

FRESH PERSPECTIVES

UNIVERSITY OF VIRGINIA PATENT FOUNDATION
2010 ANNUAL REPORT

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A close-up view of the electro-spray source of the mass spectrometry equipment used by 2010 Edlich-Henderson Inventors of the Year Kevin R. Lynch, Ph.D., and Timothy L. Macdonald, Ph.D., in the course of their analytical chemistry work. This instrument enables concurrent measurement of different types of cells and tissues. *Photo by Jackson Smith*

FRESH PERSPECTIVES

LETTER FROM THE INTERIM EXECUTIVE DIRECTOR



Photo by Tom Cogill

Our theme for this year’s annual report says it all: Fresh Perspectives.

Throughout these pages, you will find features on just a few of our inventors — some young and others more veteran — whose fresh perspectives are advancing their fields of discovery.

You’ll discover how the Patent Foundation is evolving to best meet the needs of the University’s inventive faculty, staff and students as well as entrepreneurs. For instance, you’ll meet our Advisory Panel, established this past spring to bring new industry and investor perspectives both to our patenting activities and to emerging U.Va. start-ups. In just a few short months, the Advisory Panel has already contributed immensely valuable feedback to our inventors and entrepreneurs.

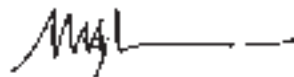
In collaboration with many entrepreneurship-focused programs across U.Va., we have also launched a new lecture and networking series. “True Confessions of a Faculty Entrepreneur” brings experienced, emerging and potential entrepreneurs from the U.Va. community together to share ideas and lessons learned. For more about this successful series, including videos of past events, see www.uvapf.org/trueconfessions.

You’ll also hear from W. Mark Crowell, the University’s first director of innovation partnerships

and commercialization. Mark’s fresh perspective on university innovations is setting a collaborative tone that will enable the Patent Foundation and other programs across Grounds to support our inventors and entrepreneurs more effectively. We welcome Mark and look forward to continuing to innovate with him.

We appreciate the fresh perspectives of University inventors; it is their innovative approaches that give rise to inventions with incredible potential to make life better for people. In turn, we think it’s important for the Patent Foundation to be innovative in the ways we approach our business, including supporting inventors, working with corporate licensees, assisting U.Va. start-ups and otherwise advancing valuable U.Va. technologies to the marketplace.

Finally, as members of the University community, we extend our sincere welcome to Teresa A. Sullivan, Ph.D., the University’s new president.



Miette H. Michie
Interim Executive Director and CEO
University of Virginia Patent Foundation

BOARD OF DIRECTORS

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OUR PERSPECTIVE IS

SIGNALING NEW PATHWAYS FOR THE TREATMENT OF DISEASE

KEVIN R. LYNCH, PH.D., AND TIMOTHY L. MACDONALD, PH.D.
2010 EDLICH-HENDERSON INVENTORS OF THE YEAR

Among the University of Virginia's most prolific inventors, Kevin R. Lynch, Ph.D., and Timothy L. Macdonald, Ph.D., work at the intersection of chemistry and biomedicine.

The interdisciplinary team's collaboration has been fruitful: "Kevin always says a biological receptor and 50 cents will get you a cup of coffee, which today probably isn't even true, but a receptor plus a good molecule can make the research viable," says Macdonald, professor of chemistry and pharmacology.

In April, the U.Va. Patent Foundation named Lynch and Macdonald the 2010 Edlich-Henderson Inventors of the Year for their achievements in modulating the activity of two of the body's naturally occurring signaling molecules, sphingosine 1-phosphate (S1P) and lysophosphatidic acid (LPA). The inventors have developed a number of small molecules that mimic or block S1P and LPA at their receptors or inhibit their synthesis, thereby offering tremendous potential therapeutic benefits.

"We all have a certain S1P and LPA 'tone,' meaning a certain amount of these molecules is present in the bloodstream," says Lynch, professor of pharmacology

and of biochemistry and molecular genetics. "Why we have that, and the consequences of augmenting or lowering that tone, are unclear.

"If you have twice the LPA tone that I do, are you more at risk of developing atherosclerosis or a neuropathic pain syndrome? Less? What should we increase or lower your tone to for the maximum therapeutic benefit? We need molecules to figure that out."

Lynch and Macdonald are pioneers in this effort, having received the first research grant ever to be focused solely on LPA signaling in 1994 from the National Institutes of Health.

"This research has also evolved into S1P signaling, and today our collection of molecules is probably the largest in an academic setting," Macdonald says.

Because S1P and LPA have each been shown to influence cell growth, migration and survival, drug molecules that modify their behavior could be helpful in treating a variety of diseases involving these factors, such as cancer, fibrosis, autoimmune disorders and atherosclerosis.



Photo by Jackson Smith

“[U.VA.] IS A GREAT PLACE FOR COLLABORATION, WHERE IT’S REALLY ENCOURAGED. WE COULDN’T HAVE GOTTEN AS FAR INDIVIDUALLY.”

—TIMOTHY L. MACDONALD, PH.D.

“Through their pioneering efforts, Drs. Lynch and Macdonald have opened up a whole new world of possibilities for the treatment of cancer and other diseases,” says Miette H. Michie, interim executive director and CEO of the U.Va. Patent Foundation. “In honor of their discoveries, the Patent Foundation is proud to name them the 2010 Edlich-Henderson Inventors of the Year.”

Two of the researchers’ S1P receptor molecules are currently in development with major pharmaceutical companies, each of which licensed the molecules from the Patent Foundation. Lynch and Macdonald also co-founded a biotech start-up company, Catena Pharmaceuticals Inc., in 2008 to put their LPA drug compounds on the path to the marketplace.

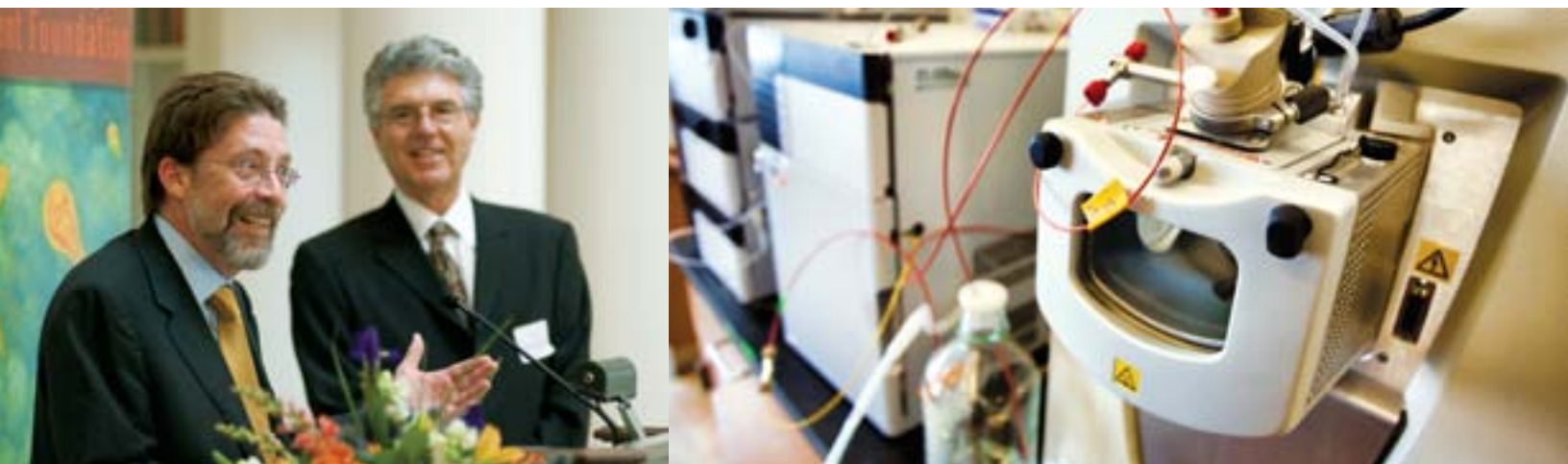
The researchers hold 14 U.S. patents and patent applications in this area, including one U.S. patent that was granted in 2010. One of their most recent patents (U.S. Patent No. 7,638,637) covers technology that enables their S1P receptor molecules to be taken orally, which means that patients suffering from multiple sclerosis or other autoimmune disorders might one day be able to take a once-a-day pill rather than undergo injections to treat their symptoms.

“There are no oral multiple sclerosis drugs currently available,” Macdonald says. “To make S1P orally available would be very unusual for a drug that would target autoimmune disorders and could significantly improve patients’ quality of life.”

The team’s latest research centers on blocking the synthesis of S1P and LPA by inhibiting the enzymes that create the signaling molecules. Lynch and Macdonald have identified new molecules that inhibit one such enzyme — autotaxin, which is thought to play a role in cancer progression — while also blocking LPA receptors, making these molecules particularly well suited for affecting LPA signaling.

Some of the researchers’ most exciting recent results, Lynch says, involve their new sphingosine kinase inhibitors. Lynch and Macdonald have found these molecules to dramatically lower S1P levels in rodents, allowing the researchers to study the molecules’ impact on cancer and fibrosis.

“We are currently exploring the best route to commercialization of these compounds,” Lynch says.



FROM LEFT TO RIGHT: 2010 Edlich-Henderson Inventors of the Year Kevin R. Lynch, Ph.D., and Timothy L. Macdonald, Ph.D., accept their award; a view of the equipment used in Lynch's laboratory. *Photos by Stephanie Gross and Jackson Smith*

“THROUGH THEIR PIONEERING EFFORTS, DRS. LYNCH AND MACDONALD HAVE OPENED UP A WHOLE NEW WORLD OF POSSIBILITIES FOR THE TREATMENT OF CANCER AND OTHER DISEASES.”

—MIETTE H. MICHIE

The researchers are also involved in several other collaborations throughout the University.

“The University of Virginia is a great place for collaboration, where it’s really encouraged,” Macdonald says. “We couldn’t have gotten as far individually with chemistry or biology alone.”

Lynch and Macdonald are currently funded by the NIH, Abbott Laboratories, AstraZeneca Pharmaceuticals and the Ivy Foundation.

Macdonald is the Patent Foundation’s first two-time recipient of the award, having shared the

honor in 1997 with Richard L. Guerrant, M.D., for their work developing glutamine-derived products and a cost-effective manufacturing process to address the malnutrition and diarrhea of young children in undeveloped countries.

Lynch and Macdonald were honored April 5 at the Patent Foundation’s annual awards reception, which also celebrated those U.Va. inventors who received U.S. patents and copyrights in 2009 (*see story on page 16*).

THE EDLICH-HENDERSON INVENTOR OF THE YEAR AWARD

The highest honor bestowed by the U.Va. Patent Foundation, the Edlich-Henderson Inventor of the Year award recognizes an inventor or team of inventors each year whose technology has proven to be of notable value to society. Named for U.Va. Professor Emeritus Richard F. Edlich, M.D., Ph.D., and Christopher J. (“Goose”) Henderson, a 25-year veteran of privately owned financial services businesses, the award is a tribute to their enduring support of and commitment to the University and its inventors. Award winners receive a \$10,000 cash prize and formal recognition at the Patent Foundation’s annual awards reception.

AWARD WINNERS

- | | |
|---|--|
| 2010 Kevin R. Lynch, Ph.D.
Timothy L. Macdonald, Ph.D. | 1999 John C. Herr, Ph.D. |
| 2009 John P. Mugler III, Ph.D.
James R. Brookeman, Ph.D. | 1997 Richard L. Guerrant, M.D.
Timothy L. Macdonald, Ph.D. |
| 2008 George T. Rodeheaver, Ph.D. | 1996 Jessica J. Brand
Patrice G. Guyenet, Ph.D.
Richard D. Pearson, M.D.
Janine C. Jagger, Ph.D. |
| 2007 Wladek Minor, Ph.D. | 1995 Donald F. Hunt, Ph.D.
Jeffrey Shabanowitz, Ph.D.
George C. Stafford Jr., Ph.D. |
| 2006 George T. Gillies, Ph.D. | 1994 Gerald L. Mandell, M.D.
Gail W. Sullivan |
| 2005 Benjamin M. Gaston, M.D.
John F. Hunt, M.D. | 1993 Joseph Larner, M.D., Ph.D. |
| 2004 Haydn N.G. Wadley, Ph.D. | 1992 Robert M. Berne, M.D.
Luiz Belardinelli, M.D.
Rafael Rubio, Ph.D. |
| 2003 William A. Petri Jr., M.D., Ph.D.
Barbara J. Mann, Ph.D. | |
| 2002 Joel M. Linden, Ph.D. | |
| 2001 Doris Kuhlmann-Wilsdorf, Ph.D. | |
| 2000 Ronald P. Taylor, Ph.D. | |

IN PERSPECTIVE

BY THE NUMBERS

UVAPF YEAR AT A GLANCE

FISCAL YEAR 2010

INVENTIONS

139 Inventions disclosed by U.Va. inventors

PATENTS

121 Provisional patent applications filed

50 U.S. applications* filed

21 U.S. patents issued

262 U.S. applications* pending

COPYRIGHTS

4 Copyrights registered to U.Va. authors

DEALS

42 Total deals with companies and institutions

* U.S. designations in Patent Cooperation Treaty (international) patent applications are included.

** All disclosure counts and percentages are rounded to the nearest tenth. Fractional disclosures represent disclosures made by multiple inventors across different schools or departments (e.g., a single disclosure shared equally by microbiology and chemistry faculty would contribute 0.5 toward each department's total).

*** The Department of Biomedical Engineering is shared by the School of Medicine and the School of Engineering and Applied Science. Disclosures are attributed to the school(s) in which the inventors have their primary appointments.

School of Medicine

73.6**

(52.9%**)

Microbiology 11.3
Medicine 10.6
Psychiatry and Neurobehavioral Sciences 10.0
Biomedical Engineering*** 6.4
Biochemistry and Molecular Genetics 4.7
Neurology 4.5
Pathology 3.2
Molecular Physiology and Biological Physics 3.0
Pediatrics 2.6
Anesthesiology 2.5
Ophthalmology 2.2
Cell Biology 1.9 Radiology 1.7 Surgery 1.3 Center for Biomedical Ethics and Humanities 1.0 Emergency Medicine 1.0 Neuroscience 1.0 Orthopaedic Surgery 1.0 Public Health Sciences 1.0 Pharmacology 0.9 Family Medicine 0.7 Urology 0.5 Physical Medicine and Rehabilitation 0.3 Neurosurgery 0.3 Plastic Surgery 0.2

INVENTION DISCLOSURES

FISCAL YEAR 2010



School of Engineering and Applied Science

41.2

(29.7%)

Electrical and Computer Engineering 14.0
Biomedical Engineering*** 8.4
Materials Science and Engineering 8.1
Mechanical and Aerospace Engineering 7.5
Systems and Information Engineering 2.0
Civil and Environmental Engineering 1.3

School of Architecture

Architecture

1.0

(0.7%)



School of Continuing and Professional Studies

Office of the Dean

1.0

(0.7%)



College and Graduate School of Arts & Sciences

17.9

(12.9%)

Chemistry 11.6
Physics 3.0
Biology 2.3
Statistics 1.0

McIntire School of Commerce

0.3

(0.2%)

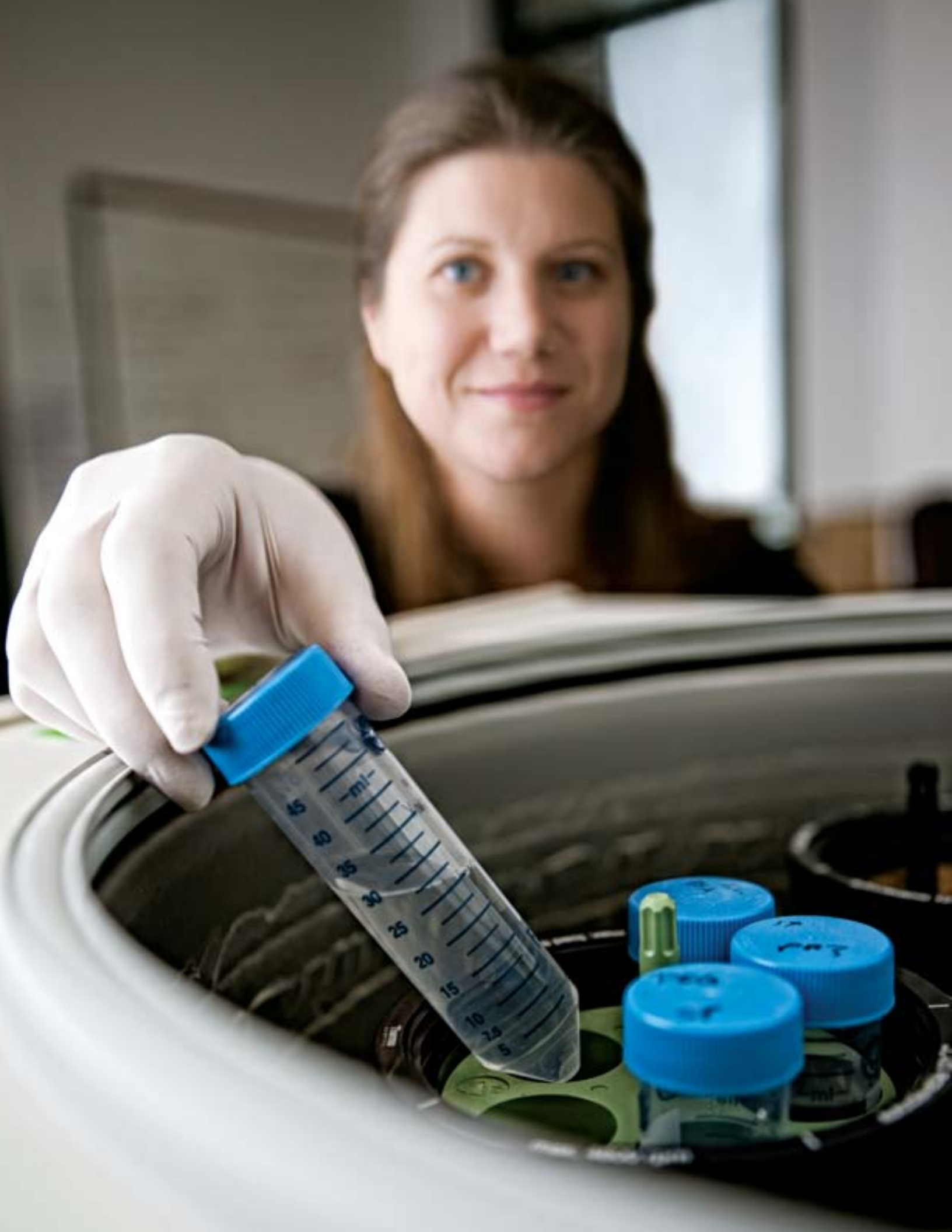


Other

4.0

(2.9%)

Athletics 1.0 Medical Center 1.0 Office of the Vice President for Research 1.0 Procurement Services 1.0
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MY PERSPECTIVE IS

DETECTING PANCREATIC CANCER BEFORE IT'S TOO LATE

KIMBERLY A. KELLY, PH.D.
BIOMEDICAL ENGINEERING

Patients diagnosed with pancreatic cancer today face a sobering reality: According to the American Cancer Society, fewer than 4 percent of them will be alive five years from now.

Why is this particular cancer, which affects one in 72 men and women in the U.S., so aggressive?

Unlike other cancers, for which there are screening tools such as mammography and colonoscopy, pancreatic cancer lacks a reliable test for early detection.

“Pancreatic cancer, by the time it’s detected, is almost always metastatic, meaning it has spread to other areas of the body,” explains Kimberly A. Kelly, Ph.D., assistant professor of biomedical engineering at the University of Virginia. “Generally, no matter what cancer you’re talking about, once it has metastasized, the patient is less likely to survive than if the cancer had been detected earlier.”

Kelly is working to develop an imaging technique that could be used to detect pancreatic tumor cells before they metastasize, when treatment is more likely to be effective.

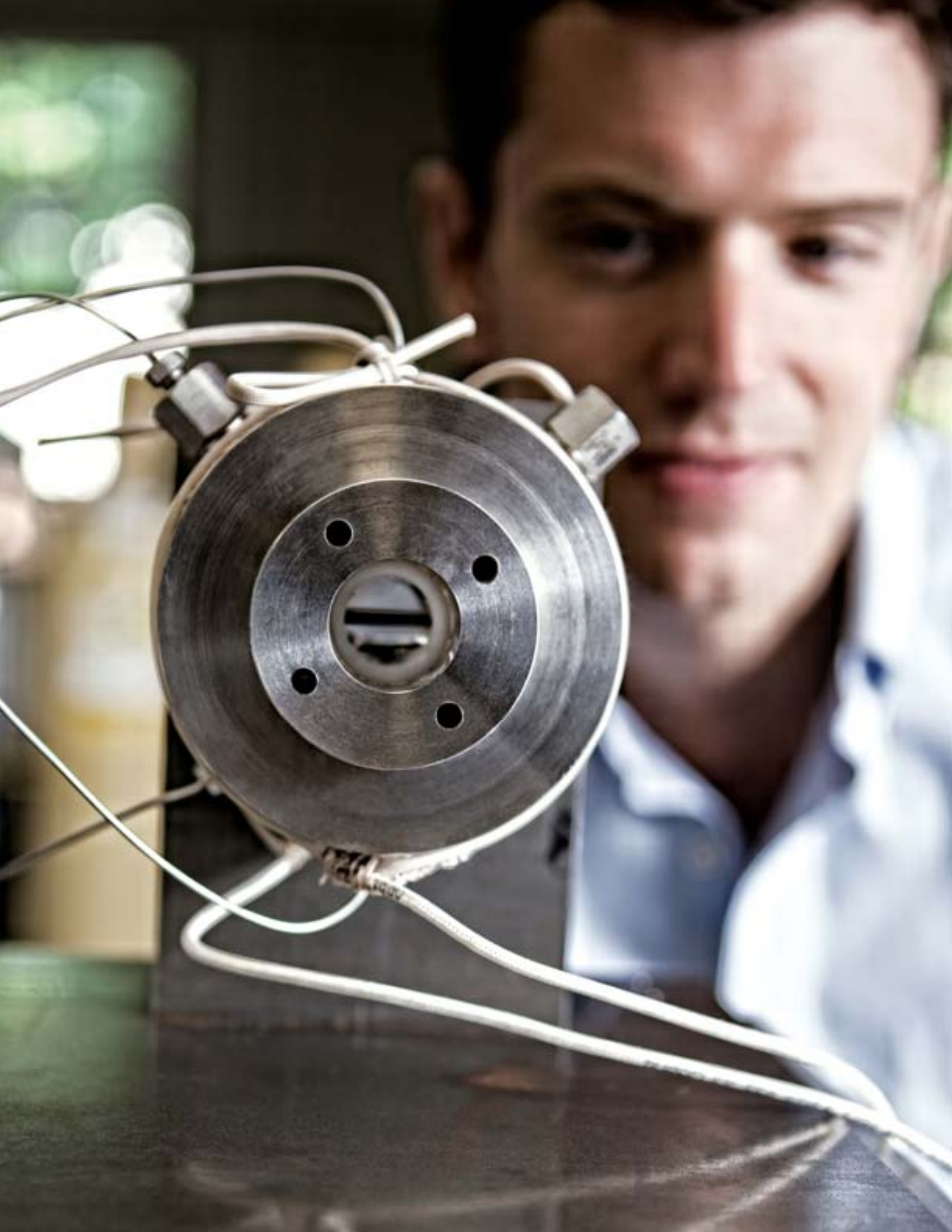
Together with collaborators at U.Va. and Massachusetts General Hospital, she has identified a biomarker unique to pancreatic ductal carcinoma cells, which make up more than 90 percent of pancreatic tumors. Her team has also identified a peptide that effectively binds with the tumors but not to noncancerous cells.

By attaching an imaging agent to this peptide and injecting mice with trace amounts of the material, the researchers have made it possible to view even very early-stage pancreatic mouse tumors using SPECT analysis. Short for single photon emission computed tomography, SPECT analysis is a highly sensitive imaging technique that allows physicians to identify tumors as small as 1–2 mm, or about the size of a sesame seed.

“If our imaging agent works,” Kelly says, “we would be able to detect precancerous lesions that can be removed to prevent the patient from even getting cancer.”

The U.Va. Patent Foundation has filed for patent protection on the researchers’ discoveries, which are available for licensing. Kelly and team members Todd W. Bauer, M.D., Lori J. Elder, R.N., Gregory B. Fralish, Ph.D., and Patrice K. Rehm, M.D., are currently discussing an exploratory investigational new-drug filing with the U.S. Food and Drug Administration to clear the way for testing their discoveries in the clinic.

Kelly’s research has been funded by the National Cancer Institute, the National Institute of Biomedical Imaging and Bioengineering, the Wallace H. Coulter Translational Research Partnership, the Johnson & Johnson Corporate Office of Science and Technology, the Lustgarten Foundation, and an American Association for Cancer Research Career Development Award funded by Laurie and Paul MacCaskill through the Pancreatic Cancer Action Network.



MY PERSPECTIVE IS

GENERATING A 'SMART' SOLUTION FOR MORE-EFFICIENT ENERGY PRODUCTION

ANDRES F. CLARENS, PH.D.
CIVIL AND ENVIRONMENTAL ENGINEERING

While the world awaits a permanent solution to its energy problems, Andres F. Clarens, Ph.D., has developed a tool that could make existing energy production techniques significantly more efficient.

Used to harvest energy from a variety of sources, turbines rely on heavily lubricated machinery, such as gears and bearings. But the fluids used to lubricate this machinery, Clarens says, are the source of inefficiency and reliability issues often arising from unpredictable operating conditions.

“Lubricants have always sort of been this one-size-fits-all thing,” says Clarens, an assistant professor of civil and environmental engineering at the University of Virginia. “As an engineer, I wanted to be able to control the lubricant and its properties inside the machinery.”

To gain this control, Clarens and co-inventors Paul E. Allaire, Ph.D., Amir A. Younan and Shibo Wang combined specific synthetic lubricants with liquid carbon dioxide under pressure. The viscosity and thermal properties of the resulting gas-expanded lubricants (GELs) can be manipulated by altering the carbon dioxide pressure in the system. This process could be automated through the use of a sensor, gas reservoir and purge valve.

“The idea was to design lubricants that are ‘smart,’ or tunable, that we can control in real time,” Clarens says.

GELs’ tunable nature could allow wind turbines and similar machinery to run more efficiently, regardless of the temperature or other factors. The team’s preliminary estimates suggest that turbines using GELs could reduce power losses by 20 percent, greatly increasing the amount of energy that power plants are able to deliver as useful energy. With this improvement and the added benefit of increasing machinery reliability, the use of GELs could yield considerable cost savings.

“This impact is significant,” he says, “but it’s going to take a lot of little technologies like this to improve the overall sustainability of our energy systems. Energy is one of the great challenges of today because it is inextricably linked to our economy, climate change and national security.”

The researchers are currently developing a test rig for further experimentation of GELs. The U.Va. Patent Foundation has filed for international patent protection for the invention, which is available for licensing.

For this project, Clarens bested more than 150 competing technologies to become first runner-up for the 2009 ConocoPhillips Energy Prize. His work has also been funded by the American Chemical Society Petroleum Research Fund and the National Science Foundation Energy for Sustainability program.

CELEBRATING UNIVERSITY OF VIRGINIA INVENTORS



FROM LEFT TO RIGHT: 2010 Edlich-Henderson Inventors of the Year Kevin R. Lynch, Ph.D., and Timothy L. Macdonald, Ph.D., prepare to accept their award; Thomas C. MacAvoy, Ph.D., vice chair and treasurer of the U.Va. Patent Foundation Board, and Leonard W. Sandridge, U.Va.'s executive vice president and chief operating officer, arrive at the reception; and Margaret A. Lindorfer, Ph.D., research assistant professor of biochemistry and molecular genetics, talks with Miette H. Michie, the Patent Foundation's interim executive director, at the reception.
Photos by Stephanie Gross

The U.Va. Patent Foundation honored 2010 Edlich-Henderson Inventors of the Year Kevin R. Lynch, Ph.D., and Timothy L. Macdonald, Ph.D., and those University inventors who received U.S. patents and copyrights in 2009 (*see listing on opposite page*) at a special ceremony held in the Rotunda's historic Dome Room the evening of April 5.

Patent Foundation Board Chairman Erik L. Hewlett, M.D., presented the award to Lynch and Macdonald, who were honored for their work at the intersection of chemistry and biomedicine.

The interdisciplinary collaborators have developed a number of small molecules that mimic or block the activity of two of the body's naturally occurring signaling molecules, sphingosine 1-phosphate and lysophosphatidic acid, thereby offering tremendous potential therapeutic benefits (*see story on page 4*).

Following the ceremony, University inventors, administrators and other distinguished guests continued the celebration at a reception held in the Rotunda's Lower West Oval Room.

U.S. PATENTS ISSUED TO U.VA. INVENTORS IN 2009

U.S. PATENT NO.	TITLE	U.VA. INVENTORS
7,485,655	2-Aminothiazole Allosteric Enhancers of A ₁ Adenosine Receptors	Joel M. Linden, Ph.D., Timothy L. Macdonald, Ph.D., Lauren J. Murphree Mihalcik, Ph.D., Mahendra D. Chordia, Ph.D.
7,496,454	High Mast Inspection System, Equipment and Method	Pradip N. Sheth, Ph.D., Dominick T. Montie, Ph.D.
7,500,986	Expandable Body Having Deployable Microstructures and Related Methods	Whye-Kei Lye, Ph.D., Michael L. Reed, Ph.D., Karen Looi, J.D., M.B.A.
7,517,415	Non-Ferromagnetic Amorphous Steel Alloys Containing Large-Atom Metals	S. Joseph Poon, Ph.D., Vijayarathi Ponnambalam, Gary J. Shifflet, Ph.D.
7,517,416	Bulk-Solidifying High Manganese Non-Ferromagnetic Amorphous Steel Alloys and Related Method of Using and Making the Same	S. Joseph Poon, Ph.D., Gary J. Shifflet, Ph.D., Vijayarathi Ponnambalam
7,519,417	Quantitative Fetal Heart Rate and Cardiotocographic Monitoring System and Related Method Thereof	James E. Ferguson II, M.D., M.B.A., M. Pamela Griffin, M.D., J. Randall Moorman, M.D.
7,527,021	Non-Invasive Drug Self-Administration System for Animals	Kevin Lease, Jay Hirsh, Ph.D.
7,534,622	Electron Transfer Dissociation for Biopolymer Sequence Mass Spectrometric Analysis	Donald F. Hunt, Ph.D., Joshua J. Coon, Ph.D., John E.P. Syka, Ph.D., Jarrod A. Marto, Ph.D.
7,534,623	Apparatus and Method for the Purification of Nucleic Acids	James P. Landers, Ph.D., Pamela M. Norris, Ph.D., Mary E. Power, Ph.D., Jerome P. Ferrance, Ph.D., Sushil Shrinivasan, Ph.D., Kelley A. Wolfe, Michael C. Breadmore, Ph.D.
7,560,477	Compounds Active in Sphingosine 1-Phosphate Signaling	Kevin R. Lynch, Ph.D., Timothy L. Macdonald, Ph.D.
7,576,069	2-Polycyclic Propynyl Adenosine Analogs Having A _{2A} Agonist Activity	Jayson M. Rieger, Ph.D., M.B.A., Joel M. Linden, Ph.D., Timothy L. Macdonald, Ph.D., Gail W. Sullivan, Lauren J. Murphree Mihalcik, Ph.D., Robert A. Figler, Ph.D., Robert D. Thompson, Ph.D.
7,583,082	Partially Parallel Magnetic Resonance Imaging Using Arbitrary K-Space Trajectories with Image Reconstruction Based on Successive Convolution Operations	Peng Hu, Craig H. Meyer, Ph.D.
7,605,143	2-Propynyl Adenosine Analogs with Modified 5'-Ribose Groups Having A _{2A} Agonist Activity	Jayson M. Rieger, Ph.D., M.B.A., Joel M. Linden, Ph.D., Timothy L. Macdonald, Ph.D., Gail W. Sullivan, Lauren J. Murphree Mihalcik, Ph.D., Robert A. Figler, Ph.D.
7,605,241	Synthesis of Inhibitors of p90Rsk	Sidney M. Hecht, Ph.D., David J. Maloney, Ph.D.
7,638,637	Orally Available Sphingosine 1-Phosphate Receptor Agonists and Antagonists	Kevin R. Lynch, Ph.D., Timothy L. Macdonald, Ph.D.



MY PERSPECTIVE IS

UNLEASHING THE THERAPEUTIC POTENTIAL OF FAT

ADAM J. KATZ, M.D.

PLASTIC SURGERY AND BIOMEDICAL ENGINEERING

In recent years, researchers have determined that adipose stem cells — adult stem cells found in fatty tissue — have therapeutic potential in a variety of areas, including tissue engineering for the treatment of severe burns and chronic wounds. The cells may also be useful in treating diseases characterized by poor blood flow, such as cardiac ischemia, which leads to heart attacks.

But when it comes to culturing the cells, the University of Virginia's Adam J. Katz, M.D., says traditional methods may be doing the cells a disservice.

"It's not just the cells you have, but how you prepare and grow them that impacts the *in vivo* therapeutic effect," says Katz, a pioneer in this area and physician-scientist with joint appointments in the University's plastic surgery and biomedical engineering departments.

Scientists seeking to prepare cells for culture will typically extract the cells from the body and place them on a plastic plate, where they will grow and divide. There, Katz says, the cells cannot help but interact with and adhere to their new artificial home, forming a one-cell-thick or mono-layer carpet. In order to use the cells, this carpet structure must eventually be disrupted, impairing the cells' ability to thrive and thus their therapeutic potential.

Katz and his collaborators have adapted various techniques to create an entirely new way of culturing adipose stem cells: upside down. Using a special inverted well plate they designed, the researchers

suspend the cells in high concentration — about 50,000 cells per hanging droplet. Under these conditions, the researchers found that the cells bind to each other rather than to an artificial substance, forming a more potent, self-sufficient, three-dimensional (3-D) structure with some surprising characteristics.

"By simply enabling the cells to assemble and grow as 3-D structures, rather than 2-D mono-layers, we have found significant changes in their genetic expression, biological activity and therapeutic potential," Katz says.

Katz and his collaborators have found that these changes appear to make the 3-D cell structures more effective in treating disease, as demonstrated in a study of mice with diabetic wounds.

This 3-D structuring technique serves as a platform for several innovative technologies developed by the researchers to optimize, grow and apply the cells to body tissue. The U.Va. Patent Foundation has filed for international patent protection and licensed these discoveries to the GID Group, co-founded by Katz in 2009, to further develop and commercialize the technology.

These projects were funded by the National Institutes of Health, the Wallace H. Coulter Translational Research Partnership and the Rutgers-Cleveland Clinic Consortium of the Armed Forces Institute of Regenerative Medicine, which is funded by the U.S. Army Medical Research and Materiel Command and the U.S. Army Institute of Surgical Research.



MY PERSPECTIVE IS

TARGETING LEUKEMIA AND PREVENTING ITS RETURN

JOHN H. BUSHWELLER, PH.D.

MOLECULAR PHYSIOLOGY AND BIOLOGICAL PHYSICS, CHEMISTRY

As with many cancers, the standard treatment for acute myeloid leukemia — a type of cancer of the blood affecting one in 266 men and women in the U.S. — is chemotherapy. Although chemotherapy is effective at killing tumor cells, it is also widely known to cause serious and extensive side effects resulting from its inability to differentiate between healthy and diseased cells.

University of Virginia researchers led by John H. Bushweller, Ph.D., have developed a targeted regimen that could one day be used to treat a specific subtype of acute myeloid leukemia more effectively and with far fewer side effects.

“There’s an emerging understanding that cancer is not one disease,” says Bushweller, professor of molecular physiology and biological physics with a joint appointment in chemistry. “There are specific genetic changes associated with different types of leukemia.”

The inversion-16 subtype of acute myeloid leukemia, which Bushweller is studying, is characterized by an abnormality in the 16th chromosome that fuses two proteins. The resulting fusion protein, known as CBF β -SMMHC, wreaks havoc by binding with another protein, known as RUNX1, negatively impacting RUNX1’s ability to manage new blood cell formation.

Bushweller and colleagues Jolanta Grembecka, Ph.D., Anuradha Illendula, Ph.D., and Lauren K. Dixon have identified binding sites for the fusion protein and designed novel compounds to block its activity.

“What our compounds do is try to prevent the fusion protein from binding with RUNX1,” Bushweller says. “In theory, if you could turn this off, you should have an effective therapeutic.”

The researchers’ preliminary evidence shows that the compounds successfully inhibit the fusion protein with minimal impact on normal cells. The compounds could also be effective at keeping patients in remission.

“For this particular disease, only approximately 50 percent of patients survive five years because leukemia stem cells remain that can reinitiate the disease,” Bushweller says. “Our compounds have the potential to eradicate the stem cell population and thus keep the cancer from coming back.”

Bushweller credits the University system with enabling research in targeted therapeutics.

“Diseases that have relatively small patient populations are not typically the target of Big Pharma,” he says. “Academia and our technology transfer infrastructure allow us to pursue novel agents to target these diseases.”

The UVa. Patent Foundation has filed for international patent protection on the researchers’ compounds, which are currently available for licensing. This project has been funded by the Leukemia and Lymphoma Society’s Specialized Center of Research program and the National Institutes of Health.

GAINING VALUABLE PERSPECTIVE

UVAPF LAUNCHES ADVISORY PANEL



FROM LEFT TO RIGHT: UVa. Patent Foundation Advisory Panel members Gregory B. Fralish, Ph.D., and Kathyne Carr participate in discussion about a University technology. At its June meeting, the Advisory Panel provided feedback on the luminescent materials and associated business plan developed by Cassandra L. Fraser, Ph.D., professor of chemistry at UVa., and collaborators; the special dyes, a sample of which is shown above, could have a variety of applications, from sensors used in medicine and manufacturing to responsive coatings and pigments. *Photos by Tom Cogill and Dan Addison*

Securing patent protection for an invention requires a significant investment, and deciding which technologies to invest in is without question a risky business.

To reduce this risk, and gain valuable insight along the way, the University of Virginia Patent Foundation has called upon a distinguished group of local entrepreneurs, venture capitalists, academics and members of industry to serve as the Patent Foundation's inaugural Advisory Panel.

Established in March of 2010, the Advisory Panel makes recommendations to the Patent Foundation regarding patent investment decisions and offers feedback on business plans for up-and-coming University start-ups. Panel members' recommendations are based on factors such as the invention's patentability, market analysis, industry feedback, research funding and the panelists' own experiences.

"The University of Virginia has created a rich entrepreneurial environment that fosters many new

and worthy technologies,” says Advisory Panel member Wendy Yarno, M.B.A., former chief marketing officer for Merck & Co. Inc. “The Patent Foundation has taken a very insightful approach in establishing this diverse Advisory Panel to assist it in determining which technologies show the most promise and helping those technologies become successful.”

The Advisory Panel also serves as a conduit for knowledge sharing, says Miette H. Michie, interim executive director and CEO of the Patent Foundation.

“In addition to providing invaluable feedback to our inventors and entrepreneurs, Advisory Panel members are providing us with the opportunity to engage them in the technology transfer process,” Michie says. “When panelists learn of a new and exciting U.Va. technology and the challenges of bringing it to market, they are also often able to forge helpful connections to advance that technology.”

Inventors of U.Va. technologies eligible for full U.S. or international patent protection are invited to present their inventions before the panel at quarterly meetings throughout the year. Following each invention presentation and subsequent question-and-answer period, panelists engage in discussion about the technology. The Patent Foundation promptly shares all panelist feedback with the appropriate inventors.

Michael C. Wiener, Ph.D., associate professor of molecular physiology and biological physics at U.Va., presented two of his laboratory’s inventions before the panel in April.

“Members of the Advisory Panel listened closely and asked substantive questions regarding both the technical aspects of our inventions and the business and financial aspects related to its out-licensing,” Wiener says. “They saw the potential of these inventions in their niche market, appreciated the length of time required for term-sheet and licensing negotiations, and recommended a strong position for the Patent Foundation.”

Due in part to the panel’s recommendation, the Patent Foundation filed for international protection on the Wiener Lab’s technologies, which could significantly improve the way researchers study membrane proteins and advance their use in structure-based drug delivery. In July, the Patent Foundation licensed the discoveries to Carlsbad, Calif.-based Omscientia Inc., which is working to launch its first products based on the technology in the coming months.

For more information about the Advisory Panel, including panel member biographies, visit www.uvafpf.org/advpanel.

ADVISORY PANEL

Brian M. Campbell, Ph.D., M.B.A.

President, Campbell Aviation Consultants LLC

Kathryne Carr

Partner, Tall Oaks Capital Partners LLC

W. Mark Crowell

Executive Director and Associate Vice President for Innovation Partnerships and Commercialization, University of Virginia

Gregory B. Fralish, Ph.D.

Clinical and Translational Research Program Director, University of Virginia School of Medicine

George T. Gillies, Ph.D.

Research Professor of Mechanical Engineering and Biomedical Engineering, University of Virginia

Kevin R. Lynch, Ph.D.

Professor of Pharmacology, Biochemistry and Molecular Genetics, University of Virginia

Daniel J. O’Connell, M.B.A.

Co-founder and Managing General Partner, NeuroVentures

Wendy Yarno, M.B.A.

Chief Marketing Officer (Retired), Merck & Co. Inc.

FRESH PERSPECTIVES PAY OFF FOR U.VA. START-UPS

MICROLAB DIAGNOSTICS ACQUIRED

University of Virginia start-up company MicroLab Diagnostics Inc. was acquired in May by ZyGEM Corp. Ltd., a biotechnology company specializing in DNA extraction and testing solutions. MicroLab will continue to operate in Charlottesville as a new business unit of the company, which also has offices in California and New Zealand.

Founded in 2003 on technology developed by U.Va.'s James P. Landers, Ph.D., and licensed by the

U.Va. Patent Foundation, MicroLab uses lab-on-a-chip technology to miniaturize and streamline the chemical processes involved in biochemical analysis, including DNA testing. Taking the form of a single device smaller than a credit card, MicroLab's innovative technology has the potential to deliver accurate DNA results in the lab or in the field in under an hour, making it particularly well suited for applications such as forensics, biodefense, point-of-care diagnostics and food pathogen testing.

U.VA.-BASED HOME MALE FERTILITY TEST GETS FDA OK

U.Va. biotechnology start-up ContraVac Inc. received U.S. Food and Drug Administration clearance in May for SpermCheck Fertility, a new, over-the-counter product that allows men to check their fertility status in the comfort and privacy of their own homes.

Developed by U.Va. inventor John C. Herr, Ph.D., and colleagues, SpermCheck Fertility uses a platform similar to a home pregnancy test to measure a man's sperm count. The Patent Foundation licensed the patented technology to ContraVac, founded by Herr,

to commercialize the discoveries and bring associated products to the public.

Already being sold in Europe, SpermCheck Fertility is one of a family of products being developed by ContraVac. The company plans to make SpermCheck Fertility commercially available in the U.S. in the coming months. SpermCheck Vasectomy received FDA clearance in 2008 for post-vasectomy sterility monitoring and is currently being sold online and by physicians to their patients throughout the U.S.



FROM LEFT TO RIGHT: James P. Landers, Ph.D., who founded MicroLab Diagnostics Inc., is shown here in his laboratory. Machinery used at the Directed Vapor Technologies International Inc. facility to employ the directed vapor deposition process, which is based on technology licensed by the U.Va. Patent Foundation. *Photos by Tom Cogill*

EPIEP RECEIVES \$1.5 MILLION INVESTMENT

EpiEP Inc., a medical device company spun out of U.Va., received \$1.5 million in investments and commitments for the development of its novel EpiAccess system, which shows promise to improve and expand the treatment of cardiac arrhythmia and other heart conditions.

Based on technology invented by U.Va. faculty members Srijoy Mahapatra, M.D., and George T. Gillies, Ph.D., and licensed from the U.Va. Patent Foundation, the EpiAccess system has the

goal of providing minimally invasive access to the epicardium, the heart's outermost tissue. The Patent Foundation has filed for international patent protection on the researchers' discoveries, which it licensed to the company in April.

EpiEP, which is now headquartered in New Haven, Conn., received \$1 million from Connecticut Innovations' Eli Whitney Fund. It also acquired funding from LaunchCapital and private investors, completing its first round of funding.

U.VA. START-UPS 'SPARKING ECONOMIC GROWTH'

Three companies with U.Va. roots are among the successful University-related ventures showcased in a national report on economic development published in April. Adenosine Therapeutics LLC, Directed Vapor Technologies International Inc. and ContraVac Inc. are featured in "Sparking Economic Growth: How Federally Funded University Research Creates Innovation, New Companies and Jobs," produced by the Science Coalition, a nonprofit,

nonpartisan organization of 50 top U.S. public and private research universities.

Citing 100 successful federally funded university start-up companies and 13 additional thriving "companies with academic research at their core," the report demonstrates the significant return on investment that occurs when federal funds are used to advance basic university research.

CULTIVATING STRATEGIC PARTNERSHIPS WITHIN THE INNOVATION ECOSYSTEM

Q&A WITH W. MARK CROWELL

W. Mark Crowell joined the Office of the Vice President for Research in June as the University of Virginia's first executive director and associate vice president for innovation partnerships and commercialization. In the few months since his arrival, he has already helped to position U.Va. among the nation's leading innovation engines — speaking, for example, before the U.S. House Committee on Science and Technology in the Subcommittee on Research and Science Education's hearing on the theme "From the Lab Bench to the Marketplace: Improving Technology Transfer."

In the following Q&A, Crowell shares with us his vision for innovation at U.Va.

PATENT FOUNDATION: What is your long-term vision for innovation and commercialization at the University?

MARK CROWELL: U.Va. is a national top-two public university and a top-25 university overall. My long-term vision for innovation and commercialization at U.Va. is to develop an innovation ecosystem that is similarly distinguished across U.S. universities, that is, one that streamlines and enhances the process of transferring U.Va. innovations to the marketplace; is an important factor in recruiting and retaining the best faculty, graduate students and undergraduate students; and helps to maximize the value of knowledge created at U.Va. to society and to business.

PF: And what are your top priorities right now?

MC: My top priorities include (1) getting to know the U.Va. research community; (2) working with the Patent Foundation's director, board and colleagues throughout the University to develop the best possible business model for the Patent Foundation's operations; and (3) accelerating and expanding U.Va.'s connections and visibility on the regional, national and international innovation scene.

PF: There's been a lot of talk about developing an "innovation ecosystem" at U.Va. What does that mean, and how will we get there?

MC: A robust innovation ecosystem requires partnerships and collaborations across the boundaries that have traditionally defined the academy and its departments and disciplines. To get there, we need to remove barriers — such as those brought about by our policies, culture, reward structures and so on — and create incentives for researchers to collaborate across departments and disciplines.

It also requires that we connect the basic and translational research community across U.Va. with entrepreneurs, industry, investors, public service agencies and foundations, and related innovation partners across the region, the nation and beyond in order to maximize our capacity for translating knowledge into social and economic benefit.



“I WANT U.VA. TO BE ON THE ‘PREFERRED PARTNER’ LIST OF THE REGION’S ENTREPRENEURS AND INVESTORS.”

W. Mark Crowell, U.Va.’s executive director and associate vice president for innovation partnerships and commercialization.
Photo by Dan Addison

PF: What will this mean for University researchers and clinicians?

MC: It will mean a more robust and efficient array of resources, collaborators and partners available to innovators at U.Va. interested in translating and commercializing their research discoveries. It will also help to ensure that U.Va. is among the most competitive research universities in competing for funding, talent and partners.

PF: As U.Va. faculty and students are increasingly becoming interested in starting their own technology-based companies, how is the University going to build on its current efforts to further support entrepreneurs and their start-ups?

MC: U.Va. already has a rich assortment of resources supporting innovation and commercialization: great research programs, top-ranked business and commerce programs, leading-edge and highly impactful translational research initiatives, strong connections with the venture capital community and enthusiastic University leadership. Our efforts

to further support U.Va. researchers wishing to launch new ventures will of course build upon and leverage the resources already in place and also supplement them by connecting them more aggressively and strategically within the innovation ecosystem.

PF: How would you like to see U.Va. interact with the region’s entrepreneurship, venture capital and angel funding communities going forward?

MC: I want U.Va. to be on the “preferred partner” list of the region’s entrepreneurs and investors. My goal is to connect U.Va.’s innovation and commercialization activities with leading institutional investors, corporate venture funds, angels and angel funds, venture philanthropy organizations and others interested in investing in well-vetted, well-protected, leading-edge university innovation. And I want those investing in our projects to complete their deals willing to come back to U.Va. to do another deal.

For more information about Crowell and his new post, visit www.virginia.edu/vpic. Contact him at mcrowell@virginia.edu or 434.243.2203.

FISCAL YEAR 2010

REVENUES AND DISTRIBUTIONS



FROM LEFT TO RIGHT: A close-up view of the electro-spray source of the mass spectrometry equipment used by 2010 Edlich-Henderson Inventors of the Year Kevin R. Lynch, Ph.D., and Timothy L. Macdonald, Ph.D., for concurrent measurement of different cells and tissues (*see story on page 4*). Adam J. Katz, M.D., evaluates a wound dressing containing adipose stem cells, or stem cells found in adult fat tissue; Katz and his collaborators are developing new techniques that have been shown to increase the cells' effectiveness in healing diabetic wounds in mice (*see story on page 18*). Photos by Jackson Smith and Cade Martin

REVENUES

License fees and royalties	\$5,206,704
Patent costs reimbursed	\$941,409
Interest income	\$21,774
Total revenue	\$6,169,887

DISTRIBUTIONS

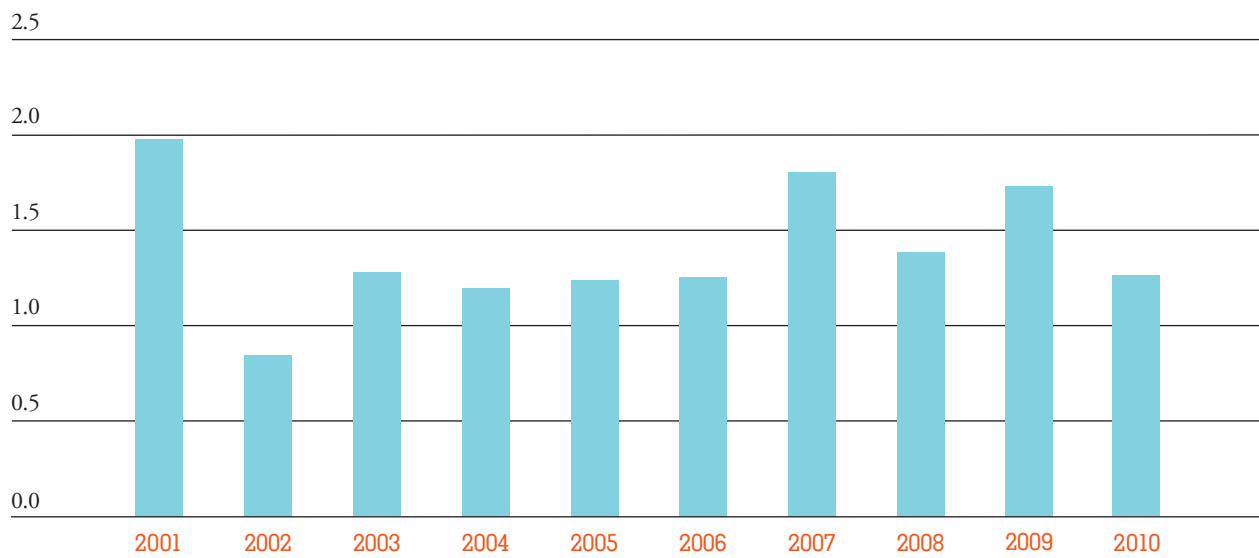
Distributions to inventors (see graph)	\$1,254,458
Distributions to the University of Virginia (see graph)	\$1,794,754
Other distributions	\$74,721
Total distributions	\$3,123,933
Net revenues	\$3,045,954

U.VA. ROYALTY DISTRIBUTION SCHEDULES

For the latest University of Virginia royalty distribution schedules for patents and software, established by the Office of the Vice President for Research, visit www.wvaf.org/royalties.

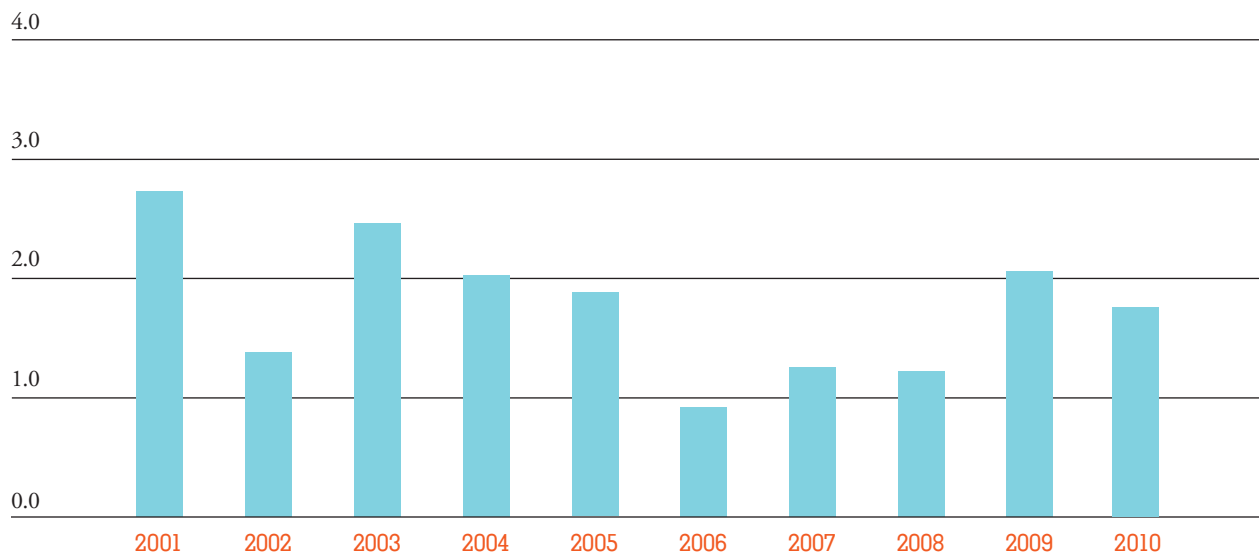
DISTRIBUTIONS TO INVENTORS (IN MILLIONS OF DOLLARS)

(Total accumulated distributions to inventors for fiscal years 1978–2010: \$21,951,494)



DISTRIBUTIONS TO U.VA. (IN MILLIONS OF DOLLARS)

(Total accumulated distributions to U.Va. for fiscal years 1978–2010: \$40,466,528)



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MISSION

- To provide accessible, responsive, competent, timely and professional patenting and licensing services to U.Va. and its faculty and staff
- To serve as an efficient and effective conduit for the licensing of promising U.Va. technologies to industry, thus promoting their entry into the commercial marketplace and also generating royalties that can further U.Va. research
- To support and encourage local economic development by licensing locally, by licensing to start-up companies, and by encouraging and supporting faculty start-up activities
- To serve as a resource for information about patents and licensing, and to encourage recognition that such matters have become meaningful and valuable aspects of university life
- To encourage greater integration between academia and industry, thereby improving the flow of innovative university technologies to the public marketplace



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FIND OUT HOW UVAPF INVENTORS' FRESH PERSPECTIVES ARE



SIGNALING NEW PATHWAYS FOR THE TREATMENT OF DISEASE

PAGE 4



DETECTING PANCREATIC CANCER BEFORE IT'S TOO LATE

PAGE 12



GENERATING A 'SMART' SOLUTION FOR MORE-EFFICIENT ENERGY PRODUCTION

PAGE 14



UNLEASHING THE THERAPEUTIC POTENTIAL OF FAT

PAGE 18



TARGETING LEUKEMIA AND PREVENTING ITS RETURN

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