Stewardship
Mission Statement

To maximize the impact of UVA’s innovation assets via commercialization, while providing high levels of customer service, value-added business development, new venture creation, and a focus on driving quality transactions.
“Strengthen the University’s capacity to advance knowledge and serve the Commonwealth of Virginia, the nation, and the world through research, scholarship, creative arts and innovation.”
FOR 200 YEARS, the University of Virginia (UVA) has shaped leaders through the sharing of knowledge and candid exchange of ideas. The collaborative nature of this institution attracts and retains top research talent across many disciplines. The name of our report this year, Stewardship, calls on the accomplishments and direction of the UVA Licensing & Ventures Group to support the advancement of the extraordinary ideas produced in every lab, clinic, and classroom across Grounds, to make a lasting impact on the world around us.

Shortly after UVA welcomed Vice President for Research, Melur K. (Ram) Ramasubramanian in August 2017, the University began its Bicentennial Commemoration: a celebration of UVA’s achievements, a recognition of the imperfections of its past, and a visualization of its future. Empowered by refreshing new leadership, LVG seized that forward-looking sentiment to strive toward the aspirations we set for this organization when I arrived in Charlottesville seven years ago.

Throughout the pages of this report, we share a collection of stories that highlight UVA faculty members whose research inspired our team to not only support but champion their work and harness the potential of their ideas into meaningful outcomes. The result was the establishment of two new ventures that we profile in this report, WarmHealth Technology, and Silivhere Technologies, Inc. Also, we made a significant effort to improve the quality of our licensing transactions and to support those that drive industry-sponsored research to the University.

The foundation of our organization continues to strengthen as our team of licensing, legal, and business professionals delivered on all of the metrics upon which we measure our performance. During the 2018 fiscal year, LVG solicited and/or received 213 invention disclosures from faculty, and we filed provisional patent applications on half of those. We also issued a record 59 US patents and executed 77 transactions with commercial partners.

The UVA LVG Seed Fund welcomed an Associate, Carleen Bowers, Ph.D. to support its portfolio, which grew with three investment commitments this year. The investments include its first in a medical device company, which Managing Director Bob Creedon will elaborate on later in this report.

This spring we were honored to recognize Dr. Jeff Elias as our 2018 Innovator of the Year. His presentation at the Rotunda
was profound and emotional, and yet Dr. Elias has found a way to stay humble. His work treating essential tremor has had a significant impact on the lives of those suffering from the disorder. At the same event, we surprised our former Chairman of the LVG Board of 12 years, Dr. Erik L. Hewlett with the inaugural award for Distinguished Service. We arranged for his family to sneak into the auditorium to hear how much he has contributed not only to our organization but the University of Virginia. LVG would not be where we are today without his unwavering support.

Our network of UVA friends, family, community leaders, entrepreneurs, and notable alumni that support our efforts to drive UVA-developed innovations toward the marketplace is rooted in the generosity and spirit of our Board of Directors. This esteemed group of individuals stewards us in our decisions and the allocation of our time and resources. Here is where we say “thank you” for your continued involvement and counsel.

While our year was successful in many ways, we continue to seek partnerships throughout the University, and look forward to supporting UVA faculty, staff, and students in the year ahead.

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Melur K. (Ram) Ramasubramanian, Ph.D.
Vice President for Research at UVA

Richard P. Shannon, M.D.
Executive Vice President for Health Affairs at UVA
Year at a Glance
fiscal year 2018

213
Invention Disclosures

221
Patents Filed

162
Patents Issued

77
Licensing Deals

3
New Ventures
## Invention Disclosures

fiscal year 2018

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| Mech./Aero Engineering | 6.3 |
| Undergraduate | 6.06 |
| Computer Science | 5.81 |

| Curry School of Education | 6.5 |

<p>| Other | 15.84 |
| Medical Center | 9.34 |
| Nursing | 3.5 |
| Information Technology | 2 |
| Library | 1 |</p>
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After long shifts working in the Neonatal Intensive Care Unit (NICU) at UVA, Tricia Cady (RN to BSN ’18) used to lie in bed in the dark and ruminate about ways to keep her patients’ tiny hands from yanking at the tubing that often snaked from their mouths and noses.

“They’re like little Houdinis,” says Cady, a nurse for 22 years, “and we always struggled to keep their hands contained.”

Unplanned extubations—when a neonate accidentally pulls out a tracheal or gastric tube from its proper position in its nose or mouth—are the 4th leading adverse event in American NICUs. Even the tiniest babies, says Cady, possess surprisingly strong ability to grasp, and when tubes get unexpectedly removed, they can cause tracheal trauma, intraventricular hemorrhage, and up the risk for longer-term issues, like ventilator-assisted pneumonia and subglottic stenosis.

Babies that accidentally extubate are also
at greater risk for needing surgical tracheostomies, for developing cognitive and physical delays, and even for developing cerebral palsy.

Over the last 30 years, the numbers of unplanned extubations in the U.S. has stubbornly refused to budge. But thanks to Cady’s midnight ponderings, and guidance from UVA’s Licensing & Ventures Group (LVG), an answer may be on the horizon.

The “Cady Hug,” a soft, stretchy, womb-like vest that contains neonates’ hands in a secure pouch while allowing them room to move, also helps clinicians by keeping umbilical ports and IVs accessible. Last fall, after encouragement from her nursing professor and months of planning and design, Cady brought her design to LVG staff, who helped her file a provisional patent.

But the invention might never have been had Cady’s Trends and Issues in Nursing class, taught by professor Tomeka Dowling, not challenged students to come up with a solution to a vexing problem they saw in their work environments. It was just the spark Cady, 57, needed.

In her early research for class, Cady found few products that fit the bill. Some kept babies’ arms entirely immobile, like tiny straitjackets, which wasn’t developmentally appropriate, while others using a full swaddle inhibited clinicians’ access to central lines, oximeters, and IVs. Cady knew umbilical and diaper areas needed to remain open, given that many neonates receive feeding directly from the belly button portal. She also knew that even the best swaddles wouldn’t guarantee that babies’ arms wouldn’t wriggle free.

So she sketched, sewed, ironed, and velcroed—considered, revised, and did it all again. By October, 2017, she’d come up with a handmade prototype to present to LVG, and, encouraged by case manager Heather Bansbach, who shepherded Cady through the beginning of the commercialization process, filed a provisional patent for the “Cady Hug.” At Bansbach’s urging, Cady applied for and earned a $14,000 Ivy Biomedical Innovation Fund grant in January, 2018, which allowed her to partner with UVA design student Shannon Dorn, who helped develop a mint-green prototype.

“It’s not cotton, as I’d expected,” explains Cady, “but stretchier, like a uterine wall, and much thinner than cotton. It has a beautiful stretch to it.”

With the patent and prototype in hand, and with counsel and encouragement from her NICU colleagues Rachel Nauman, medical director Jonathan Swanson, and respiratory therapy manager Timothy Hicks, Cady currently hopes to conduct a clinical trial on the pouch at UVA on neonates requiring ventilators. She believes her design will reduce accidental extubations and the NICU’s use of sedatives, while also allowing babies to move and stretch in developmentally appropriate ways. Pending IRB approval, she plans to test the vest by assessing whether sedative use and N-PASS scores (Neonatal Pain, Agitation, and Sedation Scale is a universal assessment for neonates that examines crying and irritability, behavioral state, facial expressions, extremity tone and vital signs) in UVA’s NICU decline with its use.

She also sees a use for the Cady Hug in populations beyond ventilated babies, including those who have naso-gastric tubes and those requiring bubble CPAP (continuous positive airway pressure), which are little plastic prongs that lay shallow in the nostrils and deliver air flow to the lungs.

According to the March of Dimes, more than 517,000 U.S. births are premature, but because of a growing array of sophisticated medical interventions, only about one percent of them—roughly 5,800—die.

“It’s been such a learning process, and though overwhelming, support from my LVG and NICU colleagues has encouraged me to think of myself as a researcher and inventor,” says Cady, who earns her BSN this spring. “This is one of those class projects that motivated me to bring this vest—which I’d been contemplating for years—to life.”
THREE YEARS AGO, Jonathan Kipnis, Ph.D., and his team of researchers made a stunning anatomical discovery that shook the scientific community to its core. Kipnis, the Harrison Distinguished Teaching Professor and Chair, Department of Neuroscience, and Director, Center for Brain Immunology and Glia, at the University of Virginia School of Medicine published the first findings on the interconnection between the brain and the lymphatic system through previously unknown meningeal vessels in the prestigious journal Nature in 2015. [Nature volume 523, pages 337-341 (16 July 2015)]

The team’s discovery ignited a frenzy among researchers around the world; what could the existence of these vessels mean for the treatment of neurological diseases such as Alzheimer’s, multiple sclerosis, and meningitis? Other scientists were not far behind Kipnis. Shortly after his first Nature article on this topic, supporting journal publications from around the world validated the discovery, and the race to determine its full impact was on.

Though the UVA research team was the first to discover these vessels in the brain, anatomy, as a natural phenomenon, cannot be patented in the same way as a drug composition or method of use. As the organization responsible for protecting intellectual property and discoveries made
at UVA, LVG had to think creatively about how to protect this exciting new discovery. LVG filed an early provisional patent application on methods of regulating the meningeal lymphatic vessels and started tapping the UVA network to gear up for what was to come.

The science continued to progress in Kipnis’ lab and in 2016, he authored a second article in *Nature* detailing research findings that meningeal immunity has implications for social behavior. Beyond neurological diseases, the immune system appears to play a significant role in neurological and mental disorders including autism spectrum disorder and schizophrenia. Their research indicates that a specific immune molecule traditionally known to fight against infection also plays an important role in maintaining proper social behavior and pointed the team toward exploring this co-evolutionary relationship. [*Nature* volume 535, pages 425–429 (21 July 2016)]

While Kipnis’ work inspired collaborative research investigating neurological diseases and disorders at universities around the world, LVG explored every opportunity within the UVA network to find different ways to support this remarkable research. A prominent venture capitalist with close ties to UVA introduced LVG to a UVA School of Law alum who also holds a Ph.D. in neuroscience. Particularly well suited to advise Kipnis’ portfolio, LVG hired his firm to support enhanced patent portfolio development.

Further discoveries made by Kipnis and his team include the identification of specific immune cells in the meninges around the brain. Not only could these new cells be the missing connection between the brain and microbiota in the gut, but their existence could also lead to developing new targets and therapies for neurological conditions such as migraines and even spinal cord injuries. With each research milestone, the reality of developing therapeutics to address neurological disease inches closer.

In late 2017, a biopharmaceutical company approached Kipnis about speaking at their inaugural Brain, Immune, Gut (BIG) Axis Summit. Scientists, physicians, and industry leaders would convene on an international stage to discuss the immune system and its interconnectedness – the very topic Kipnis was working on in his lab in Charlottesville. The invitation reminded him of his first encounter with this company years earlier, after his first *Nature* publication, when a UVA graduate employee by the company inquired about his research.

Until this point, LVG advised a strategy focused on internal support of Kipnis’ research. Within two weeks of the conference, LVG connected with the host company, PureTech Health, to begin a conversation about a possible licensing agreement.

During LVG’s assessment of PureTech Health, notable UVA alums and industry advisors offered insight during pertinent discussions around the potential agreement. LVG worked to ensure PureTech Health placed as much value on Kipnis, his lab, and continued research at UVA as it did any future commercial output from his research.

In close collaboration with the UVA Office of Sponsored Programs and strong support from UVA senior leadership, LVG negotiated an agreement optimized to support Kipnis and the University to close the 2018 fiscal year. Regarded as one of the most progressive companies in the industry, PureTech Health announced the exclusive license agreement on the same day that Kipnis’ third journal article published in *Nature*. [*Nature* volume 560, pages 185–191 (2018)]
IN THE LAST THREE DECADES, wireless communication has become essential to life in the 21st century. WiFi, the wireless version of a wired Ethernet network that connects devices to the Internet, transmits data through the radio frequency band of the electromagnetic spectrum. The continual increase of devices connected to WiFi clutters the available bandwidth and slows its capabilities to send information. As a result, experts in the Internet of Things (IoT) suggest that a spectrum crunch is inevitable.

Researchers at the University of Virginia School of Engineering and Applied Science are exploring another class on the spectrum to develop an innovative, alternative solution to WiFi for network utilization. When visible light communication emerged, Maite Brandt-Pearce, Ph.D., began researching data transmission through LED light waves. Li-Fi, or light fidelity, is wireless access using infrared and visible light for high-speed data communication.

A Professor of Electrical Engineering and UVA Vice Provost for Faculty Affairs, Brandt-Pearce has been studying optical communications at UVA for 25 years. As an educator and engineer, she challenges her students to think like entrepreneurs...
and to create solutions for problems that face our world. While optical wireless communication has technologically been around for a long time, visible light communication creates the necessary economic incentive to further adapt the technology for commercial applications.

Today, we send and receive information over shared WiFi networks. It transmits through walls, slows down with each added device, and carries the risk of data breaches. Trying to connect in crowded places, like airports, causes frustration because there is too much competition for a signal. But, if each light was an access point, only the people in the room, or under the light, could use it. This physical limitation creates added layers of privacy and security and means that significantly more users could gain simultaneous access in the same environment.

After four years of research and development in the lab at UVA, Brandt-Pearce and Mohammad Noshad, her former Ph.D. student, co-founded VLNComm in 2013. As an LLC, the research team sought funding from the US Department of Energy, the National Science Foundation, and earned an SBIR Grant to develop Li-Fi prototypes to continue refining this new technology.

“To further develop the technology and eventually bring it to market, we knew starting a company was the next step,” said Dr. Brandt-Pearce. “LVG helped me navigate intellectual property protection in the past, and offered guidance when we set out to launch VLNComm.”

As a faculty member, Brandt-Pearce perpetuates further research opportunities in Li-Fi for her graduate students and supports VLNComm as a research advisor. LVG will continue to support her portfolio of intellectual property with strategic patent protection as she explores her latest research interest in visible light positioning. She is pursuing another unique application of the technology that can be used to identify geographic location based on proximity to a Li-Fi enabled LED.

“Imagine you find yourself in a building or a parking garage, and your GPS signal is blocked or unable to get an accurate reading, and you don’t know where you are,” she said. “Using Li-Fi, we could adapt the technology for visible light positioning indoors, creating another safety component and use for Li-Fi.”

Today, VLNComm offers five products including a Li-Fi enabled desk lamp; overhead LED panel and USB adapters that connect electronic devices to Li-Fi networks. The company maintains a strategic partnership with the UVA School of Engineering and Applied Science with Brandt-Pearce and has office and lab space in Charlottesville. While Li-Fi technology continues to evolve, VLNComm remains the only company in the US offering Li-Fi enabled products. As a result, the company is in a unique position to target customers in US government and defense markets looking for high-security

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“To further develop the technology and eventually bring it to market, we knew starting a company was the next step,” said Dr. Brandt-Pearce. “LVG helped me navigate intellectual property protection in the past, and offered guidance when we set out to launch VLNComm.”

— Maite Brandt-Pearce, Ph.D.
Rebecca Dillingham, M.D.
School of Medicine

LVG has taken a special interest in nurturing this new venture for its potential to impact healthcare costs associated with managing chronic disease.

During an unexpected residency interview, Rebecca Dillingham, M.D., M.P.H., sat across the desk from an accomplished physician whose stories illustrated the University of Virginia’s collaborative nature and holistic approach to healthcare. Nearly two decades after those stories of collegiality inspired her to pursue her medical training in Charlottesville, Dillingham is now the Director of the Center for Global Health at UVA, alongside the Founding Director, her aforementioned interviewer, and mentor of two decades, Richard Guerrant, M.D.

Before joining the UVA faculty in 2006, Dillingham completed a fellowship program where she worked to support the initial rollout of antiretroviral therapy for HIV patients at a medical clinic in Haiti.
It was a politically tumultuous time for the country, and many patients traveled for hours to the clinic for appointments only to be met by authorities preventing entry into the city. She observed her Haitian colleagues navigate these tense situations and overcome geographic boundaries by connecting with their patients using cell phones.

Dillingham’s patients at the UVA Ryan White Clinic also face similar geographic challenges, as many live in rural parts of the state and travel several hours to Charlottesville for appointments. Since her fellowship experience, Dillingham has explored using mobile technology and communication to combat these challenges and improve continuous engagement in care among people living with HIV.

“HIV is a treatable disease. It is medically easier to manage than other chronic diseases including diabetes, but only 40% of people living with HIV in the U.S. engage in care,” said Dr. Dillingham. “Using mobile health solutions, we have seen an increase in care even among our chronically disengaged patients.”

In 2012, Dillingham and her research collaborators from the UVA Division of Infectious Disease & International Health earned a grant from AIDS United to develop an automatic text messaging program for patients. As they navigated the emerging field of mobile health, the research group turned to LVG to understand what constituted intellectual property. This early engagement with LVG initiated a strategic partnership that began with helping the researchers develop contractual language and led to the launch of a new venture five years later.

Company Profile
WarmHealth Technology

A TEAM OF RESEARCHERS in the Division of Infectious Disease and International Health, Psychiatry and Neurobehavioral Sciences at UVA are developing a holistic solution to improve the lives and care for patients with chronic disease. Rebecca Dillingham, M.D., M.P.H., Karen Ingersoll, Ph.D., and Ava Lena Waldman, M.H.S., have conceptualized an approach called warm technology to address the need for human connection among patients with chronic disease. Warm technology allows patient communities to share their experiences and gain social support from one another. These connections help feelings of isolation fall away and long-term management of illness improves.

Dillingham and Ingersoll are both specialists at the UVA Ryan White Clinic and serve the HIV+ patient community in Virginia where warm technology stands to make a meaningful impact. According to the Centers for Disease Control, in 2014, only 48 percent of people living with HIV were retained in continuous care. This deficiency compromises the health of individuals who are not engaged in care while also increasing the risk of new HIV infections in the community.

To bring the warm technology concept to life, the team built a custom smartphone application with funding from the Virginia Department of Health (VDH). The app, PositiveLinks, is a HIPAA-compliant platform that allows people living with HIV to communicate securely with healthcare providers from their local clinic.
PositiveLinks also includes an anonymous community message board that facilitates a virtual community to connect people living with HIV, and offers brief educational quizzes about managing their health. The platform encourages daily check-ins to monitor personal health behavior, mental health status, and provides appointment information.

Funded by AIDS United and the M.A.C. AIDS Fund, the team conducted a pilot PositiveLinks Program study which involved 77 patients from the UVA Ryan White Clinic and the surrounding rural communities representing a diverse population across age, ethnicity, sex, and gender identity. The results, published in the scientific journal “AIDS Patient Care and STDs” in June 2018, revealed that consistent use of the app correlated with an increase in regular clinic visits and an improvement in health status. During the first six months of the study, the research team saw a 37 percent increase in regular HIV clinic visits among participants.

“PositiveLinks was developed with significant input from our patients for the entire duration of the project,” said Dr. Dillingham. “We believe that this collaborative approach to creating and testing a clinical intervention made it more appealing to our patients and contributed to the terrific outcomes.”

As the study concluded and its results showed significant improvement in long-term care of HIV+ patients, the researchers engaged with LVG to determine how to empower patients around Virginia with warm technology. Together with the UVA Health System, LVG supported the launch of the new venture, WarmHealth Technology (WHT) in 2018, and licensed the PositiveLinks software to the company.

LVG has taken a special interest in nurturing this new venture for its potential to impact healthcare costs associated with managing chronic disease. The team of licensing and business professionals at LVG meet regularly with WHT to discuss commercialization strategies, offer marketing support, and tap the UVA network to identify potential partners and employees to support the company’s growth.

WarmHealth Technology is creating the infrastructure necessary to extend the PositiveLinks model to other interested clinics and organizations that care for people living with HIV outside of Virginia. With support from VDH, the research team has already expanded the program to Inova in Northern Virginia and to Lynchburg.

Patients with many chronic diseases face barriers to care including access, health literacy, stigma, unhealthy behaviors, and psychological burdens that reduce their abilities to maintain their health regimens over time. WarmHealth Technology is committed to overcoming those barriers by creating a secure virtual environment where empathy, community, and patient-centeredness lead to optimal health outcomes to help patients thrive.
Company Profile
Silivhere Technologies, Inc.

ACCESS TO CLEAN drinking water is a basic human right, yet three billion people around the world today live without reliable water service and millions die each year from waterborne illnesses. UVA Professor of Civil and Environmental Engineering Jim Smith, Ph.D., has dedicated his research career to finding a solution to this public health epidemic.

Smith has been studying, creating, and refining the effectiveness of a potentially disruptive, household water treatment technology at UVA over the past six years. His technology, the MadiDrop, is a porous ceramic tablet that slowly releases silver ions into stored, household water over time, killing waterborne pathogens. The Jenga-block sized tablet contains just enough silver to disinfect harmful pathogens while ensuring safe consumption of water. This point-of-use water treatment solution is simple to use and requires minimal effort compared to other options on the market today.

LVG has been involved with Smith’s research on innovative point-of-use water treatment technologies since he began this line of work in 2004. In addition to protecting the intellectual property and methods behind the creation of the MadiDrop, LVG helped Smith launch a Public Benefit Corporation which partnered with over 160 nonprofit organizations around the world to test the MadiDrop in the field. Through this company, 30,000 MadiDrops are now being used in over 40 countries providing safe drinking water to 150,000 people.

In 2018, a breakthrough came when Smith discovered how to dramatically increase the amount of water treated each year by a single tablet and introduced the MadiDrop+. “We quadrupled the effectiveness of our water purification tablet, and collaborating with UVA LVG’s incredible resources is helping to ensure that it gets in the hands of those who need it most,” says Dr. Smith. “We are closer than ever to reaching our commercial potential with the MadiDrop+.”

This discovery prompted LVG to recalibrate the business strategy to suit the new effectiveness of the filtration tablets and worked to relaunch the company as Silivhere Technologies, Inc. The new company is named after the derivative of the Tshivenda South African word for silver; South Africa being where Smith has worked for years on the MadiDrop.

Beyond the obvious need for access to clean water in the developing world, LVG is exploring other opportunities for MadiDrop+ in disaster relief, international travel, and humanitarian aid. Smith’s consistent engagement with LVG has allowed the team to lead this new venture through the launch process while Smith continues to refine the technology. LVG continuously meets with company investors and members of the larger UVA friends, family, and alumni networks to identify appropriate advisors, investors and leadership who can help to shepherd the company and the MadiDrop+ to as many end markets as possible.
WITH THE GLOBAL POPULATION exceeding 7 billion and thousands reaching an advanced age every day, cardiovascular disease continues to rise and remains the leading cause of death in the US. Catheter-based procedures used to treat a multitude of heart problems ranging from valve disease to rhythm issues are simultaneously increasing as an appealing alternative to invasive surgery. However, catheter technologies and surgical techniques for these non-invasive procedures have gone unchanged for decades.

Scott Lim, M.D., an interventional cardiologist and the Director of the Advanced Cardiac Valve Center at the UVA Health System conceptualized a medical device that would improve outcomes for heart surgery patients, and make it easier and safer for surgeons to execute operations on the left side of the heart.

“Accessing the left side of the heart is becoming so common with catheter procedures that there needs to be a safer, more efficient, and more accurate way to do it,” said Dr. Lim.

The current method to access the left side of the heart is a catheter-based procedure known as a transseptal puncture. This technique allows a direct route to the left atrium and minimizes the risk of arterial bleeding. Navigating a catheter through veins in the right side of the heart and
puncturing the septum to access the left side is extremely challenging, especially with tools that are hard to control.

Lim partnered with Jaime Sarabia whose eighteen years of experience in medical device ventures include being one of the lead mechanical engineers with the Evive Corporation which developed the MitraClip heart implant and was acquired by Abbott for $410 million in 2009. Sarabia shepherded Lim’s idea for a device into what is now known as the Lim Transseptal System (LTS).

The LTS is a surgical instrument designed to improve efficiency and precision when crossing the interatrial septum and targeting specific locations within the structure of the heart. The goal of the device is to reshape catheters to better maneuver through the veins and cross from one side of the heart to the other with maximum visibility.

“Rather than accepting what anatomy gives to you, the LTS will drive the catheter to precise locations giving surgeons a much better starting point and thus better outcomes for patients,” said Sarabia.

In 2015, Lim and Sarabia worked with UVA LVG to license the intellectual property for the LTS and to launch a new venture, 510 Kardiac Devices, Inc. Since its inception, the company has contracted with a manufacturer, designed six generations of functioning prototypes of the LTS, and conducted a successful pre-clinical study. In preparation for regulatory approval and initial commercialization, the company implemented a quality control system with completed molds, packaging, and labeling design for the device.

The UVA LVG Seed Fund invested in the company in 2018 to support the FDA approval process of the device which is on track for 2019. Investment during the early stage of commercialization of a device like the LTS epitomizes why LVG created the Seed Fund. The impressive professional experience and collaboration between Lim and Sarabia instilled the necessary confidence for UVA LVG to not only invest in the company but to also attract several other investors, including Minnesota-based Nextern, Inc.

“Any new technology, even if it’s fascinating and great, takes money to bring it to market,” said Dr. Lim. “But the UVA Licensing & Ventures Group has also been quite generous with their time and their advice. It’s a tremendous partnership for us.”

The UVA Licensing & Ventures Group has also been quite generous with their time and their advice. It’s a tremendous partnership for us.” — Scott Lim, M.D.
AFTER A DYNAMIC AND PRODUCTIVE FIRST YEAR, the UVA LVG Seed Fund continues to flourish. Specifically, we made strong progress in a number of areas including closing three investments, formalizing an Advisory Board to support our companies, completing our second full year of the Due Diligence in Seed Funds class at the Darden School of Business, and teaming with the iLab and Engineering School in their summer and iCorps Program.

Our first investment in the 2018 fiscal year was in Mission Secure, Inc. a Charlottesville company based on technology developed by UVA faculty member Dr. Barry Horowitz. Licensed from UVA LVG, the technology addresses concerns in the growing market of cyber security in the Industrial Control Systems space, sometimes referred to as the Operational Technology market. The Company’s solution addresses the control system’s security by uniquely focusing on the component level, making it one of the first to offer visibility and protection at this level of the control system. The Company is growing quickly, adding new customers in its target markets of oil and gas, defense, and transportation.

Our second investment this year was in 510 Kardiac Devices, a company founded by Dr. Scott Lim, a leading interventional cardiologist at UVA in the field of structural heart and catheter based technologies, and Jaime Sarabia, who was one of the lead engineers behind the Mitraclip technology. The Company is developing a novel, high-quality interventional device for performing advanced cardiac procedures. The Lim Transseptal System provides physicians with an increased level of device control, functionality, visibility, and precision performing transseptal punctures.

The team at Ceres Nano, the third company we invested in, are UVA graduates and are engaged in the development and commercialization of innovative sample collection and preparation products based on its proprietary Nanotrap particle technology. The Company recently received approval as a “Breakthrough Device” designation from the FDA for its point of care Lyme test and hopes to bring it to market in 2019.

As we begin to work with and invest in companies that are embryonic, we have a growing need to assist founders on building their business and filling out their management teams. With this in mind, we have formed an Advisory Board, comprised of a broad range of successful entrepreneurs, industry experts and investors. Advisory Board members will serve as advisors, coaches and board members of our nascent companies.

In May, we completed our second, full year offering of the Due Diligence in Seed Funds class with the Darden School of Business. Once again, we had more than thirty applications for the 10 spots available, and we continue to reap great benefit from these students in terms of diligence.
and support for our portfolio companies, and the students gain the real life experience of an investment fund associate.

Our Seed Fund investment committee continues to be one of the most enjoyable components of our operation. Their role in helping us evaluate opportunities and manage the portfolio is invaluable and has been a major reason for the Fund’s success to date.

In January of this year, Carleen Bowers, Ph.D., Chemistry, joined me as a Venture Associate. A UVA grad (Col ’07), Carleen is a great addition to the team, bringing not only technical expertise but start-up experience as well.

As we begin to mature as a Fund and New Ventures group, we still have much to accomplish in the coming years. Carleen and I look forward to working with the LVG team, our Seed Fund Committee, Advisory Group, and Darden students on sustaining our progress and stretching toward expanded impact in the next twelve months.
Seed Fund Overview

About the UVA LVG Seed Fund

THE UVA LVG SEED FUND, created in 2016 with funding from the UVA Health System and unrestricted private funds aligns with the second pillar of the UVA Cornerstone Plan to advance knowledge and serve the public through research, scholarship, arts, and innovation.

Objectives

THE UVA LVG SEED FUND is intended to complement the high caliber of research conducted at the University, be capable of generating significant financial returns, and be diversified in supporting a broad range of innovation assets developed at UVA. Structured within the UVA Licensing & Ventures Group (LVG), the organization responsible for the commercialization of University research discoveries, the $10 million UVA LVG Seed Fund is uniquely positioned to provide capital and other resources to accelerate technologies based on UVA research to market. An independent committee comprised of leaders in early-stage investing and new venture creation who are all UVA alum oversee each investment decision. The Fund practices an industry-proven due diligence process to assess the commercialization viability of each opportunity.

Investment Eligibility

THE UVA LVG SEED FUND will invest in companies founded to commercialize UVA intellectual property; companies founded by current faculty, staff, and students at UVA; and iLab companies. In special cases, the UVA LVG Seed Fund may invest in development of innovation assets to improve or enhance the commercial viability, value, or marketability.
THE UVA LVG SEED FUND recently concluded its second year of Due Diligence in Seed Funds, an elective course in the entrepreneurship, innovation, and strategy discipline of Darden’s MBA curriculum. The course offered eleven second-year Darden students exposure to the operations of the UVA LVG Seed Fund, and the opportunity to learn about venture capital from experts in the field.

Led by Bob Creeden, Managing Director of the UVA LVG Seed Fund & New Ventures at LVG, the course is available to second-year business students interested in venture capital. Using real examples from the Fund’s pipeline, Creeden teaches an industry-proven due diligence process to assess the viability of investments under consideration.

In a class review at the end of the year, one student commented on what he liked most about the course: “The hands-on experience of conducting due diligence in a real-life fund. The work we were doing each week was meaningful, and the decisions we helped make had real consequences.”

Another said, “This might be the best class at Darden. It [the course] made me synthesize everything I learned at Darden into one class… I came away from this experience so much more prepared for the working world and pursuing my professional goals.”

On Wednesday evenings, the students filled the LVG conference room to discuss company evaluations and sit in on pitches to the Fund. They were also invited to participate in conversations with the UVA LVG Seed Fund Committee comprised of five UVA alum who are all leaders in early-stage investing and startup development.

“The students this year, as in the past, have provided significant value to our diligence and support of the UVA LVG Seed Fund portfolio,” says Creeden. “We look forward to fostering our mutually beneficial relationship with Darden and continuing to offer this course on an annual basis.”

The 2017/2018 school year was the first time the course was available as a yearlong offering and will continue with a new group of students starting the course in August.
Mission Secure, Inc. (MSi)  

**THE UVA LVG SEED FUND** invested in Mission Secure (MSi) as part of the company’s largest financing round to date. Headquartered in Charlottesville, MSi is founded on technology developed at UVA and licensed from LVG. The company creates cybersecurity solutions that not only make systems more complex and costly to attack but also take corrective action against cyber attacks.

The Department of Defense funded the initial research conducted by MSi’s founders which sought to develop onboard protection mechanisms for unmanned aerial vehicles (UAVs). The prototype created at UVA evolved into the now patented “MSi Platform” which is used to mitigate cyber attacks from within operational software. The platform provides monitoring, detection, and corrective capabilities spanning the oil and gas, power, transportation, and defense industries.

TearSolutions, Inc.  

**THE UVA LVG SEED FUND** invested in TearSolutions, Inc. as part of a $3 million funding that helped the company launch its next phase of clinical testing. Discovered by UVA Professor of Cell Biology and Ophthalmology Gordon Laurie, TearSolutions’ first-in-class therapy is a synthetic form of the protein lacritin which targets the causes of dry-eye disease.

The company is currently conducting Phase II clinical trials, focusing efforts on patients affected by Primary Sjogren’s Syndrome, an autoimmune disorder that causes dry eye and dry mouth. These trials will be the first in humans with 200 patients over 26 sites nationwide – all the preceding work in pre-clinical animal studies showed that the drug is effective and appears safe and well tolerated.

TearSolutions, Inc. was founded in 2013 by Dr. Laurie and Mark Logan, a former company executive from Bausch & Lomb, Becton Dickinson and VISX, after licensing the technology from the LVG.

TypeZero Technologies, Inc.  

**THE UVA LVG SEED FUND** made its first investment in TypeZero Technologies, Inc. as part of a $1.5 million funding round. Headquartered in Charlottesville with 15 employees, TypeZero is a digital health company revolutionizing the management of type 1 and type 2 diabetes.

In 2014, TypeZero licensed artificial pancreas intellectual property from LVG that was developed by a research team at the UVA Center for Diabetes Technology. Using these foundational technologies, TypeZero built the inControl Diabetes Management Platform that includes applications for smart insulin pens and smartphone-based artificial pancreas systems that automatically regulate insulin delivery, reduce hypoglycemia, and improve blood glucose levels. The company’s clinical trials are ongoing, and TypeZero has licensed its technologies to two medical technology companies in pursuit of the commercialization of the artificial pancreas system.
THE UVA LGV SEED FUND made its fourth investment in 510 Kardiac Devices Inc., an early stage medical-device company based in Charlottesville. The company was co-founded in 2015 by Dr. Scott Lim of the UVA Health System and Jaime Sarabia, a mechanical engineer.

510 Kardiac Devices works to increase the efficacy of operations on the left side of the heart. In an effort to update the current technology cardiologists use when operating, Lim has spent several years developing an instrument that will allow for greater control of the needle during operations to position it in precise locations. This device, called the Lim Transseptal System, has the potential to improve the safety and accuracy of heart procedures that are typically dangerous and difficult. The company has successfully manufactured and tested several prototypes of the LTS device. 510 Kardiac Devices is currently pursuing FDA approval and commercialization of the technology.

Ceres Nanosciences

THE UVA LGV SEED FUND invested in Ceres Nanosciences as a contribution to their Series A funding, along with three other investors. Headquartered in Manassas, VA, Ceres Nano was founded in 2009 by UVA alumnus Ross Dunlap. The company is currently led and staffed by UVA alumni. This investment marks the Fund’s first involvement with a UVA alumni company.

The company develops versatile technology that serves to improve the sensitivity of diagnostic testing. The Nanotrap Lyme Antigen Test System introduces a direct diagnostic urine test with a processing time of one hour and 90% sensitivity. This suggests a significant upgrade from the 50% sensitivity of current two-tiered blood tests used to diagnose Lyme disease. Ceres Nano is currently working to advance their point-of-care Lyme disease test into manufacturing and analytical performance testing next year and to set the stage for clinical study and FDA approval in 2019.

Gerry Brunk
Managing Director, Lumira Capital

Jonathan Ebinger
General Partner, Blue Run Ventures

Dayna Grayson
Partner, New Enterprise Associates

Peter M. Grant II
Partner, Anchormarck Holdings

Rob Paull
Co-Founder, Partner, Lux Capital

Richard Shannon, M.D.
EVP UVA Health Affairs (ex-officio)

Melur K. (Ram) Ramasubramanian
Vice President for Research, UVA (ex-officio)
The Edlich-Henderson Innovator of the Year Award

The highest honor bestowed on University of Virginia innovators, the Edlich-Henderson Innovator of the Year award recognizes an individual or team each year whose research discovery is making a major impact.
Celebrating Impact Through Innovation

NAMED FOR UVA PROFESSOR Emeritus Dr. Richard F. Edlich 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 innovators.

In 2012, the award title and criteria were modified to be more inclusive of University innovators pursuing a variety of different paths to achieve impact for their discoveries. Eligible nominees are current University of Virginia faculty, staff or students whose research discoveries are making a major impact. Prior to 2012, the award was known as the Edlich-Henderson Inventor of the Year award. Award winners receive a $10,000 cash prize and formal recognition at a special awards reception.
Dr. Jeffrey Elias saw his clinic change overnight with the advent of a new procedure to treat essential tremor.

UVA Today | By Whitelaw Reid

MILLIONS AROUND THE WORLD suffering from essential tremor now have a far-less-invasive option than brain surgery to treat the disorder, thanks to University of Virginia School of Medicine neurosurgeon Dr. Jeffrey Elias who has pioneered the use of focused ultrasound.

Elias pushed the technology – which eliminates the need for incision – from clinical trials to FDA approval in only five years.

Last week, the University of Virginia Licensing & Ventures Group named Elias the 2018 Edlich-Hen-
“He has made a remarkable impact not only for his patients, but on the field of neurosurgery,” the Licensing & Ventures Group’s executive director, Michael Straightiff, said. “He is leading the way for innovative clinicians in translational research at UVA.”

When focused ultrasound technology came to UVA in 2009, the idea was to use it in the treatment of brain tumors.

However, Elias pursued an additional application. He believed the technology could treat essential tremor, a condition that afflicts an estimated 10 million Americans.

The technology allows for a highly precise treatment that focuses sound waves within the brain to create heat, interrupting malfunctioning circuits that are responsible for the tremor symptoms. Using MRI, clinicians can monitor the procedure in real time and adjust the treatment based on the patient’s response.

After starting a lab and organizing a clinical trial, the first treatment on a patient in 2011 was, according to Elias, “wildly successful.”

When some 2,000 people applied for 15 spots in the next clinical trial, Elias knew he was really onto something.

“That demonstrated the interest in an incisionless procedure,” Elias said.

Subsequently, Elias published an article in the New England Journal of Medicine that created buzz, along with some debate. “It was reintroducing stereotactic lesioning to a field that had kind of abandoned it,” said Elias, referring to the technique that uses a coordinate system to locate small targets in the body.

But over time, Elias said there has been a paradigm shift in the approach to the treatment of movement disorders.

“The mainstream procedure had shifted to brain stimulation,” Elias explained. “Stereotactic lesioning of the brain was kind of viewed as kind of a step back, or less of an advance. But the fact that we could do these precise treatments without any kind of incision, implanting any kind of device, or having any kind of real surgery, was very appealing to patients.”

Elias saw his clinic change overnight. Suddenly, patients were driving their own care. “Initially, they were more interested in this procedure than their doctors,” he said.

After Elias conducted a successful international study, the technology received FDA approval in July of 2016.

Today, Elias said, UVA is one of about 10 places in the United States that perform the procedure. Elias said the development of the procedure was a team effort involving the areas of imaging, engineering, neuroscience and surgery.

“No one group could have done it,” he said. “The sum of the parts way exceeded the whole.

“It really demonstrates how teams and technologies come together. It shows what you can do in medicine.”

The Innovator of the Year is an award given to University faculty members whose research is making a major impact on society.

Dr. Jeff Keller, the chief innovation officer at the UVA Health System, said Elias is doing just that.

“You have to have someone with a lot of smarts, a lot of vision and a lot of persistence – like Jeff – to fit the pieces together and deliver better care for patients,” said Keller, a colleague of Elias.

Elias, who will be honored Feb. 27 during a ceremony at the Rotunda, said UVA proved to be the perfect incubator.

“We had great collaborators, great support of the institution and my departments,” he said. “I just didn’t feel any barriers.

“This is a place where we can do big things.”
Previous Winners

2017 Brooks H. Pate, Ph.D.
2016 John A. Hossack, Ph.D.
N. Scott Barker, Ph.D.
Arthur W. Lichtenberger, Ph.D.
Robert M. Weikle II, Ph.D.
2015 Benton H. Calhoun, Ph.D.
James A. Smith, Ph.D.
2014 J. Randall Moorman, M.D.
Douglas E. Lake, Ph.D.
2013 Marcia A. Invernizzi, Ph.D.
2012 Robin A. Felder, Ph.D.
2011 Boris P. Kovatchev, Ph.D.
2010 Kevin R. Lynch, Ph.D.
Timothy L. Macdonald, Ph.D.
2009 John P. Mugler, Ph.D.
James R. Brookman, 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 F. Hunt, Ph.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.
1998 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.
Erik L. Hewlett, M.D.  
Distinguished Service Award

THE 2018 INNOVATOR of the Year award ceremony marked the beginning of a new tradition. At the event in February, Erik L. Hewlett, M.D., Professor Emeritus of Medicine, Division of Infectious Disease and International Health at UVA, was surprised with the inaugural UVA LVG Erik L. Hewlett Distinguished Service Award in front of friends, family, and colleagues. This award was implemented to recognize Dr. Hewlett’s commitment to and persistent support of innovation at UVA throughout decades of involvement and to highlight his legacy for years to come.

Dr. Hewlett began his tenure at the University of Virginia in 1980 where he has worked as a professor of medicine, microbiology, immunology, and cancer biology. Dr. Hewlett expanded his talents beyond the classroom by serving on the LVG Board of Directors for 24 years, including 12 years as Chair, as well as pursuing his research in bacterial toxins as biomedical research tools. Hewlett’s contribution to UVA and LVG is unparalleled due to his versatility serving as a clinician, researcher, educator, entrepreneur, and advisor.

Dr. Hewlett’s extended family was invited to celebrate this recognition at the ceremony without Hewlett’s knowledge. Dr. Hewlett only noticed their presence after the initial surprise of the award itself was revealed and he faced the crowd to give an impromptu acceptance speech. Decked out in disguises, Dr. Hewlett’s three children and oldest and youngest grandchildren made their way to the front after his speech to congratulate him on this special honor.

UVA LVG is thrilled to have had the opportunity to not only work with Dr. Hewlett but also to honor his significant personal accomplishments and unwavering commitment to this organization.
LVG Staff

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Executive Director

Patrick J. Klepcyk
Director, Licensing

Claudine R. Wispelwey
Director, Operations

Robert J. Creeden
Managing Director, UVA LVG Seed Fund & New Ventures

Carleen M. Bowers, Ph.D.
UVA LVG Seed Fund Associate

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Licensing Manager

Marc Oettinger
Licensing Manager

Hui Wang, Ph.D.
Licensing Analyst

Heather M. Bansbach, Ph.D.
Licensing Analyst

Cortney L. Mushill, Ph.D.
Licensing Analyst

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Senior Patent & General Counsel

Rodney L. Sparks
Ph.D., J.D.
Senior Biotechnology Patent Counsel

G. Eden Para
Senior Patent Paralegal

Kathleen A. Moore
Legal Assistant
Operations

Lindsay M. Clark
Manager, Financial Operations

A. Michael Koch
Information Manager

Megan R. Bartels
Manager, Strategic Communications

2018 Annual Report / Stewardship
Noteworthy


HemoSonics announced the appointment of Remi Corlin, a 20-year medical device and diagnostic industry veteran, as VP International Markets to lead the rollout of the Quantra™ Hemostasis Analyzer in markets outside of the US in October 2017.

Craig H. Benson, Ph.D., Dean of the UVA School of Engineering & Applied Science was elected a fellow of the National Academy of Inventors in December 2017.

LVG portfolio company, Mission Secure (MSi) launched their MSi Platform 3.0 in January 2018.

Cavion, Inc. announces first patient enrolled in multi-center phase 2 clinical trial in epilepsy in March 2018.

Gary Koenig, Ph. D., assistant professor of chemical engineering at the UVA School of Engineering & Applied Science earns the Hartfield Excellence in Teaching Award from the Jefferson Scholars Foundation.

DNA Diagnostics Center® (DDC®), one of the world’s largest private DNA testing companies, acquires LVG licensee ContraVac, Inc., a global leader in male reproductive health.

ContraVac, Inc. markets SpermCheck® Fertility, SpermCheck® Vasectomy and FertileCheck® Fertility Gel. The SpermCheck® brand of products, developed by ContraVac, is the first FDA-approved immunoassay home-diagnostic test to measure sperm count.

LVG portfolio company, Mission Secure (MSi) joins Comodo Cybersecurity in unveiling their integrated IT/OT/SOC Security Architecture at Hack New York City in May 2018.

Tim Showalter, M.D., a radiation oncologist at the UVA Cancer Center, earned an STTR Matching Fund from the Center for Innovative Technology (CIT) in June 2018 for Development and Validation of Delivery System for Commercialization of Self-Expanding Hydrogel for Pelvic Brachytherapy.

The United States Patent and Trademark Office (USPTO) issued the 10 millionth US utility patent along with a new patent cover design in June 2018.

The UVA Office of the Vice President for Research launches the 3 Cavaliers (3C) Program in July 2018 to help faculty members connect and pursue new research with the potential for significant external funding. 3C is a connection point in a rapid seed funding program designed to enable creative, collaborative, and consequential research.

LVG portfolio company, Ceres Nanosciences’ Point-of-Care Nanotrap Lyme Antigen Test System Granted Breakthrough Device Designation by FDA in July 2018.

ABial Pharmaceuticals priced 1.464 mm shares at $5.00 in IPO, raising $7.32 mm in July 2018.

Dexcom acquires LVG portfolio company, TypeZero Technologies, Inc., marking the first exit for the UVA LVG Seed Fund in August 2018.