70

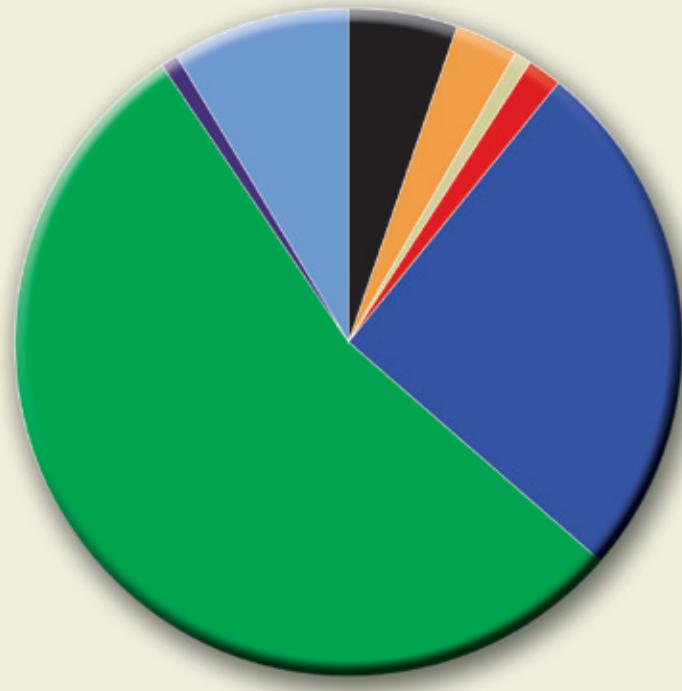
School of
Nursing

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School of
Pharmacy

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DISTRIBUTION OF INVENTION DISCLOSURES



The Billy R. Martin Innovation Award

Dr. Michael Rao, VCU's president, and Dr. Francis Macrina, VCU's vice president for research, presented the 2011 Billy R. Martin Innovation Award to Dr. Martin L. Lenhardt and Dr. Sheldon M. Retchin at this year's "Invented at VCU" reception, recognizing their collaborative roles in developing an underwater bone conduction listening device.

Dr. Lenhardt, professor in the Department of Biomedical Engineering and director of the Biomedical Engineering Bioacoustics Laboratory, had been developing technologies that use bone conduction for remediating hearing loss and tinnitus. An avid swimmer, Dr. Retchin, vice president for Health Sciences and CEO of the VCU Health System, was a regular in the VCU swimming pool, but wanted to make his daily laps more enjoyable. So together, they invented a new technology that uses bone conduction for delivering music under water - a waterproof MP3 player.

Their patented invention has been licensed to Finis Inc. that sells the device under its trademarked name SwiMP3® to swimmers around the world.

SwiMP3® is one of VCU's most publicized innovations and has been featured on the NBC Today Show as well as in numerous other TV programs, fitness and health magazines and newspapers.

"Congratulations to this team... The SwiMP3® has been a catalyst for Finis to grow its business. Now accepted in many international markets, it is the fantastic sound quality that is always the reference endorsing this product over other non-bone conduction models. But perhaps the greatest pleasure of all is still that ah-ha moment when a swimmer takes her first plunge underwater and comes up smiling from ear to ear."

– John Mix
Co-Founder & President
Finis, Inc.

"The SwiMP3 has been quite a journey. Dr. Lenhardt and I had an idea that seemed useful, and the VCU Tech Transfer helped us to frame it into a patentable concept. After the phenomenal sales we have seen, I think we can safely say that the collaboration was a resounding (pun intended) success!"

– Sheldon M. Retchin, M.D., M.S.P.H.
VP for Health Sciences
CEO, VCU Health System

"What's patenting all about? It is a mindset. You open your mind to patenting using the opportunities around you. What's the real joy? Teaching your students so that they go out and patent technologies more than you would. So patenting is really part of our academic life."

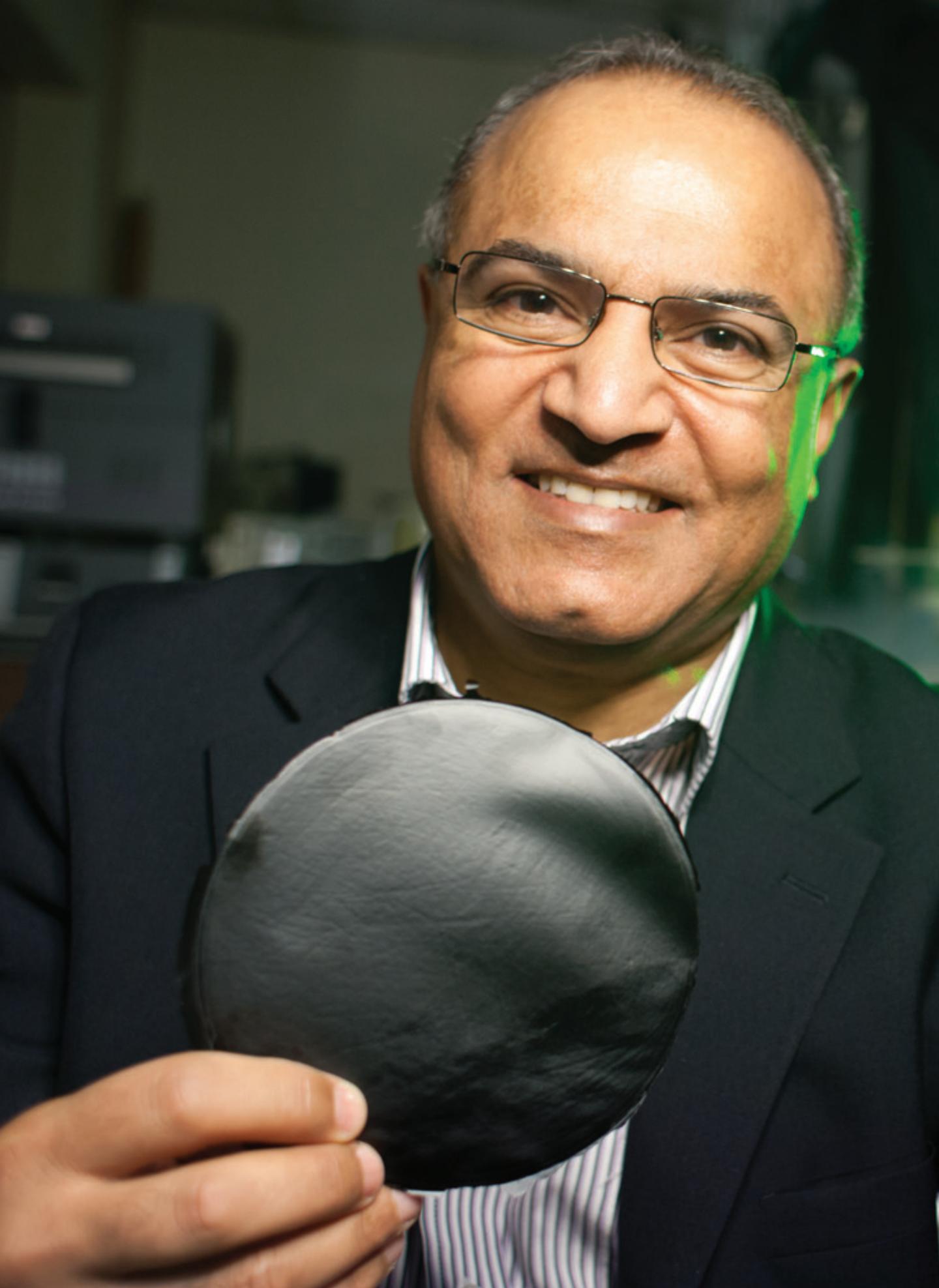
– Martin L. Lenhardt, AuD., Ph.D, CCC A/SLP
Professor
Department of Biomedical Engineering



FROM LEFT TO RIGHT:

Sheldon M. Retchin, M.D., M.S.P.H.
Martin L. Lenhardt, AuD., Ph.D, CCC A/SLP

Graphene: Innovative Applications and Methods of Fabrication



M. Samy El-Shall, Ph.D.



Graphene is a substance that is super-conducting, one atom thick, and 200 times as strong as steel. It has been touted as a wonder material that may revolutionize the fields of electronics, chemical manufacturing, solar power, energy storage, and computer memory. Dr. El-Shall, a professor in the Department of Chemistry has invented new and creative ways to manufacture graphene and metal nanoparticle catalysts that aim to launch graphene into these futuristic applications. His collaboration with Dr. Frank Gupton, professor and chair of VCU Chemical Engineering and an experienced industry executive, has resulted in novel cross-coupling catalysts to improve the efficiency of drug synthesis, and commercial-scale drug manufacturing. Dr. El-Shall's research has resulted in 13 invention disclosures and 12 patents and patent applications.

"Working with industry has helped me understand important issues and mold my research towards creating new technologies that meet societal needs."

M. Samy El-Shall, Ph.D.
Professor
Department of Chemistry

Quest for Distinction

VCU Tech Transfer sits down with Dr. Michael Rao, president of VCU and VCU Health System and Dr. Beverly Warren, provost and vice president of academic affairs

VCU Tech Transfer: Dr. Rao, the university's strategic plan, Quest for Distinction, has a significant emphasis on commercialization and innovation. Why?

Dr. Rao: The economic future of our nation depends on small businesses and entrepreneurs, not just mega-businesses. These innovators will drive the future economy, and their businesses and technologies often begin in the laboratories of universities like VCU. In the 21st century, discovery and innovation are not realized in a vacuum; they require multidisciplinary collaboration around an idea. VCU has a responsibility to create an environment that encourages our faculty and prepares our students to embrace and advance innovation based on forward-thinking and social need, not confined by disciplinary boundaries. It's our responsibility to ensure that the next generation of entrepreneurs and professionals are not afraid to create and explore how new ideas can be commercialized for the greater good.

VCU Tech Transfer: Dr. Warren, how does the emphasis on commercialization and innovation affect our students?

Dr. Warren: An increased emphasis on innovation will encourage our students to reach beyond the boundaries of their classrooms. We have to foster innovation early, from the freshman year experience through graduate school. VCU's Quest for Distinction emphasizes interdisciplinary work where innovation and creativity are

blended -- from engineering to arts to business to medicine -- and the real discoveries come through that collaboration. This is great fertile ground for our students, in which they are not isolated in a certain discipline with a certain collection of courses. Instead, it is a collection of experiences that make them truly marketable in a global environment. That's what we provide at VCU in this new strategic plan.

VCU Tech Transfer: Dr. Rao, what does this mean for our faculty?

Dr. Rao: As government funding becomes more difficult to attract, we need to increase our focus on industry partnerships and collaborations. In many ways, we must become more financially independent. As a faculty, we must not only be innovative, but we must also make certain our research addresses current market demands and anticipates emerging ones. Commercialization will provide a new source of research funding and opportunity for faculty in all disciplines. VCU will work hard to retain and recruit faculty who are innovative, imaginative and creative. If they want to take their discoveries to market, VCU is where they want to be.

VCU Tech Transfer: What is the vision for increasing commercialization at VCU?

Dr. Rao: To develop and advance to market those technologies that can improve the quality of life, both here in the United States and around the world. Also, it's critical that we graduate our students and produce an innovative workforce of professionals armed with advanced, practical and cross-disciplinary experience.

Dr. Warren: To ensure faculty and students work together to make new discoveries that solve problems and positively impact society while promoting economic success.

VCU Tech Transfer: What is your vision for enhancing VCU's economic impact?

Dr. Rao: We're creating partnerships and collaborations between industry and the university. We need to have the ability to quickly generate key information about our programs, capabilities and expertise, based on the specific company's needs. Strategically using our assets to attract and develop university-industry collaborations will effectively advance technologies that are of mutual interest. This type of activity is designed to enhance the market-pull of research. Success in this initiative will increase the relevance of our technologies, the value of our licenses, and the opportunity for start-up ventures. It will also help attract economic activity in the high-tech and life sciences industry sectors that are so important to all of us.

Dr. Warren: That economic activity will also result in significant opportunities for our students. These opportunities may include exposure to projects as students, or as emerging and seasoned professionals that are filling the region's advanced workforce needs.



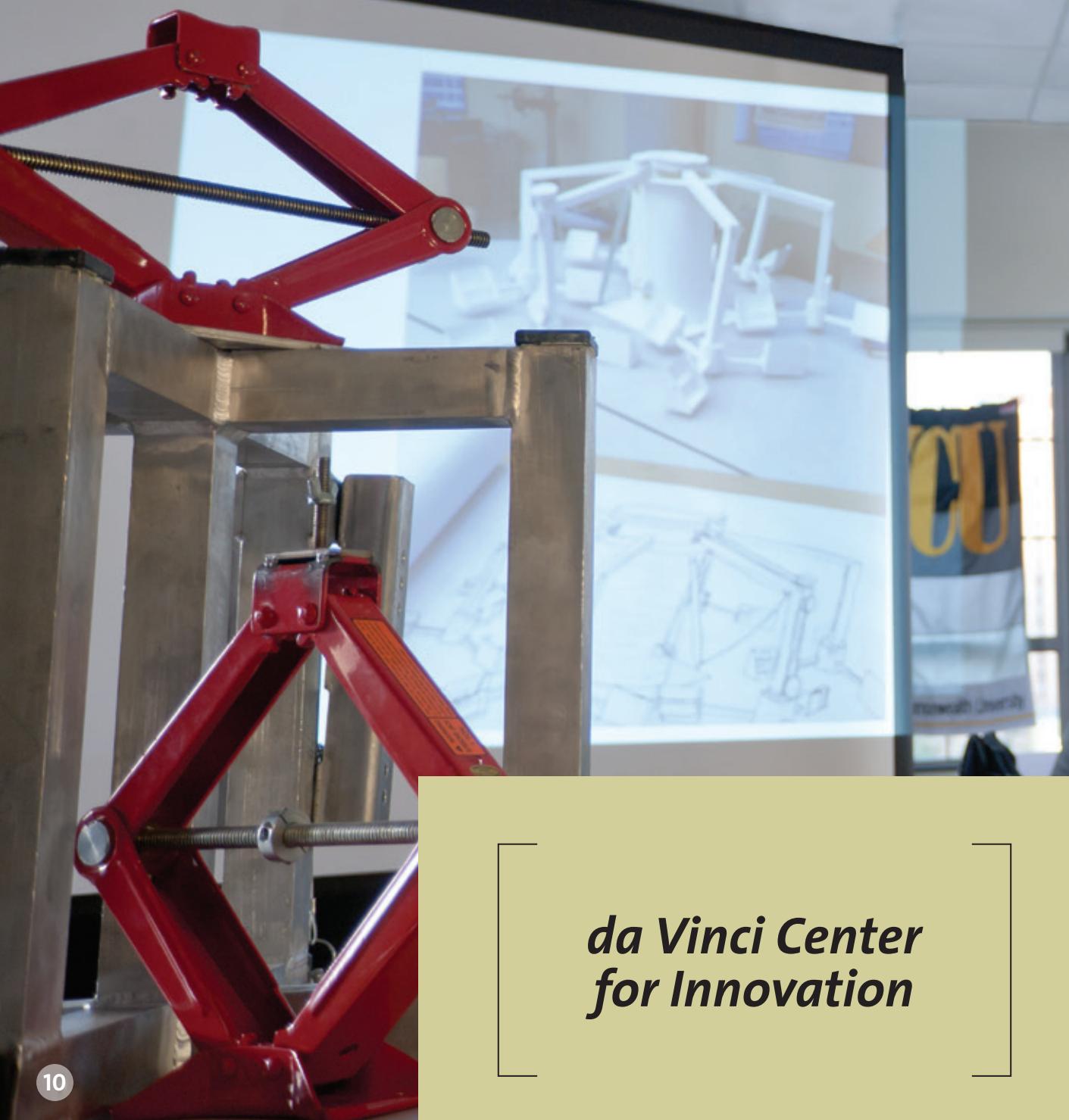
FROM LEFT TO RIGHT:

Beverly J. Warren, Ed.D., Ph.D., FACSM
Michael Rao, Ph.D.

The da Vinci Center for Innovation started in 2007 as an experiment in cross-disciplinary collaboration for VCU undergraduates. Students from the schools of the Arts, Business and Engineering formed teams to solve problems posed by companies, nonprofit organizations, or VCU faculty. Many of these projects have had successful outcomes including new products for companies, new interactive exhibits at the Virginia Science Museum, as well as invention disclosures and patent filings for VCU.

In collaboration with VCU Tech Transfer, the da Vinci Center is morphing into an innovation hub for VCU and for the greater Richmond region. Under the

direction of Kenneth B. Kahn, Ph.D., professor of marketing and director of the da Vinci Center, the Center is developing into a key asset for VCU in training and inspiring VCU faculty, staff and students in innovation and entrepreneurship. The Center and VCU Tech Transfer are launching the inaugural annual university-wide student venture creation competition to help support and groom new entrepreneurs. VCU Tech Transfer is excited to partner with the Center in encouraging innovation and entrepreneurship both at VCU and in the community.



da Vinci Center for Innovation



"The NexGen EViTAR™ catheter system represents the culmination of years of research and collaboration by a large team of individuals... As the catheter begins to be utilized in the clinical setting I have no doubt that it will continue to evolve in a number of directions in order to optimize the system for delivering therapeutics into a variety of brain diseases."

Dr. William Broaddus
Professor
Department of Neurosurgery



William Broaddus, M.D., Ph.D.

ON THE MARKET

Neurological Catheter for Cell and Drug Delivery

Brain tumors and other neurological diseases such as stroke, Parkinson and Alzheimer diseases affect millions of people across the world. As new cellular therapies are developed, there remains a fundamental clinical problem of how these treatments can be safely and effectively delivered inside the brain.

This is where Dr. William Broaddus, professor of neurosurgery comes in. Dr. Broaddus, a physician and researcher who splits his time between the clinic and the laboratory, has spent his career studying brain tumors and neurological diseases and developing potentially life-saving devices. His most recent invention is a product of collaboration between engineers, scientists and physicians from the University of Virginia, University of Minnesota and VCU. Broaddus and his collaborators created a unique catheter to deliver

medical treatments into the brain or the spinal cord. The device employs a tube-within-a-tube design that allows for high concentration delivery of therapeutic agents directly to target tissues, thus avoiding the dangerous side effects associated with systemic delivery.

This cell delivery catheter has been approved for use by the U.S. Food and Drug Administration. It is being marketed under the name EViTAR™ I by NexGen Medical Systems Inc., a small medical device company based in Melbourne, Florida.

New Approaches to Drug Delivery



Drug candidates often fail due to issues with solubility and absorption. Still other drugs make it to market but never reach their full commercial potential due to problems with bioavailability. Dr. Phillip Gerk in the Department of Pharmaceutics has developed a new approach to solve this problem.

The most promising compounds currently used in cancer and HIV treatments, as well as some over-the-counter drugs such as phenylephrine, are poorly absorbed by the body. Dr. Gerk has discovered a new method to improve the delivery and effectiveness of those drugs. This approach can be used to improve drug bioavailability to the body and allow for targeted drug delivery.

Dr. Gerk has received a Grand Challenges Explorations' grant from the Bill & Melinda Gates Foundation focused on creating solutions for global health problems such as eradicating HIV infections. He is also an award recipient from the VCU Presidential Research Incentive Program initiated by the VCU President Dr. Michael Rao. The lead compounds are currently in preclinical trials.

"VCU Tech Transfer has been critical for the innovation process, from educating me in what makes a good patent, to providing commercialization advice. With their help, we are well ahead in the process of securing industry development partners."

– Phillip M. Gerk, Ph.D.
Assistant Professor
Department of Pharmaceutics

Intellectual Property:

property that derives from the work of the mind or intellect

Types of intellectual property

- Patent
- Copyright
- Trade Secret
- Trademark
- Tangible research material
- Know-how

What is patentable?

- New chemical compounds, formulations or mixtures
- New uses for existing compounds
- New or improved device or machine
- Method of doing business (by software, algorithm, etc)
- Methods for synthesizing a compound or treating a disease

What is copyrightable?

- Software
- Images
- Written books or chapters
- Literary and artistic works

What are tangible research materials?

- Antibodies
- Transgenic mice
- Cells
- Plasmids
- Compounds
- Devices

When should you submit an invention disclosure?

- You can fully describe your discovery and how it works; or
- You plan to give a talk or publish a manuscript or abstract; or
- You are leaving VCU; or
- You have been contacted by a company

If you are in doubt, we urge you to contact Tech Transfer to discuss your discovery.

Email: ott@vcu.edu
Call: (804) 828-5188

What is intellectual property and how does the new patent law affect VCU inventors?

What is intellectual property?

The term "intellectual property" or "IP" includes inventions, such as new drugs, devices or processes. Intellectual property also may be in the form of computer programs, microscopic images and written materials that are protected by copyrights. In addition, research tools such as antibodies, cell lines, plasmids, transgenic animals, devices and equipment, also may be transferred to industry and other institutions through the technology transfer process.

Once you determine that you may have created intellectual property, we encourage you to share it with us by completing an invention disclosure form, which is posted on our web site (www.research.vcu.edu/ott). Invention disclosures should effectively communicate the content and value of an invention and will be used to determine if an invention is patentable and commercially viable. The best time to submit an invention disclosure is when you can fully describe your discovery and how it works, but before any publications have been made, which include abstracts, manuscripts and presentations.

How does the new patent law affect intellectual property developed at VCU?

On September 16, 2011, the America Invents Act (AIA) was signed into law. The bill reforms Chapter 35 of the United States Code which governs the right to patent. The legislation was enacted to streamline the US patent process and foster economic development, as well as to more closely align the US patent system with other nations.

The biggest change that the AIA enacts involves the conversion from a first-to-invent to a first inventor-to-file system. Under the new system, the date that a patent is filed at United States Patent and Trademark Office (USPTO), rather than the date of conception, becomes the important date for determining novelty and obviousness of an invention, and ultimately to whom the patent is issued. Under the previous first-to-invent system, there was a process in place to allow inventors to

prove to the USPTO that they were the first to create and make an invention, even if they were not the first to publish or file a patent application. Under that system, a validated scientific notebook could be used to trace inventorship to a specific date. This is no longer the case under the new first inventor-to-file system. Instead, the party that files or publishes first will be the one who receives the patent. Scientific notebooks, however, still remain valuable for determining who is an inventor on a patent.

What this means - The new patent process brings the US system more closely in alignment with the rest of the world which operates under a strict first-to-file system and complete novelty system. Outside of the US, any public disclosure of an invention, including a publication, presentation at a conference, abstract publication or public use, prior to filing a patent can be used as prior art to prevent a patent from being issued. This means that if you publish details about your invention in a manuscript, abstract or at a conference before a patent has been filed, you will forfeit all foreign patent rights. Losing foreign patent rights may significantly decrease the commercial value of a technology, which is why it is very important to submit an invention disclosure before you publish.

For US patents, there will still be a one-year grace period, in which any publications made by the actual inventor or by someone who learned of the invention from the inventor (e.g. postdoc, collaborator), will not be used as prior art to bar a US patent from being issued, as long as the patent is filed within one year of the public disclosure.

A lot of questions still remain regarding how the new patent law will be enforced. For VCU inventors, it will be even more important to work with VCU Tech Transfer as early as possible and before publication to ensure that an enabling patent application is filed with the USPTO. (Note: Any applications filed before March 16, 2013 will be treated under the old laws.)

The VCU Tech Transfer team will be glad to talk with you and advise you on the preparation of invention disclosures, the different types of intellectual property protection and commercialization, and explain the new patent law.

About VCU

Virginia Commonwealth University is one of the state's largest universities with more than 31,000 students. Located on two campuses in historic downtown Richmond, Virginia, this vibrant, urban university offers 216 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 2011. 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 health 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 one of the nation's leading academic medical centers and 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 the 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 engine and urban leader, VCU has forged ties with industry in such innovative projects as the VCU School of Engineering, da Vinci Center for Innovation, and the Virginia BioTechnology Research Park, which 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.



VCU Tech Transfer Team

TOP LEFT IVELINA METCHEVA, PH.D., MBA, EXECUTIVE DIRECTOR

TOP RIGHT T. ALLEN MORRIS, PH.D., MBA, ASSOCIATE DIRECTOR

BOTTOM LEFT WENDY M. REID, PH.D., LICENSING ASSOCIATE

BOTTOM RIGHT CLARA A. SINE, OFFICE MANAGER

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Founder, Seven Consulting

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Virginia Commonwealth University

Ivelina Metcheva, Ph.D., MBA
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President, VCU Intellectual Property Foundation



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