A smart solution to diabetes management: 2011 Edlich-Henderson Inventor of the Year Boris P. Kovatchev, Ph.D., and collaborators’ novel software algorithm, shown here on a smartphone device, simulates the work of a healthy pancreas to maintain safe blood sugar levels in diabetics. (See story on page 4.) Photo by Stephanie Gross
It will come as no surprise to you that researchers at the University of Virginia are developing innovations every day that advance their fields, improve patient care and enhance our quality of life. Indeed, several of these "smart solutions" are featured throughout this publication, which seeks to highlight the high quality and diverse nature of the translational research under way at the University.

At UVa., however, we don’t feel that the onus of innovation falls to our researchers alone. Just as University founder and prolific inventor Thomas Jefferson would have wanted, innovation is infused throughout the University, sought even — and especially — at the highest levels of the administration. Please see the Q&A with UVa. President Teresa Sullivan on page 26 for her vision for UVa. innovation.

I am pleased to welcome aboard Michael Straightiff, who recently joined the UVa. Patent Foundation as director. You can read more about Michael and his priorities on page 22. In the spirit of innovation and with your helpful feedback, Michael and I will work closely over the next year to develop smart solutions that will augment the success of our inventive researchers, entrepreneurs, industry partners and other collaborators. I encourage you to contact me with your ideas at mcrowell@virginia.edu.

Finally, I want to take this opportunity to thank Tom Skalak, vice president for research; Erik Hewlett, chairman of the Patent Foundation Board of Directors, and the entire Board; and the members of the search committee that worked diligently over the past year to recruit a new leader for the Patent Foundation. I also sincerely thank Miette Michie, who served as interim director for the Patent Foundation throughout this time of transition, and the entire Patent Foundation staff for their hard work and diligence.

W. Mark Crowell
Executive Director and Associate Vice President
Innovation Partnerships and Commercialization
University of Virginia
BOARD OF DIRECTORS
ERIK L. HEWLETT, M.D., CHAIR
THOMAS C. MACAVOY, PH.D., VICE CHAIR AND TREASURER
HAYDN N.G. WADLEY, PH.D., SECRETARY
KATHRYNE CARR
W. MARK CROWELL
JOHN C. HERR, PH.D.
RANDAL J. KIRK, J.D.
THOMAS C. SKALAK, PH.D.
CHARLES F. STAMM, M.B.A.
SUSAN WRAY, D.D.S., J.D.

ADVISORY PANEL
BRIAN M. CAMPBELL, PH.D., M.B.A.
KATHRYNE CARR
RAUL O. CHAO, PH.D., M.B.A.
W. MARK CROWELL
GREGORY B. FRALISH, PH.D.
GEORGE T. GILLIES, PH.D.
KEVIN R. LYNCH, PH.D.
SANJEEV MUNSHI, PH.D., M.B.A.
DANIEL J. O’CONNELL, M.B.A.
WENDY YARNO, M.B.A.
In healthy children and adults, the pancreas is constantly working to produce enough insulin to keep the body’s blood sugar levels in check. In people with Type 1 diabetes, however, the pancreas fails to deliver, instead leaving these patients to work around the clock to manage their blood glucose levels.

Even with the advent of diabetes management tools such as insulin pumps and continuous glucose monitors, “You are still the driving force behind the diabetes management,” said Elliott Mendes, a Type 1 diabetic, in a video interview for the Juvenile Diabetes Research Foundation’s Artificial Pancreas Project.

By developing “an automated system to disperse insulin based on real-time changes in blood sugar levels,” the project seeks to free Type 1 diabetics of the onus of diabetes management and reduce the incidence of severe diabetes-related outcomes, such as ulcers, nerve damage, vascular diseases, blindness and kidney failure.

“We have to keep working for a cure, absolutely, but until we get to that point, we need an artificial pancreas,” Mendes said.

At the core of the artificial pancreas is a “smart” algorithm developed by University of Virginia diabetes technology scientist Boris P. Kovatchev, Ph.D., and collaborators. Using existing diabetes management technology and information unique to each patient, the algorithm recommends and delivers a custom insulin dose every 15 minutes. The system is thus able to automatically regulate a patient’s insulin levels, with no action required on behalf of the user — or, in Mendes’ words, “taking that burden off my shoulders and helping me go and enjoy the other aspects of my life.”

The algorithm is currently being tested in clinical trials at the UVa. Health System and 10 other centers spanning seven countries.

For his work on the artificial pancreas and other leading diabetes management technologies, the UVa. Patent Foundation selected Kovatchev as the 2011 Edlich-Henderson Inventor of the Year. Awarded annually, the honor recognizes a UVa. inventor or team of inventors whose research discoveries have proven to be of notable value to society. Kovatchev was honored at the Patent Foundation’s annual awards reception April 19 at the Rotunda.
“DIABETES TECHNOLOGY, AND PARTICULARLY THE ARTIFICIAL PANCREAS, IS AN AREA OF VERY RAPID ACADEMIC AND INDUSTRIAL DEVELOPMENT.”

—BORIS P. KOVATCHEV, PH.D.
“Dr. Kovatchev’s novel computational methods have significantly advanced the field of diabetes research worldwide,” said Patent Foundation assistant director and senior licensing manager Miette H. Michie, who formerly served as interim director. “For his achievements in Type 1 and Type 2 diabetes control, the U.Va. Patent Foundation is pleased to recognize him as the 2011 Edlich-Henderson Inventor of the Year.”

Director of the U.Va. Center for Diabetes Technology, Kovatchev is among the University’s most prolific inventors, with 38 issued U.S. and international patents and an additional 74 patents currently pending. Through agreements brokered by the Patent Foundation, industry partners are working to bring several of these patented technologies to market.

“Diabetes technology, and particularly the artificial pancreas, is an area of very rapid academic and industrial development,” said Kovatchev, a professor in the School of Medicine’s Department of Psychiatry and Neurobehavioral Sciences with a joint appointment in the School of Engineering and Applied Science’s Department of Systems and Information Engineering.

“I am thankful to my colleagues, collaborators and supporters for their help with positioning U.Va. as a leader in this new and promising field of medical science,” he added.

In addition to his work on the artificial pancreas, Kovatchev has developed several pioneering tools that have advanced the state of diabetes research, including a computer-based diabetes simulator that is the only protocol to have been accepted by the U.S. Food and Drug Administration as an alternative to animal testing of Type 1 diabetes control strategies. Developed in collaboration with U.Va. colleague Marc D. Breton, Ph.D., along with Claudio Cobelli, Ph.D., and Chiara Dalla Man, Ph.D., of the University of Padova, Italy, the simulator uses a software algorithm to model the human metabolic system.

Based on patient data from 300 children, adolescents and adults with Type 1 diabetes, the algorithm uses 26 different parameters to mimic human metabolism at the individual level, through several distinct patient profiles. Within these individual profiles, variables such as diet, exercise behavior and insulin intake can be manipulated to test the accuracy or effectiveness of a new product under varying conditions — or to compare it to existing products.

Offering an improvement over other simulators, “This simulator allows in silico preclinical experiments to be conducted at the level of an individual, revealing interpersonal differences due to treatment,” Kovatchev said.
Boris P. Kovatchev, Ph.D., and the novel software he developed with collaborators to maintain safe blood sugar levels in diabetics, shown here on a smartphone device. Photos by Stephanie Gross

“Dr. Kovatchev’s novel computational methods have significantly advanced the field of diabetes research worldwide.”
—Miette H. Michie

The Patent Foundation granted Charlottesville-based medical research firm The Epsilon Group, a division of Medical Automation Systems Inc., an exclusive license to the simulator technology in April 2011.

“It takes a tremendous amount of time and resources to conduct animal testing for clinical trials, often only to find that a treatment doesn’t work,” Michie said. “Through their innovative diabetes simulator, Drs. Kovatchev and Breton and their collaborators have provided an FDA-accepted substitute for animal trials, allowing effective treatments to reach the market — and start impacting patients — much sooner.”

Approximately 60 academic and industrial sites are already using the simulator for research purposes. Patents on the simulator are pending.

Among Kovatchev’s other diabetes technology projects are methods for predicting the short- and long-term risks of severe hypoglycemia, a serious condition arising from patients’ blood sugar dipping below safe levels; computational tools for assessing behavioral irregularity associated with Type 1 diabetes and for assessing long-term diabetes control; and a method for evaluating the accuracy of continuous glucose sensors. He has also developed computational methods useful in the study of conditions such as substance addiction and attention-deficit/hyperactivity disorder.

Kovatchev has received funding from the Juvenile Diabetes Research Foundation, the National Institute of Diabetes and Digestive and Kidney Diseases, the Wallace H. Coulter Translational Research Partnership, Paul and Diane Manning, and industry sources.
THE EDLICH-HENDERSON
INVENTOR OF THE YEAR AWARD

The highest honor bestowed by the UVa. 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 UVa. 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

2011  Boris P. Kovatchev, Ph.D.
2010  Kevin R. Lynch, Ph.D.
       Timothy L. Macdonald, Ph.D.
2009  John P. Mugler III, Ph.D.
       James R. Brookeman, Ph.D.
2008  George T. Rodeheaver, Ph.D.
2007  Wladek Minor, Ph.D.
2006  George T. Gillies, Ph.D.
2005  Benjamin M. Gaston, M.D.
       John E. Hunt, M.D.
2004  Haydn N.G. Wadley, 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.
1999  John C. Herr, Ph.D.
1997  Richard L. Guerrant, M.D.
       Timothy L. Macdonald, Ph.D.
1996  Jessica J. Brand
       Patrice G. Guyenet, Ph.D.
       Richard D. Pearson, M.D.
       Janine C. Jagger, Ph.D.
1995  Donald F. Hunt, Ph.D.
       Jeffrey Shabanowitz, Ph.D.
       George C. Stafford Jr., Ph.D.
1994  Gerald L. Mandell, M.D.
       Gail W. Sullivan
1993  Joseph Larner, M.D., Ph.D.
1992  Robert M. Berne, M.D.
       Luiz Belardinelli, M.D.
       Rafael Rubio, Ph.D.
UVAPF YEAR AT A GLANCE
FISCAL YEAR 2011

INVENTIONS
141 Inventions disclosed by U.Va. inventors

PATENTS
122 Provisional patent applications filed
70 U.S. applications* filed
37 U.S. patents issued (see listing at www.uvapf.org/patents)
264 U.S. applications* pending

COPYRIGHTS
6 Copyrights registered to U.Va. authors

DEALS
58 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 computer science and neurology 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.
## INVENTION DISCLOSURES
### FISCAL YEAR 2011

### School of Medicine

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Invention Disclosures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medicine</td>
<td>23.5</td>
</tr>
<tr>
<td>Microbiology, Immunology and Cancer Biology</td>
<td><strong>86.5</strong></td>
</tr>
<tr>
<td>Psychiatry and Neurobehavioral Sciences</td>
<td>5.5</td>
</tr>
<tr>
<td>Surgery</td>
<td><strong>10.3%</strong></td>
</tr>
<tr>
<td>Biomedical Engineering</td>
<td>34.0</td>
</tr>
<tr>
<td>Cell Biology</td>
<td>14.5</td>
</tr>
<tr>
<td>Anesthesiology</td>
<td>3.5</td>
</tr>
<tr>
<td>Neuroscience</td>
<td>4.0</td>
</tr>
<tr>
<td>Pathology</td>
<td>3.0</td>
</tr>
<tr>
<td>Pharmacology</td>
<td>3.7</td>
</tr>
<tr>
<td>Emergency Medicine</td>
<td>4.0</td>
</tr>
<tr>
<td>Radiology and Medical Imaging</td>
<td>3.0</td>
</tr>
<tr>
<td>Biochemistry and Molecular Genetics</td>
<td>3.0</td>
</tr>
<tr>
<td>Neurology</td>
<td>2.0</td>
</tr>
<tr>
<td>Pediatrics</td>
<td>1.0</td>
</tr>
<tr>
<td>Public Health Sciences</td>
<td><strong>67.5%</strong></td>
</tr>
<tr>
<td>Molecular Physiology and Biological Physics</td>
<td>1.0</td>
</tr>
<tr>
<td>Cancer for Telehealth</td>
<td>1.0</td>
</tr>
<tr>
<td>Neurosurgery</td>
<td>1.0</td>
</tr>
<tr>
<td>Ophthalmology</td>
<td>0.5</td>
</tr>
<tr>
<td>Urology</td>
<td>0.5</td>
</tr>
<tr>
<td>Neurology</td>
<td>2.8%</td>
</tr>
</tbody>
</table>

### School of Engineering and Applied Science

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Invention Disclosures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomedical Engineering***</td>
<td><strong>6.8</strong></td>
</tr>
<tr>
<td>Mechanical and Aerospace Engineering</td>
<td>5.5</td>
</tr>
<tr>
<td>Electrical and Computer Engineering</td>
<td>11.5</td>
</tr>
<tr>
<td>Mechanical and Aerospace Engineering</td>
<td>5.5</td>
</tr>
<tr>
<td>Biomedical Engineering***</td>
<td><strong>6.5</strong></td>
</tr>
<tr>
<td>Biomedical Engineering</td>
<td>6.5</td>
</tr>
<tr>
<td>Medical and Aerospace Engineering</td>
<td>5.5</td>
</tr>
<tr>
<td>Chemical Engineering</td>
<td>3.0</td>
</tr>
<tr>
<td>Systems and Information Engineering</td>
<td>3.5</td>
</tr>
<tr>
<td>Computer Science</td>
<td>3.0</td>
</tr>
<tr>
<td>Center for Advanced Study of Teaching and Learning</td>
<td>1.0</td>
</tr>
<tr>
<td>College of Architecture</td>
<td>1.0</td>
</tr>
<tr>
<td>Architecture</td>
<td>(0.7%)</td>
</tr>
<tr>
<td>Chemistry</td>
<td><strong>10.5</strong></td>
</tr>
<tr>
<td>Psychology</td>
<td>2.0</td>
</tr>
<tr>
<td>Physics</td>
<td><strong>5</strong></td>
</tr>
<tr>
<td>Biology</td>
<td><strong>5</strong></td>
</tr>
</tbody>
</table>

### Curry School of Education

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Invention Disclosures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Center for Advanced Study of Teaching and Learning</td>
<td>1.0</td>
</tr>
<tr>
<td>Architecture</td>
<td>(0.7%)</td>
</tr>
</tbody>
</table>

### School of Architecture

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Invention Disclosures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architecture</td>
<td><strong>1.0</strong></td>
</tr>
</tbody>
</table>

### Other

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Invention Disclosures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical Center</td>
<td><strong>4.0</strong></td>
</tr>
<tr>
<td>Other</td>
<td>(2.8%)</td>
</tr>
</tbody>
</table>
Anselmo G. Canfora was looking to engage architecture students in a timely and relevant design–build project when disaster struck — literally. When Hurricane Katrina hit the American Gulf Coast in 2005, Canfora watched in dismay as the U.S. Federal Emergency Management Agency conducted disaster-relief efforts with its much-maligned travel trailers.

“That’s when I started to focus on disaster-recovery housing,” said Canfora, assistant professor in the University of Virginia School of Architecture and director of Initiative reCOVER. “The FEMA trailers were highly inadequate, exacerbating the deplorable conditions people were living in after a natural disaster. This was a compelling design problem I wanted to concentrate on through my research and teaching.”

To address this problem, Canfora focused his studio, the equivalent of a research lab, on transitional disaster-recovery housing. With the help of partners in the School of Architecture and the School of Engineering and Applied Science, and external partners such as the Building Goodness Foundation and the Arup Cause, Initiative reCOVER was born.

When an international competition sought solutions for Haiti’s displaced population following a magnitude 7.0 earthquake in January 2010, reCOVER responded. The team’s innovative “Breathe House,” so named for its natural ventilation strategy, took first place in the competition and will be built this spring in the Haitian community of Bois l’Etat, near St. Marc.

The pioneering structure combines panelized and modular prefabricated building components with new and proven strategies for leveraging the environment for comfortable, economical living, off the grid. The home’s rooftop photovoltaic system, for instance, provides the electricity required to power low-volume ceiling fans, lighting, a small refrigerator and sensors that monitor system efficiency.

Passive ventilation strategies, solar walls, expanded rooftops and advanced water filtration work to keep occupants cool and mitigate the spread of disease — particularly airborne tuberculosis, the second leading cause of death in Haiti after HIV/AIDS. The reCOVER team also took great care to incorporate indigenous building materials into their design and involve local trades to help preserve Haitian culture and revive the local economy.

All of the home’s components — minus the modular amenities unit — ship flat-packed in a kit that can be assembled using only hand tools and in just two days, making it a smart and practical housing solution for the months and even years following a disaster.

Canfora and his partners are adapting the innovative design, copyrighted by the U.Va. Patent Foundation, for use in a variety of climates and other site conditions, so that reCOVER can provide disaster-relief housing wherever it is needed.

“Haiti is proving to be a challenging place to build a unit,” Canfora said. “We hope to learn as much as we can from this experience and continue to improve and adapt the design for future applications around the world.”

Initiative reCOVER is funded by the Virginia Tobacco Indemnification and Community Revitalization Commission, the National Science Foundation, the Environmental Protection Agency, U.Va.’s Jefferson Public Citizens program and Vice President for Research, and several additional organizations and individuals.
When it comes to the chemical structure of a drug, even a small improvement can make a big impact on its biological activity. University of Virginia professor of medicine Paul S. Hoffman, Ph.D., and collaborators offer a case in point. According to Hoffman, their modification of an existing treatment for diarrheal disease, which claims approximately 2 million lives each year, could lead to “a completely new generation of therapeutics.”

Discovered in the 1980s, nitazoxanide is approved by the U.S. Food and Drug Administration for the treatment of diarrhea-causing infections involving pathogens *Cryptosporidium* and *Giardia*. Because it is not water soluble, however, the drug — trade-named Alinia® — is poorly absorbed by the body, reducing its effectiveness against infection.

With a $2.6 million grant from the National Institute of Allergy and Infectious Diseases, Hoffman set out to improve the drug with the help of several interdisciplinary collaborators.

“We’re really fortunate to be in a position to do very applied, medically relevant research here at U.Va. with some of the brightest minds on the planet,” said Hoffman, who previously conducted research at pharmaceutical giant GlaxoSmithKline and, as a consultant for Romark Laboratories LC, identified bacterial enzyme pyruvate:ferredoxin oxidoreductase as the drug target for nitazoxanide.

“Knowing nitazoxanide’s limitations and biological target, we asked, ‘What can we do to make this drug better?’”

Hoffman began working with U.Va. chemist W. Dean Harmon, Ph.D., to determine the chemical properties of the drug. Together they found that a small portion of the drug’s chemical structure, referred to as 5-nitrothiazole, was responsible for its biological activity. Using the nitrothiazole group as a building block, U.Va. medicinal chemists Timothy L. Macdonald, Ph.D., and T. Eric Ballard, Ph.D., synthesized more than 250 derivative compounds, many of which were found to be more potent inhibitors of the enzyme than nitazoxanide.

Lead compound amixicile, which is currently undergoing preclinical studies, shows particular promise in the treatment of *Clostridium difficile*, a severe diarrhea-causing infection that typically occurs following the use of antibiotics, and of other harmful pathogens.

“Since amixicile is completely water soluble, it may offer therapeutic value not only against anaerobic and parasitic infections but potentially also as an antiviral against hepatitis C,” Hoffman said.

The researchers’ novel compounds, on which the U.Va. Patent Foundation has filed for patent protection, may be effective against a wide range of organisms, including those causing *Staphylococcal* infection, Legionnaires’ disease, anthrax, tuberculosis and influenza. In addition, the compounds are the first drugs to target vitamins, or small molecules involved in an enzymatic reaction, rather than larger proteins, thus limiting the likelihood of mutation-based drug resistance. The compounds are currently available for licensing.
 CELEBRATING SMART SOLUTIONS

The University of Virginia Patent Foundation honored 70 U.Va. inventors at its annual awards ceremony April 19 in the Rotunda, including 2011 Edlich-Henderson Inventor of the Year Boris P. Kovatchev, Ph.D., (featured on page 4) and those who received U.S. patents and copyrights in 2010.

FOR A COMPLETE LISTING OF U.S. PATENTS ISSUED TO U.VA. INVENTORS, SEE WWW.UVAPF.ORG/PATENTS
For many people suffering from disorders like insomnia, psychological treatment is not an option — specialized counseling can be costly and is not available everywhere. But Lee M. Ritterband, Ph.D., and Frances P. Thorndike, Ph.D., at the University of Virginia are working to change all that. Through their innovative software platform and new company, the clinical psychologists are working to bring expert psychological help from the therapist’s couch to your own.

As part of the Behavioral Health and Technology group within the School of Medicine’s Department of Psychiatry and Neurobehavioral Sciences, the clinician–scientists aim to make psychological care more widely available through what are called Internet-based interventions. Employing the cognitive-behavior therapy strategies widely used by clinicians, the Web-based programs provide guidance to patients within the comfort of their own homes.

“We turned to the Internet as a way to take what we typically do in the office and transform it for online delivery, to reach greater numbers of people and increase access to care,” Thorndike said.

For insomniacs, for instance, there’s Sleep Healthy Using the Internet, or SHUTi™. Using the researchers’ BeStudy Manager™ platform technology, the interactive, six-week-plus program offers users tailored recommendations based on their sleep habits, which they record in a detailed online sleep diary. As they make their way through the program’s interactive modules, users monitor their progress, track goals, unlock new program content, receive personalized feedback, take quizzes, play related games, and engage in multimedia vignettes that weave throughout the intervention.

In a clinical trial, 73 percent of SHUTi users reported no longer suffering from insomnia upon completion of the program. Following the trial, Ritterband said, “We were eager to find a way to make our interventions available, to get them out there, and that’s really what led to BeHealth Solutions™,” the researchers’ new company.

BeHealth licensed the BeStudy Manager platform, SHUTi and another intervention — UCanPoopToo™, for children ages 5 to 12 struggling with encopresis, or “accidents” — from the U.Va. Patent Foundation in April 2011. Through BeHealth, the researchers are exploring various models to make their Internet interventions available.

The company also offers customization of the BeStudy Manager to those wishing to develop Internet interventions in additional areas. “That way, that particular researcher doesn’t have to re-create the wheel,” Thorndike said. “They can hit the ground running by taking advantage of the technology we already have in place.”

While Internet interventions hold promise, Ritterband and Thorndike don’t expect their technology to replace face-to-face therapy sessions as the standard of psychological care.

“We believe in the stepped-care model,” Thorndike said. “A fully automated Internet intervention can likely work for a certain group of people, and hopefully, with more research, we’ll be able to predict who might need another level of care.”

The researchers’ interventions have been funded by numerous institutes at the National Institutes of Health, including the National Institute of Mental Health.
Today’s microprocessing chips employ up to 4 billion transistors, allowing our computers, smartphones and other devices to run faster, store more data, be smaller and cost less than ever before. But what if this is “it” — that is, what if today’s devices are as good as they get?

It’s a valid concern, according to Benton H. Calhoun, Ph.D., associate professor in the University of Virginia’s Charles L. Brown Department of Electrical and Computer Engineering. As transistors and other complex circuitry become smaller and thus more difficult to fabricate on a silicon chip, device manufacturers are running into significant physical design constraints. Specifically, today’s memory circuits contain irregular shapes, which become exceedingly difficult to fabricate precisely at shrinking dimensions.

“We’re starting to hit the physical limit of scaling,” said Calhoun. “These circuits are actually down on the same scale or smaller than the wavelength of the light that is used to pattern them, and so it becomes harder and harder to draw these irregular shapes.”

But there’s no need to panic just yet. Calhoun and graduate student Randy W. Mann have invented a new circuit blueprint that could solve these physical design challenges for memory bit cells by replacing complex shapes with a series of straight lines. If adopted, the innovative new design could allow for more precise fabrication, even at an increasingly infinitesimal scale, and more densely packed memory chips. Translation: Future generations of faster, better, smaller, less-expensive devices.

The University of Virginia Patent Foundation has filed for international patent protection on the novel design and is now seeking industrial partners interested in commercializing the technology.

In addition, with funding from the U.S. Defense Advanced Research Projects Agency and the National Science Foundation, Calhoun and graduate student Joseph F. Ryan have developed a sub-threshold field-programmable gate array (FPGA), a type of integrated circuit that allows the end user flexibility to program or configure its functionality. While FPGAs’ flexibility typically comes at the cost of lost efficiency over hard-wired alternatives, Calhoun’s ultra-low-power solution could be ideal for many devices requiring higher energy efficiency or extended battery life.

“There are a lot of applications out there that require a lot of computation but also reduced size, weight and power,” he said, such as sensors to monitor environmental activity or the behavior of a material over time.

Calhoun’s FPGA, which is also covered by international patent protection and available for licensing, operates at voltages as low as 0.2 volts, well below the threshold required to turn on a transistor.

“If you compare it to a faucet,” he said, “the threshold is the point at which the water starts flowing, and we’re using basically a bunch of barely dripping faucets to do useful work.”
NEW LEADERSHIP SIGNALS EXPANDED ROLE FOR UVAPF

MICHAEL P. STRAIGHTIFF BRINGS BUSINESS DEVELOPMENT TO THE FOREFRONT

Michael P. Straightiff joined the University of Virginia Patent Foundation as director Sept. 21, bringing to the organization an expanded focus on business development and new-venture creation.

Formerly director of biomedical engineering commercialization in Case Western Reserve University’s Technology Transfer Office, Straightiff has managed high-profile research, development and commercialization partnerships with several large biomedical technology companies and has been involved in the formation of a number of technology start-ups.

Straightiff’s “background includes success in forming new businesses, raising investment capital and licensing intellectual property,” said W. Mark Crowell, executive director and associate vice president for innovation partnerships and commercialization at U.Va. “His unique insight on innovation management and translational research will help to strengthen the Patent Foundation’s efforts to support the University’s inventive researchers and, increasingly, entrepreneurs as we work to enhance the innovation ecosystem at U.Va. and in central Virginia.”

Among Straightiff’s top priorities are “strengthening relationships with University innovators, continuing to develop creative industrial partnerships, and fostering the region’s burgeoning entrepreneurial and innovation communities,” he said.

“Through these efforts, we will achieve a higher number and quality of invention disclosures, we will make more strategic investments and intellectual-property decisions, and we will ultimately create a larger impact for University of Virginia innovations on society.”

Straightiff’s goals are reflective of the University’s priorities, said Thomas C. Skalak, Ph.D., vice president for research.

“U.Va. is deeply committed to playing a central role in winning America’s future. One critical path to that goal is through the dissemination of new knowledge that creates high-value jobs and economic strength, and we are confident that Michael brings a highly creative approach to building the University’s innovation enterprise,” Skalak said.
Throughout Skalak’s tenure, the University has placed increasing importance on its technology commercialization and economic development activities, embracing industry and other organizations through dynamic collaborations like the Wallace H. Coulter Translational Research Partnership and strategic research partnerships with major corporations and industry leaders such as AstraZeneca, Johnson & Johnson and Rolls-Royce.

“The University of Virginia is an exceptional institution with world-class faculty, students, research and patient care,” Straightiff said. “These resources, coupled with strong institutional commitments to industrial partnerships and commercialization, create a critical component of a robust innovation economy. As a result, UVa. is poised to become a national leader in business development, strategic partnerships and technology commercialization.”

Erik L. Hewlett, M.D., chairman of the Patent Foundation board and of the search committee that recommended Straightiff, said the Patent Foundation will continue to manage and commercialize the innovative technological discoveries generated by the University community while UVa. and Patent Foundation officials further develop an integrated model for enhanced service to UVa. inventors.

“Michael has the ideal background, experience, philosophy and spirit to lead the foundation as the enhanced working relationship with the University matures,” said Hewlett, a professor of internal medicine in the Division of Infectious Diseases and International Health in the School of Medicine.

Straightiff previously was a senior licensing associate and a consultant for Virginia Tech Intellectual Properties Inc., where he managed a diverse portfolio of technologies in engineering, physical sciences and life sciences. He also worked as a patent examiner for the U.S. Patent and Trademark Office after serving as a research assistant at the Cleveland Functional Electrical Stimulation Center.

For more information about Straightiff, visit www.uvapf.org. Contact him at straightiff@virginia.edu or 434.982.3709.

“U.Va. is poised to become a national leader in business development, strategic partnerships and technology commercialization.”
SMART SOLUTIONS SPELL SUCCESS FOR U.VA. SPINOFFS

FROM LEFT TO RIGHT: HemoSonic LLC’s William F. Walker, Ph.D., Megan K. Shaw, Elisa A. Ferrante, Ph.D., and Francesco Viola, Ph.D., pose with the company’s Breakthrough Award, and Robin A. Felder, Ph.D., accepts the People’s Choice Navigator Award, at the Charlottesville Business Innovation Council’s 2011 awards gala. Phthisis Diagnostics Inc.’s Crystal R. Icenhour, Ph.D., and Elizabeth P. Pyle, M.B.A., talk with attendees at the Biotechnology Industry Organization’s 2011 international convention. Photos by Stephanie Gross and Oscar Einzig

ACCOLADES

ADIAL PHARMACEUTICALS™ LLC and TAU THERAPEUTICS LLC were named finalists for the Virginia Biotechnology Association’s 2011 Virginia Bioscience Company of the Year Award in May. The award recognizes the firm with strong overall performance and that “best exemplifies the innovative spirit of the Virginia life sciences community.”

www.adialpharma.com | www.tautherapeutics.com

HEMOSONICS LLC received the Charlottesville Business Innovation Council’s 2011 Breakthrough Award in June for achieving the “most remarkable breakthrough or quantum advance.” In 2010, the company secured three federal grants worth nearly $2 million under the Small Business Innovation Research and Small Business Technology Transfer programs. www.hemosonics.com

Richmond-based WELLWARE® SYSTEMS INC. received a 2011 Virginia Healthcare Innovators Award in April, taking top honors in the Health Information Technology category. The awards “recognize Virginia organizations that have developed innovative ways to improve health care quality and efficiency.” WellAWARE founder Robin A. Felder, Ph.D., also received the Charlottesville Business Innovation Council’s 2011 People’s Choice Navigator Award in June for demonstrating “exceptional leadership in the local or regional business community.” www.wellwaresystems.com
PRODUCTS

PHTHISIS DIAGNOSTICS INC. launched its first product, the E-Sphere® Stool DNA Extraction Kit, in May 2011 after receiving $450,000 in investments. The kit streamlines the extraction of DNA from stool samples prior to analysis, improving laboratories’ efficiency and accuracy while reducing costs and risk of sample contamination. www.phthisisdiagnostics.com

REGULATORY AFFAIRS

Clinical Data Inc., which acquired ADENOSINE THERAPEUTICS LLC in 2008 and was itself acquired by Forest Laboratories Inc. in 2011, announced in December 2010 that Santen Pharmaceutical Co. Ltd. filed an Investigational New Drug application with the U.S. Food and Drug Administration for Clinical Data’s ATL313 drug candidate for the treatment of glaucoma and ocular hypertension. Clinical Data licensed the compound, which was developed at UVA, to Santen in May 2010.

Forest Laboratories’ apadenoson compound, also developed at UVA and licensed to Clinical Data, is currently in Phase III clinical trials for the detection of defects in the supply of blood to the heart muscle using SPECT-MPI, or Single-Photon Emission Computed Tomography Myocardial Perfusion Imaging.

DIFFUSION PHARMACEUTICALS LLC’s lead drug candidate for the treatment of glioblastoma multiforme, or primary brain cancer, was granted orphan drug status by the U.S. Food and Drug Administration. Created to support the development of therapies that “treat a rare disease or condition,” the designation qualifies the company for marketing incentives and tax credits. www.diffusionpharma.com

KNOPP BIOSCIENCES LLC and Biogen Idec announced the launch of a multinational Phase III study evaluating drug candidate dexpramipexole as a potential treatment for amyotrophic lateral sclerosis, or Lou Gehrig’s disease, in April. Knopp licensed the drug candidate, identified at UVA, to the Fortune 500 company in August 2010. www.knoppbio.com

PLUROGEN™ THERAPEUTICS INC. received European marketing approval for its flagship burn and wound gel, PluroGel® with Silver Sulphadiazine, in August 2010 and has begun product sales in seven European countries, with more expected. PluroGen also signed an agreement worth up to $8.6 million with the U.S. Department of Defense to fund the regulatory approval process of the company’s second product, PluroGel® PNN, and expand manufacturing. PluroGen opened a 21,000-sq.-ft. operational and manufacturing facility in January 2011. www.plurogen.com

TAU THERAPEUTICS LLC closed a $4.2 million funding round in December 2010 to conduct a multisite clinical trial on repositioned drug mibefradil for the treatment of brain cancer. The trial will be co-sponsored by the National Institutes of Health’s Adult Brain Tumor Consortium. www.tautherapeutics.com

ON THE MOVE

INDOOR BIOTECHNOLOGIES INC. announced plans in March 2011 to create the CityCampus Biotechnology Center (www.citycampusllc.com), an expansive biotechnology research center and business incubator, in the former Coca-Cola® bottling plant on Preston Ave. in Charlottesville. www.inbio.com
**Q&A WITH TERESA A. SULLIVAN, PH.D.**

*Teresa A. Sullivan, Ph.D., a leading scholar in labor force demography and former provost and executive vice president for academic affairs at the University of Michigan, took office as the University of Virginia’s eighth president on Aug. 1, 2010.*

*In the following Q&A, she shares with us her vision for University innovation.*

**PATENT FOUNDATION:** Having been exposed to innovative research coming out of the University of Michigan, the University of Texas system and now the University of Virginia, what are your thoughts on the role of academic technology transfer, in general and as it relates to UVa’s overall mission?

**TERESA SULLIVAN:** In the United States, universities are the big engines of research and development in everything from engineering, computer science and medical research to areas like organizational and financial innovation.

The University of Virginia has a vibrant research community, and technology transfer allows our research to have more impact by connecting it with the outside world. That’s good for our students, it’s good for us and it’s certainly good for the community.

**PF:** What is your long-term vision for innovation at UVa?

**TS:** I’d like us to be known as best-in-class for being friendly to innovation, so that when potential partners are looking for a university to work with, they think of UVa first. By the way, I think Thomas Jefferson would have liked that, too. He was exceedingly innovative, and I think that he would’ve been pleased for the University to continue this aspect of his legacy.

**PF:** What can those of us involved in translational research at the University do to help make that vision a reality?

**TS:** We need to look for barriers that we can remove to make the process more convenient for inventors. Some barriers we can’t remove because they’re already put in place by, say, patent law, but we can help provide the know-how, easy-to-understand procedures and friendly atmosphere to help get inventors’ ideas out into the world.

**PF:** The School of Medicine recently added a technology commercialization section to its promotion and tenure application. What are your thoughts on including intellectual property, deals with industry, and entrepreneurial activity in tenure decisions?
I’m in favor of seeing this activity considered as a plus-factor when somebody goes up for promotion. In the scientific community, this activity will never replace publishing in a peer-reviewed journal, but it is an important contribution, and I think it deserves to be recognized for that reason.

Technology commercialization also plays a role in faculty recruitment and retention, as newly minted Ph.D.s who come from an actively entrepreneurial department want to see the same thing when they arrive here. Accordingly, it’s important that we educate graduate students about their intellectual-property rights and the value of technology commercialization. If we’re not doing that for our graduate students, we’re putting them at a disadvantage when they go out to look for their first job.

We’re seeing an upswing in the number of companies spinning out of the University. What would you like to say to our readers who are considering starting a new technology venture?

That’s the direction that we’d like to move, and I think that’s wonderful. To those of you who are entrepreneurially inclined and interested in starting a company around your discoveries, we’d like to help you make that happen, because we see that as being of mutual benefit to the University and to the inventor. And when you’re ready, the U.Va. Patent Foundation is the place to start.

For more information about Sullivan and her priorities, see www.virginia.edu/president.
## FISCAL YEAR 2011

### REVENUES AND DISTRIBUTIONS

### REVENUES

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>License fees and royalties</td>
<td>$6,891,374</td>
</tr>
<tr>
<td>Patent costs reimbursed</td>
<td>$956,459</td>
</tr>
<tr>
<td>Interest income</td>
<td>$11,117</td>
</tr>
<tr>
<td><strong>Total revenue</strong></td>
<td><strong>$7,858,950</strong></td>
</tr>
</tbody>
</table>

### DISTRIBUTIONS

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distributions to inventors (see graph)</td>
<td>$1,902,532</td>
</tr>
<tr>
<td>Distributions to the University of Virginia (see graph)</td>
<td>$2,084,091</td>
</tr>
<tr>
<td>Other distributions</td>
<td>$101,151</td>
</tr>
<tr>
<td><strong>Total distributions</strong></td>
<td><strong>$4,087,774</strong></td>
</tr>
<tr>
<td><strong>Net revenue</strong></td>
<td><strong>$3,771,176</strong></td>
</tr>
</tbody>
</table>

### U.VA. ROYALTY DISTRIBUTION SCHEDULES

For the latest University of Virginia royalty distribution schedules, established by the Office of the Vice President for Research, visit [www.uvpf.org/royalties](http://www.uvpf.org/royalties).

FROM LEFT TO RIGHT: A novel circuit design for a microprocessing chip is tested using a printed circuit board in the electrical and computer engineering laboratory of Benton H. Calhoun, Ph.D. (see story on page 20). The innovative “Breathe House” designs developed by Anselmo G. Canfora and collaborators in the School of Architecture optimize manufacturing to reduce material waste, pictured (see story on page 12). 

*Photo by Stephanie Gross*
DISTRIBUTIONS TO INVENTORS (IN MILLIONS OF DOLLARS)
(Total accumulated distributions to inventors for fiscal years 1978–2011: $23,854,026)

DISTRIBUTIONS TO U.V.A. (IN MILLIONS OF DOLLARS)
(Total accumulated distributions to UVa. for fiscal years 1978–2011: $42,550,619)
STAFF

DIRECTOR

MICHAEL P. STRAIGHTIFF, M.B.A.
Director
434.982.3709
straightiff@virginia.edu

LICENSESING DEPARTMENT

MIETTE H. MICHIE, M.S.
Assistant Director and Senior Licensing Manager
Certified Licensing Professional
434.982.1610
miette@virginia.edu

STEPHANIE A. MILLER, PH.D.
Licensing Associate
Medical, Biotechnology
434.982.1608
stephaniemiller@virginia.edu

CATHRYN T. GOOD
Senior Licensing Paralegal
434.982.3791
cgood@virginia.edu

MATT S. BEDNAR, PH.D.
Licensing Associate
Physics, Engineering, Electronics, Materials Science
434.982.1615
mbednar@virginia.edu

MIKE F. PERHAM, PH.D.
Licensing Associate
Chemistry, Pharmaceuticals, Medical Devices
Registered U.S. Patent Agent
434.243.5792
mperham@virginia.edu

CRYSTAL BALLIF
Office Assistant
434.924.2185
cac4w@virginia.edu
BUSINESS DEPARTMENT

JEFFREY A. WILK, M.B.A.
Chief Financial Officer
434.982.3703
jaw5f@virginia.edu

LINDSAY M. LARSON
Business Assistant and Compliance Officer
434.982.1921
llarson@virginia.edu

V. LYNN PILLOW
Business Manager
434.982.3689
lpillow@virginia.edu

OUTREACH AND COMMUNICATIONS

MORGAN E. ESTABROOK, M.M.C.
Outreach and Communications Manager
434.982.4191
estabrook@virginia.edu

ROBERT J. DECKER, J.D.
Senior Patent and General Counsel
Registered U.S. Patent Attorney
434.924.2640
robedecker@virginia.edu

G. EDEN PARRA
Patent Paralegal
434.924.2232
edenparra@virginia.edu

RODNEY L. SPARKS, J.D., PH.D.
Senior Biotechnology Patent Counsel
Registered U.S. Patent Attorney
434.243.6103
rls9en@virginia.edu

KATHLEEN A. MOORE
Legal Assistant
434.924.2173
kmoores@virginia.edu
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
FIND OUT HOW UVAPF INVENTORS’ SMART SOLUTIONS ARE

TAKING THE ‘ME’ OUT OF DIABETES MANAGEMENT
PAGE 4

HELPING HAITI RECOVER
PAGE 12

TEACHING AN OLD DRUG NEW TRICKS
PAGE 14

BRINGING PSYCHOLOGICAL CARE ONLINE
PAGE 18

STRAIGHTENING OUT MEMORY CHIP DESIGN
PAGE 20

ALSO FEATURING
SMART SOLUTIONS, FROM THE TOP: Q&A WITH TERESA A. SULLIVAN, PH.D.
PAGE 26