The University of Vermont is a place grounded in the commitment to the importance of discovery and knowledge, as exemplified by our focus on the teacher-scholar model. Every day our 1,600 faculty members are deeply involved in imparting knowledge and guiding thousands of students in their intellectual journeys. At the same time, our faculty are engaged in research, scholarship, and creative arts, bringing forth new knowledge, discoveries, and insights for the benefit of all humankind.

UVM Inquiry is a showcase for the breadth and depth of the creative efforts of the University’s faculty. No report could adequately convey all the work of hundreds of faculty members — as a University we truly “contain multitudes,” to use the words of the great poet Walt Whitman. Within these pages you will find a sampling of the extensive work of our teacher-scholars over the past academic year.

The teacher-scholar model has a long history at UVM. Over the years at this Public Ivy, a great many students have learned from faculty who are engaging teachers and distinguished scholars, researchers and creative artists as well. This was recognized this past year with our dedication of a permanent display on campus that showcases the University’s most accomplished teacher-scholars, acknowledging both their contribution to the discovery and the creation of new knowledge and the deep connections they have made with their students. The contributions and accomplishments of our faculty have a direct and significant effect on our students’ success.

At the same time, other new initiatives have been undertaken to recognize the importance of research and scholarship. Last fall, our institution’s Office of Undergraduate Research named its first recipients of a new Mentoring Award, who are nominated by any of the hundreds of student mentees who participate in UVM’s annual Student Research Conference. Research and scholarship are truly the products of an unbroken chain of inquiry from one generation to the next. These awards recognize the importance of the spirit of mentorship that guides the teacher-scholar.

I have often used the term “talent magnet” in describing the role of our scholars. We see UVM as an attractor for outstanding students and staff, bringing innovation and entrepreneurship and the ideas that help our communities grow and prosper. By far the strongest force behind that magnetic attraction is the faculty talent that brings us the best students and all of the other benefits that outstanding teachers, scholars, and researchers contribute to a great university. I hope that you will feel the strength of that force as you read about the work profiled here.

TOM SULLIVAN
President
University of Vermont
FACTS

THE MISSION OF THE UNIVERSITY OF VERMONT
To create, evaluate, share, and apply knowledge and to prepare students to be accountable leaders who will bring to their work dedication to the global community, a grasp of complexity, effective problem-solving and communication skills, and an enduring commitment to learning and ethical conduct.

HISTORY
The University was chartered in 1791, the same year that Vermont became the 14th state, and celebrated its 225th anniversary in 2016. It was established as the fifth college in New England (after Harvard, Yale, Dartmouth and Brown). Although it began as a private university UVM attained quasi-public status with the passage of the Morrill Land-Grant College Act in 1862 and the addition of the State Agricultural College. Today, the University blends the traditions of both a private and public university, drawing a portion of its general fund from the State of Vermont.

A TRADITION OF EQUALITY
Throughout its history the University of Vermont has demonstrated its commitment to fairness and equality. It was the first American college or university with a charter plainly declaring that the “rules, regulations, and by-laws shall not tend to give preference to any religious sect or denomination whatsoever.” In addition, the University was an early advocate of both women’s and African Americans’ participation in higher education. In 1871, UVM defied custom and admitted two women as students. Four years later, it was the first American university to admit women to full membership into Phi Beta Kappa, the country’s oldest collegiate academic honor society. Likewise, in 1877, it initiated the first African-American into the society.

UVM UNDERGRADUATE PARTICIPATION IN RESEARCH (BASED ON 2016 NATIONAL SURVEY OF STUDENT ENGAGEMENT)

82% FEDERAL
10% STATE
4% NON-PROFIT
2% FOUNDATIONS
2% COMMERCIAL

72% RESEARCH
13% PUBLIC SERVICE
9% EXTENSION
6% INSTRUCTION

AWARDS BY PURPOSE (FY17)

$123M TOTAL
715 AWARDS RECEIVED

AWARDS BY SPONSOR (FY17)

82% FEDERAL
10% STATE
4% NON-PROFIT
2% FOUNDATIONS
2% COMMERCIAL

$467M UVM ENDOWMENT (FY16)
$135.7M NEW FUNDRAISING COMMITMENTS TO UVM (FY2017)
$439,172,103 MOVE MOUNTAINS CAMPAIGN (TOTAL AS OF SEPTEMBER 1, 2017)
61,199 CAMPAIGN DONORS (AS OF JUNE 30, 2017)

THE UNIVERSITY OF VERMONT FOUNDATION, in partnership with the UVM Medical Center Foundation, secured a record in total new commitments pledged during the fiscal year that concluded on June 30, 2017. This marked the fourth year in a row that the UVM Foundation has set a new record for total commitments to support the University of Vermont and the UVM Medical Center.

Move Mountains: The Campaign for The University of Vermont was publicly launched in October 2015 to support the four strategic areas of focus at UVM — student access and affordability, faculty support and endowments, new and renovated facilities, and academic and program support. Total commitments to the campaign, which is set to conclude on June 30, 2019, have as of September 2017 surpassed $439 million towards the overall goal of $500 million.
NEW KNOWLEDGE

From Black holes to Helium Atoms

A team of scientists co-led by UVM physicist Adrian Del Maestro, Ph.D., has discovered that a law controlling the bizarre behavior of black holes in deep space also governs the behavior of cold helium atoms that can be studied in a “spider’s web.” IVF called an entanglement area law,” says Del Maestro. That law appears at both the vast scale of outer space and at the tiny scale of atoms, “is weird,” Del Maestro says, “and it points to a deeper understanding of reality.” The study, published in Nature Physics in March 2017, may be a step toward a long-sought quantum theory of gravity and new advances in quantum computing. Research has implications for some fundamental problems in physics, including the possibility of nontangential understanding gravity within the realms of quantum mechanics.

THE VALUE OF LAKE CHAMPLAIN’S BEAUTY

Research presented in the summer of 2016 by Adrian Del Maestro, Ph.D., has discovered that a law controlling the bizarre behavior of black holes in deep space also governs the behavior of cold helium atoms that can be studied in a “spider’s web.” IVF called an entanglement area law,” says Del Maestro. That law appears at both the vast scale of outer space and at the tiny scale of atoms, “is weird,” Del Maestro says, “and it points to a deeper understanding of reality.” The study, published in Nature Physics in March 2017, may be a step toward a long-sought quantum theory of gravity and new advances in quantum computing. Research has implications for some fundamental problems in physics, including the possibility of nontangential understanding gravity within the realms of quantum mechanics.

THE BIG CHEESE IN FOOD REFERENCE

CATHERINE DONELLY, PH.D., a professor in the UVM-Danish Department of Nutrition and Food Sciences, won a 2017 James Beard Foundation award in April for her encyclopedic reference work, The Oxford Companion to Cheese, published in November 2016 by Oxford University Press. The book won in the reference and scholarship category. The James Beard Foundation awards are the culinary industry’s most prestigious recognition program. Four years in the making, The Oxford Companion to Cheese contains 855 entries from 325 contributors in 35 countries. Donnelly advised all of the 855 categories and entries cover—ranging from cheese regulations and cheese-making techniques to cheese history and culture—established the geographical diversity 12-member editorial board that selected many of the contributors and solicited entries, worked directly with numerous contributors herself, and edited all the entries, which are signed by the contributors.

“The book was to reach out to the global cheese community to find experts, who were passionate about the cheeses of their country or region and to bring that expertise, and passion, to the book,” Donnelly says.

The Power of Spider Silks

The stuff of spider webs is an engineer’s dream, as spider silks are stronger than steel at a mere fraction of weight, and can be tougher and more flexible too. These silks are also nearly inimitable to the human immune system. Some even inhibit bacteria and fungi, making them potentially ideal for surgical and medical device applications. However, exploitation of these natural marvels has been slow, due to our limited understanding of how and why certain spiders’ silks seem to be composed of a mosaic of proteins. In addition to cataloging new spider silks, the researchers discovered novel patterns within the genes that may help to explain the unique properties of different types of silk.

"Spider silks are much more complex than we previously thought," says Agnarsson, an expert on spider silk biomechanics. He and colleagues discovered that "most silk fibers seem to be composed of mosaic of multiple proteins rather than a single or a few genes underlying each specific silk," he says. "This gives spiders many options."

Connections to the New Deal Landscape

Ground A Reprint of Photographs from the Farm Security Administration, a project by photographer and UVM Professor Bill McDowell, M.F.A., earned accolades as one of 2016’s top publications. Mother Jones included McDowell’s book in its list of the 100 best books of 2016, and ArtNet News placed the volume among the top 10 art books of 2016. McDowell’s book brings together photographs from the New Deal’s Farm Security Administration (FSA); an effort that employed famed photographers such as Walker Evans and Dorothea Lange. But the photos collected in Ground never saw publication at the time. Rejected by an FSA bureaucrat, the negatives were involuntarily archived with a hole punch.

The black circle created for that hole when a print was made — like a black run over a summer field or a rude intrusion placed equably over a farmer’s face— piqued McDowell’s interest. “I found that there were so many of these that were intriguing images because they were simultaneously representational and abstract,” McDowell says. “That black hole created an abstraction and a really palpable tension.”

Whereas the intact FSA photos only deal with the past, in McDowell’s opinion, the bolded photo connect with our age through that black circle. “It got me thinking about the parallel between the times that we live in and the Great Depression and post-Depression times. There are some chilling parallels in terms of the impact on the average person in society,” he says.

OFFERING HOPE FOR MORE EFFECTIVE LEUKEMIA TREATMENT

The discovery of a protein signature that is highly predictive of leukemia could lead to novel treatments of the leading childhood cancer, according to a study by Seth Frietze, Ph.D., assistant professor in medical laboratory and radiation sciences, published in the journal Nature Immunology. Frietze and his colleagues found that comparison among certain proteins causes an imbalance that leads to leukemia. The new study reveals that the activation of a protein known as STAT5 causes competition among other proteins that leads to acute lymphoblastic leukemia (ALL). If a drug could be developed to prevent the initial activation of STAT5 and restore the normal balance of proteins, ALL could potentially be treated more effectively.

“The major outcome of this story is that a signature emerged from looking at the level of activated proteins compared to other proteins that’s very predictive of how a patient will respond to therapy,” says Frietze. “That’s a novel finding. We could feed drugs to target that activation that could be an incredibly effective way to treat leukemia.”

THE BOOKSHELF

From the earliest days of the field, modern techniques tailored to the tiniest of infants, the practice of anesthesiology has a rich and nuanced history. A new book from UVM Associate Professor of Anesthesiology Joseph Kreutz, M.D., Anesthesia at the Mouse, chronicles the development of the specialty at UVM. The project was no small undertaking: Kreutz spent the better part of a decade researching and writing the illustrated history. He combed through archives and special collections at UVM and UVM Medical Center, and interviewed more than 20 surviving members of the department. The result is a detailed history of anesthesiology at UVM, from the early 1940s up to the present day.

From Black holes to Helium Atoms

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THE VALUE OF LAKE CHAMPLAIN’S BEAUTY

Research presented in the summer of 2016 by BRIAN VOIGT, PH.D., of UVM’s Gund Institute, puts a hefty price tag on Lake Champlain’s natural beauty. According to the study, Vermont lakeside communities would lose 35% of their water clarity and 240 million in the spring—May and August alone—for every one-meter decline in water clarity. The study is the first to investigate the relationship between home prices, tourism, and Lake Champlain’s visual appearance, which is regularly monitored by many boaters, canoeists, swimmers, and other fans.

Crunching five years of data, Voigt and his partners found that lake-related tourism — including summer expenditures for every meter decline in water clarity. The study is the first to investigate the relationship between home prices, tourism, and Lake Champlain’s visual appearance, which is regularly monitored by many boaters, canoeists, swimmers, and other fans.

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Discovering Disparities in Policing

A 2017 study by UVM economist Stephanie Seguin, Ph.D., revealed notable disparities in how police officers from 29 departments across Vermont treat drivers by race. The research found racial disparities in traffic stops, searches, arrests and outcomes — which vary by police agency. It is the first study of statewide traffic policing and race, covering Vermont’s largest police departments and follows a 2014 state law requiring police to collect race data. The study is the largest to date on Vermont police and race, and the first to compare data across multiple departments. At the state level, Black and Hispanic drivers were searched approximately three times more often than White drivers. However, drivers of all races were more likely to be caught with serious on-the-road violations, given their share of the driving population. Black and Hispanic drivers were searched more, but found with less contraband, suggesting police use a lower threshold of evidence for these searches. It also points to potential inefficiencies in policing.

Fiction Becomes Fact when Entertainment Affects Politics

New research by Jack Gieryniski, Ph.D., UVM political science professor, indicates that the fiction we watch influences our gender perceptions of what it takes to be an effective leader. The number of roles for strong women has grown in the stories we’re watching. Researchers, conducted with colleagues from the University of Oxford and published in November 2016 in the journal Mayo Clinic Proceedings, examine stereotypes of how men and women perform on the job. The study’s results reveal notable gender differences. In the past, women were perceived as selfish, bold, and “untrustworthy.” These traits are associated with leadership, but lead to gender bias. These collective stereotypes can lead to women not being perceived as effective leaders. The study also found that female leaders were often characterized as more likable, better at social interactions, and more confident. Despite these stereotypes, women are now more often perceived as effective leaders. The study’s findings reveal that gender perceptions are changing, and that women are increasingly being perceived as effective leaders.

End of “Otherhood” for Adults with Autism

Nearly 5 million Americans believe to have autism spectrum disorder (ASD), and many, after years of feeling friendless and socially isolated, attempting to self-diagnose. A study by College of Nursing and Health Sciences Assistant Professor Laura Lewis, Ph.D., R.N., in the journal Archives of Psychiatric Nursing explores the experiences of this often-ignored population to help adults struggling with the neurodevelopmental disorder and help healthcare workers identify adults with ASD before they become depressed or harm themselves. “Healthcare professionals must have an understanding of self-diagnosis to help individuals transition to formal diagnosis and to adequately educate, support, and assist this population,” says Lewis. “Without knowledge of their diagnosis or support in place, this undiagnosed population is likely at a higher risk of depression, anxiety, and suicide.”

Cardiac Rehab Roadmap

More than two million Americans experience some type of a cardiac event every year. Whether there has been a heart attack or coronary revascularization procedure, such as bypass surgery or coronary stent placement, doctors typically recommended these patients participate in Cardiac Rehabilitation as part of their treatment. But despite the proven benefits of increased longevity and reduced hospitalizations with CR, only 10 to 20 percent of eligible patients actually participate. Why are the rates for this comprehensive secondary prevention program so low? And how can they be improved? An article published in November 2016 in the Mayo Clinic Proceedings by lead author Philip Ades, M.D., professor of medicine at the UVM Larner College of Medicine and associate director of the Vermont Center on Behavior and Health, offers answers and solutions. Written by participants of the Cardiac Rehabilitation Collaborative, the paper identifies ways to increase participation rates to at least 70 percent among eligible patients — an outcome that, if accepted nationwide, could save 250,000 lives and reduce hospitalizations by 180,000 annually.

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How Many Calories in that Tweet?

It’s easy to find out how many calories are in a Twinkie. But how about in a tweet? A team of UVM scientists has invested heavily in its national NFL PLAY 60 initiative to promote fitness and health among youth over the past decade. Its focus on childhood obesity and related issues, however, has lacked scientific validation — until now. A new study in the American Journal of Preventive Medicine found that NFL PLAY 60 programming significantly improved both aerobic capacity and body mass index among a large percentage of the approximately 100,000 students who participated in the program between 2011 and 2015. The study funded by the NFL was conducted by The Cooper Institute and led by lead author Yang Bai, Ph.D., graduate student in rehabilitation and movement sciences at UVM. The study focused on the impact of the two most popular NFL PLAY 60 programs: Fuel Up to PLAY 60, coordinated by the National Dairy Council; and NFL PLAY 60 Challenges, developed with the American Heart Association. Overall, schools that implemented the programs had better health and fitness profiles than schools that chose not to implement them or did so only partially. Launched in 2007, NFL PLAY 60 was designed to increase the wellness of young fans, including the 33 million children who are obese or overweight, by encouraging them to be active for at least 60 minutes a day. NFL PLAY 60 stars such as Tom Brady of the New England Patriots, Tony Romo of the Dallas Cowboys, and many of today’s touchscreens has only two dimensions of conductivity, of understanding that unique category — family-owned businesses. These businesses are a unique category — run by the closest kind of family: entrepreneurs, and driven to success by the original entrepreneurial spirit alive. The chair of Family Business skills in practice in other business models. The findings suggest why some opioid abusers don’t respond to substance abuse counseling or PTSD treatment and point the way toward potentially more productive therapies.

The NEXT STRETCH IN CONDUCTIVITY

By taping your Phone in your pocket or on your body, you can miniaturize a touch sensor down to the size of a grain of sand. This new technology, called “electronic skin,” has the potential to revolutionize the way we interact with the world around us. It could be used to make touchscreens flexible and foldable, allowing them to be rolled up or wrapped around objects. This technology could also be used to create new types of sensors, such as those used in health monitoring devices or in wearable technology. The next stretch in conductivity involves creating materials that can conduct electricity at room temperature, which could lead to exciting new applications in electronics and energy storage. However, scientists are still working on developing materials that can conduct electricity efficiently at room temperature, and this is an active area of research.

The Value of Floodplains

A study by Keri Bryan Watson, Ph.D., student in UVM’s School of Public Health and Natural Resources, has shown that wetlands and floodplain creatures could be the key to saving lives during tropical storms. The study found that neighborhoods near floodplains have lower rates of death and injury during tropical storms, and that neighborhoods without floodplains have higher rates of death and injury. The study also found that neighborhoods near floodplains have lower rates of mental health problems, such as anxiety and depression, during tropical storms.

Linking Opioid Abuse to Child Trauma

A study by UVM researchers published in March in the journal Addictive Behaviors reveals a link between childhood trauma and opioid abuse. The study found that a history of childhood trauma increases the risk of developing opioid abuse.

The effects of Hurricanes Katrina and Rita closely. This personal connection drove her to investigate the financial benefits of natural flood barriers, as global flood risks grow due to climate change and development. Among the threats to floodplains are the flooding of rivers to keep water away from new residential and business developments. These threats can be met with flood preparedness and risk assessment. The study showed that NFL PLAY 60 programming led to significantly improved both aerobic capacity and body mass index among the participating students. The study also found that neighborhoods near floodplains have lower rates of death and injury during tropical storms, and that neighborhoods without floodplains have higher rates of death and injury. The study also found that neighborhoods near floodplains have lower rates of mental health problems, such as anxiety and depression, during tropical storms.

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Saffron on Snow?

Vermont is famous around the globe for its maple syrup, cheese and craft beer. Even the state could add saffron to that list. Saffron? In Vermont?

UVM scientists think so. Margaret Skinner, Ph.D., research professor of plant and soil science, and Arash Ghalghelebbehbahani, Ph.D., a visiting post-doctoral associate from Iran, started an experiment, germinating about 24,000 of the crocus plants that produce saffron, the world’s highest-valued spice, known for its unique flavor and ferric red hue. Resulted in a St. Albans high tunnel — a greenhouse-like dome structure that typically uses no heat or electricity — the plants thrived, even through the Vermont winter. In the fall, they delivered almost four times as much saffron per square meter as the average yield in Iran, the largest saffron-producing country, and more than twice that of the next-largest producer, Spain, according to Ghalghelebbehbahani.

“We did it,” Skinner says. “We got higher yields than we reported in saffron-growing areas. So we’ve proven that, yes, it can be done.” Based on the current, retail price of about $10,000 per gram, the research estimate that saffron could potentially generate revenue of about $100,000 per acre — which would make it Vermont’s most lucrative greenhouse-grown crop.

Drugs in the Water?

Don’t Blame Students.

With nearly sixty percent of American adults now taking prescription medications, there is growing concern about how many drugs are flowing through wastewater treatment facilities and into rivers and lakes. Scientists have assumed that people flushing their unused medications down the drain or toilet was a major source of these drugs in the water. But a new first-of-its-kind UVM study tells a different story.

“Less than one percent of students we surveyed reported flushing any drugs down the drain in the last year,” says UVM scientist Christine Vatovec, Ph.D. And what she and her colleagues found in the water backs up the students’ self-reporting.

Let There Be Light, in a New Form

Glare-in-the-dark stickers, weirdly deep-sea fish, LED lightbulbs — all have forms of luminescence. In other words, instead of just reflecting light, they make their own. Now a team of scientists from UVM and Dartmouth College have discovered a new way that some molecules can make a luminescent glow — a strange, bright green whose production contradicts what had seemed to be an immutable chemical law on molecular light production.

“It’s a weird method to create light,” says Matthew Lipka, Ph.D., a UVM chemist who co-led the research. The new light may have many promising applications including novel kinds of LED bulbs and medical dyes “that can sense viscosity within a cell,” he says. The discovery was reported in September 2016 in the journal Nature Chemistry.

Improving Diagnosis for MS

While it has been known for decades that misdiagnosis of multiple sclerosis (MS) is a problem, there have been no large studies to help better understand the disorder’s mistakes for MS and the possible reasons for why they are misdiagnosed. A study by researchers including UVM’s Andrew Solomon, M.D., published in the journal Neurology in August 2016, provides that guidance. The research involved 24 MS specialist neuromyelitis at UVM, Mayo Clinic, Washington University, and Oregon Health & Science University.

“While there may be different reasons for misdiagnoses by subspecialists, [the research] suggests that we all make mistakes, and can do better,” says Solomon, who hopes the study will encourage better education of clinicians on the proper use of MS diagnostic criteria, and further study of how to recognize patients incorrectly diagnosed with MS.
Exchanging Resurgent Progressives

University of Vermont Professor Jon Erickson, Ph.D., has never been a fan of the status quo. As an ecological economist, his national and international scholarship has challenged the mistaken assumptions of mainstream economics. As a social entrepreneur, he has helped build interdisciplinary research-to-action collaborations between academic, government, and civil society partners. Now an up-and-coming independent filmmaker, he’s gauging the strength of a new era of progressive politics in America. He thinks May be waking, at just the right moment to seed the social movement of the generation.

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“Plan Bee” — an App for Farmers

A farmer today who wants to plant wildflowers to nurture the humble bee that pollinates her crops has a complicated task. Currently, she would have to walk through her fields, assess hives, take measurements, spend hours crunching metrics, and still only guess at the number of bees and pollination the effort will generate. Soon, that farmer could do it all on her phone or computer with a mobile app co-developed by UVM bee expert Taylor Ricketts, Ph.D., that will include the crop productivity and pollination benefits of supporting endangered bees. Ricketts introduced the technology at an American Association for the Advancement of Science annual meeting this past February.

A beta version of the app will allow farmers to explore land management scenarios, and virtually test how bee-friendly decisions would improve their business, says Ricketts. The app is a product of the Integrated Crop Pollination Project, supported by the USDA NIFA Specialty Crop Research Initiative. The app builds on the first national map of U.S. wild bees, which found the key insects are disappearing in the country’s most important farmlands — including California’s Central Valley, the Midwest’s corn belt, and the Mississippi River valley. That study, led by UVM bee researchers, showed that with fewer bee hives, farmers could face higher costs and the nation’s food production could experience “destabilization” due to climate change, pestidization, habitat loss and disease.

“Farmers are a natural partner to protect bees, because pollinators are essential for growing many foods,” says Ricketts, noting that more than two-thirds of the most important crops other than honey for bees, with state-by-state information on exiting hives and early mail-in ballots. (Many students at the University are not registered to vote in their home states.)

The guide was created and developed, by Vyseth Chia, a Ph.D. candidate in the Cellular, Molecular, and Biomedical Sciences Program, with help from team members Jeann Karson, M.F.A., a lecture in the College of Engineering & Mathematical Sciences.

Rehab Services Provide Major Help to Medicare Recipients

Research by Nancy Geil, Ph.D., from the College of Nursing and Health Sciences that shows significant patient-reported functional improvement among Medicare recipients who utilize rehabilitation services offers hope for America’s 65-and-older population.

The study published in April in the Archives of Physical Medicine and Rehabilitation, was based on an analysis of the 2013 National Health and Aging Trends Study. It found that among the approximately eight million Medicare beneficiaries who received rehabilitation in 2013, 72 percent reported functional improvement following physical, occupational or speech-language therapy rehabilitation. Approximately 75 percent reported meeting their personal goals for discharge from rehabilitation

“Understanding rehabilitation services use is essential to plan for sufficient resources for the projected doubling of the older adult population, from 43.1 million in 2012 to an estimated 83.7 million by 2050,” says Geil, who is also a physical therapist.

“Loss or reduction in this benefit as currently provided by Medicare may result in worse health outcomes and more health care expenditures.”

An Electrical “Switch” in the Brain’s Capillary Network

All it takes is the flip of a protein “switch” within the tiny wire-like capillaries of the brain to increase tiny blood flow that ensures optimal function. New research by Thanas Longson, Ph.D., and Fabrices Dubertland, Ph.D., both assistant professors of pharmacology at the UVM Larner College of Medicine, has uncovered the control mechanism that allows the brain to respond to, in turn, the sensation of thirst. The UVM team discovered that capillaries actively regulate tiny blood flow by acting like a switch of wires, transmitting electrical signals to direct blood to the areas that need it most.

“This finds open new avenues in the way we can investigate cerebral diseases with a vascuclar component,” says Dubertland.

HOT PEPPERS AND DECREASED MORTALITY

Like spicy food? If so, you might live longer, say researchers at the UVM Larner College of Medicine, who found that consumption of hot red chili peppers is associated with a 15 percent reduction in total mortality — primarily deaths due to heart disease or stroke — in a large prospective study published in PLoS One. For centuries, peppers and spices have been used in traditional medicine to treat diseases, but only one other study — conducted in China and published in 2005 — has previously examined chili pepper consumption and its association with mortality. This new study corroborates the earlier study’s findings.

“Ideathon” Entry Helps Student Voters

The winning entry at the University of Vermont’s first “Ideathon” — a pocket guide that will make it easier for UVM students to vote in national elections by providing them with state-by-state information on votingアニメーションとearly mail-in ballots. (Many students at the University are not registered to vote in their home states.)

The guide was created and developed, by Vyseth Chia, a Ph.D. candidate in the Cellular, Molecular, and Biomedical Sciences Program, with help from team members Jeann Karson, M.F.A., a lecture in the College of Engineering & Mathematical Sciences.

Ideathons have become popular in recent years as a kind of non-technical version of a hackathon, whose end product is an idea rather than an app. Like hackathons, ideathons harness the power of the group to address a single challenge. UVM’s ideathon was inspired by the downtown water tunnel of the 2016 presidential election. Only 55 percent of voting age citizens cast ballots; the lowest rate in 50 years, according to CNN. The event’s theme was to create ideas that would encourage more voting. The event attracted about 30 students, faculty and staff to the Hills Building in February to take on the challenge.

“The Bookshelf: Professor and Chair of Pathology and Laboratory Medicine Debra S.B. Leonard, M.D., Ph.D., broke ground ten years ago with the latest edition of Molecular Pathology in Clinical Practice. In 2016, Leonard edited the new updated and expanded second edition of this work from Springer. The text covers all areas of the rapidly expanding field of molecular pathology, including a new section on genomics, which is increasingly becoming a source of foundational medical information for physician decision-makers.”

University of Vermont Professor Jon Erickson, Ph.D., has never been a fan of the status quo. As an ecological economist, his national and international scholarship has challenged the mistaken assumptions of mainstream economics. As a social entrepreneur, he has helped build interdisciplinary research-to-action collaborations between academic, government, and civil society partners. Now an up-and-coming independent filmmaker, he’s gauging the strength of a new era of progressive politics in America. He thinks May be waking, at just the right moment to seed the social movement of the generation.

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When news first broke in 2014 about the Flint, Michigan water crisis, Assistant Professor of Sociology Katrinell Davis, Ph.D., was as surprised as the rest of America, but for a different reason: that it took so long for a public health disaster to happen in her hometown. Davis experienced inadequate public services first-hand while growing up in Flint, motivating her to become an expert on how public policy disproportionately affects lower-income communities. Her research examines the intersection of race, gender, and work trends within the American labor market and how they negatively affect working people. “I was looking at this in 2012, well before anyone was concerned about environmental injustice in Flint,” says Davis, who is working on a highly anticipated book on the topic. “My research focuses on the life chances of low-skilled poor people living in low-resource communities, so I want my students to understand how these inequalities are created and how they negatively affect working people in cities across America.”
Paul Hines, Ph.D., the L. Richard Fisher Professor at UVM’s College of Engineering and Mathematical Sciences, shares an office with Homer Simpson. Well, not technically, but a print of the animated cartoon character at work — cooking hot dogs on the control panel at the Springfield Nuclear Power Plant — hangs on the wall of Hines’ office, opposite a whiteboard filled with complicated physics equations.

It’s an apt juxtaposition for Hines, as one of three UVM faculty members whose research has formed the basis of Packetized Energy, a new company that is cooking up a hot-dog approach to a control system for renewable energy resources through complex computations, streamlining the way the world charges and stores electricity.

“I’m working on describing how to manage a battery in a power system,” says Hines of the whiteboard equations, during an interview on the eve of his departure to speak about this new technology at the Grid Edge World Forum in California. “How do you manage batteries best? When do you put power in, or pull power out?”

All are critical questions, as trains will stop, stoplights will fail, and people will become stranded during the massive power outages triggered by improper management of the electrical grid — the network of power lines that distribute electricity to millions of consumers. “It becomes a near doomsday scenario, and it can happen on a regular basis, because the grid is vulnerable,” says Hines. “We’re designing a system that can balance the ups and downs of renewable energy in a way that can keep the reliability we’ve grown accustomed to.”

Growing up in Tacoma, Washington, Hines had a hankering for engineering early on. He tinkered with Legos and was fascinated with how things worked. “Maybe it was rebellion against my parents, who were both English majors — I was going to solve nuclear fusion,” he says with a laugh. “I’ve always been interested in energy.” Learning how the world runs on power systems and electricity he was hooked on discovering “how the grid works, and how to move my career in that direction.”

Hines’ scholarly pathway has been firmly linked with the grid. He earned a B.S. in electrical engineering from Seattle Pacific University and an M.S. at the University of Washington, where his thesis title was “A Power Systems Capstone Design Project and Associated Simulation Software Designed to Meet the Changing Needs of the Electrical Power Industry and Engineering Accreditation Requirements.” That, in turn, gave way to “A Decentralized Approach to Reducing the Social Costs of Cascading Failures,” his dissertation for a Ph.D. in Engineering and Public Policy from Carnegie Mellon University.

It wasn’t until 2011, however, that Hines took these topics to a new level by brainstorming ideas with Jeff Frolik, Ph.D., a fellow UVM professor and Fulbright Distinguished Chair in the Department of Electrical and Biomedical Engineering, who had been studying how to manage wireless sensor networks. “We developed a way to take this algorithm and apply it to power,” says Hines, adding that the next key development was Assistant Professor Mads Almassalkhi, Ph.D., suggesting that they could extend this theory to other applications — such as water heaters, air conditioners, and batteries.

“So now we’re taking these core computational algorithms and applying them to lots of different things that might get plugged into the grid,” says Hines, “so that we can run everything without blowing up the grid.”

The nationwide power grid — which can only transmit electricity, not store it — is experiencing a period of rapid change, he adds, thanks to the addition of wildly fluctuating wind and solar power sources coming into a system designed for much more stable, predictable nuclear and coal power plants. Put them...
all together, and you get a grid in crisis. Also sweeping is the price of electricity which can go from 2 cents per kilowatt-hour on a “normal” day up to an effective price of $100 per kilowatt-hour on extremely hot summer days. Synchronizing all the elements flowing into the grid has tremendous value. Instead of managing the supply of electricity at the level of the enormous, spreading grid, the Packetized device puts supply management right in individual homes and businesses.

That’s what guided Hines, Frolik, and Almassalkhi when they co-founded Packetized Energy in 2016, with the basic aim to take their research and use it to build a software platform to connect electricity customers and suppliers in a much more systematic fashion.

“In very simple terms, the technology we are developing, producing, and commercializing aggregates and coordinates a fleet of energy resources that sit in people’s homes — in basements and closets — that people do not interact with, but use every day,” explains Almassalkhi. “By doing so, we’re able to offer valuable services to utilities and other energy market participants at the very highest level.”

On the screen of his MacBook Pro, Hines brings up a dot-dotted diagram showing electrical power usage in Poland. Connect the dots as an example of the scholarship he and his colleagues have undertaken, and the resemblance of a circulatory system emerges — an alien system, perhaps, one that pumps a different sort of electronic blood to different, unfamiliar body parts.

“It’s a view of the world that has shaped the dozens upon dozens of peer-reviewed journal articles, book chapters, policy reports, conference papers, and presentations they have authored and co-authored.

Putting these words into action, however, is the mission of Packetized Energy. The groundwork for this was laid even before the company’s founding, thanks to the foresight of Almassalkhi, who joined the UVM faculty in August of 2014 and was soon putting together a proposal for the Department of Energy (DOE). “As a young faculty you ask funding, so you come up with crazy ideas,” he says, explaining how he reached out to the Advanced Research Project Agency — Energy (ARPA-E) with the underlying concept for Packetized Energy. Because the DOE’s ARPA requires a commercialization path for approved projects upon completion of a three-year grant, Almassalkhi drafted a basic business plan in his proposal.

ARPA-E responded with a $1.7 million in funding for UVM’s Packetized Energy Management project, to run from mid-2016 through 2019. Instead of waiting for 2019, though, the Packetized Energy team was able to step outside of the standard ARPA template. “It’s a highly competitive program, so we realized we were onto something special,” he says. “We looked at the market, and the competing technology, and we realized we needed to strike very early.”

Their mobilization was swift. They hired chief engineer and UVM graduate Andrew Giroux, and created a website that clearly lays out the premise of Packetized Energy: to design and deploy “human-friendly systems to enable distributed energy resources such as water heaters, electric vehicle chargers, battery storage systems and pool pumps to balance supply and demand in the power grid as a result people can better manage their energy costs and the grid can run reliably with renewable energy.”

The founders also present the advantages of the patent-pending Packetized Energy Management (PEM): local decision-making, privacy, fairness, reliability and the ability to be adaptive.

The Packetized co-founders, meanwhile, have learned plenty as they meet the obstacles that can arise from introducing an innovative concept to the renewable energy world. “The biggest challenge has been finding partners that are willing to work with a very small company,” says Almassalkhi, “with enormous promise but a small track record. How do we find partners that are willing to work with us in the same agile way we work?”

Frolik adds that Packetized Energy faces another hurdle: “We have thousands of devices, such as electric water heaters, under management, but that requires a project of that scale to be adaptive. We have a chicken and egg situation.”

That situation was aided this summer when the National Science Foundation (NSF) awarded the company a $225,000 Small Business Technology Transfer grant. The NSF grant will allow Packetized to more fully explore coordinating large numbers of solar panels and battery storage systems.

LaunchVT is the name of a community initiative powered by the Lake Champlain Regional Chamber of Commerce to recognize local businesses with exposure for their entrepreneurial efforts, and funds to support their efforts.

In May, Packetized Energy received $250,000 prize money in the competition. “It was a huge win for us,” says Hines, who is using the funds to hire a software developer. More recently, in September, the company won the “Future Formula” pitch at the national Climate Economy Conference. Satisfaction comes in less tangible ways, too, such as fostering the friendships that enable growth. “There are certain risks that companies take to work with small, unknown entities,” says Almassalkhi. “Luckily, Paul, over the last ten years, has established himself as a presence within the power systems community and we can leverage those relationships.”

Almassalkhi agrees that the LaunchVT recognition was “a fantastic reward,” and a validation of the value of the concept of Packetized Energy Management. “This is just the beginning,” he says. “We have a long road ahead of us.” For his part, Frolik points to the company receiving its first seed investment and that NSF grant. “It’s rewarding seeing others embrace our approach,” he says. “We aren’t the only company trying to match electric energy demand to the availability of renewable energy but I believe we are the only one with a solution that can scale to manage millions of devices in a way in which customers aren’t bothered.”

Keeping cool is key says Hines, especially with the time crunches of serving as full-time professors while moving Packetized Energy forward into the future. A father of two, he likes to hike and bike in the Green Mountains, but much of his free time is spent investigating, estimating and measuring such concepts as cascading failure risk and the impact of network structures on global power usage.

So while Homer Simpson may choose his nuclear station to cook hot dogs, Hines and his team are just heating things up. When asked if the three co-founders of Packetized Energy ever enjoy outdoor excursions or other diversions together, Almassalkhi laughs: “We don’t do anything to blow off steam,” he says. “We use steam to push us forward.”

— MADS ALMASSALKHI, PH.D.
A VISION OF BETTER CARE

As the inaugural recipient of the Outstanding Investigator Award from the National Heart, Lung and Blood Institute, YVONNE JANSSEN-HEININGER, PH.D., professor of pathology and laboratory medicine at the Larner College of Medicine, says this award will facilitate her vision to fully translate her research findings into clinical care. This prestigious award is designed “to promote scientific productivity and innovation by providing long-term support and increased flexibility” in research. Janssen-Heininger will use it to further her already substantial work in antioxidant therapies for the millions of patients with asthma, chronic obstructive pulmonary disease, and pulmonary fibrosis.
A cross the University of Vermont, faculty members are pursuing research and leading initiatives to understand and potentially impact the slow, sure, and perilous changes in the Earth’s climate caused by humankind’s industrialization of the planet over the last three centuries. The following is just a sampling of the scholarly work and community action taking place that is influenced by this vital and controversial topic.

LEADING ASSESSMENT IN THE NORTHEAST

Lesley-Ann Dupigny-Giroux, Ph.D., chair of the Department of Geography, was named regional lead of the northeast chapter of the fourth National Climate Assessment (NCA4) in November of 2016. Dupigny-Giroux was selected from nearly 200 experts across the United States nominated by their peers to serve as author on NCA4.

David Reidmiller, director of the National Climate Assessment, described her as having “a unique set of qualifications, experiences, and perspectives that will elevate the utility of the Northeast Chapter — and the NCA4 as a whole.”

“Gathering and disseminating knowledge are key factors in the professor’s life. "Sharing knowledge and giving back to my community of scholars, peers, students are my two axioms in life," said Dupigny-Giroux in an interview in Directions magazine in 2016. "Watching students mature and flourish in their four years with us is a great privilege and the best part about being a teacher-scholar here at UVM.”

Dupigny-Giroux is also the State Climatologist for Vermont. Her work takes her across Vermont to assist colleagues in state agencies dealing with transportation, emergency management, agriculture, and forestry as well as outreach to the state’s legislators to help plan for and adapt to climate change. She is an expert in floods, droughts, and severe weather and the ways in which these affect Vermont’s landscapes and people.

In 2016, Dupigny-Giroux was also one of the lead organizers of the 14th Annual Climate Prediction Applications Science Workshop in Burlington. The international conference, launched in 2002 by the National Weather Service’s Climate Services Division, brought together a diverse group of climate researchers, climate product developers, and climate information users to share developments in research and applications of climate predictions, with the goal of putting new information and tools in the hands of end-users to improve decision making at all policy levels.

WHAT WE THINK ABOUT CLIMATE

Research published in 2016 by Meredith Niles, Ph.D., of the Department of Nutrition and Food Sciences in the journal Global Environmental Change suggests that irrigation systems designed to buffer farmers from the effects of a warming planet may be causing them to think their local area is cooler and wetter than it is — perceptions that other studies suggest may slow their efforts to address climate change. The paper is the first to show the impact of infrastructure on climate perception.

The research compares the climate record since 1980 of two wine producing regions in New Zealand, Marlborough and Hawke’s Bay, with resident farmers’ perceptions of climate change. Both areas rely heavily on irrigation for growing grapes and other crops.

By Joshua Brown and Jeffrey Wakefield

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“This study is the first to suggest that infrastructure like irrigation that can help farmers deal with the climate may actually affect how they perceive climate change,” said Niles. “What may have previously been dry pasture is now lush with given leaves and grapes. It’s not surprising that some farmers believe precipitation has increased.”

The findings are especially significant because of their behavioral implications. In an earlier paper, in Proc. Natl. Acad. Sci., Niles showed that experience with, and belief in, human-induced climate change was necessary for farmers to want to reduce their greenhouse gas impacts and adopt adaptive strategies. Absent these experiences and beliefs, farmers indicated they would be less likely to make these behavioral changes.

“This could be a significant factor we’re overlooking,” Niles says. “While many of these infrastructure systems are critical to help us adapt and manage the climate, they might also influence how we perceive change. And given that experience with climate change is shown to be a critical factor for behavior change and policy support, this might have profound effects.”

Mountaintops, Clean Water, and Climate Change

Mountains are far more than rocks. They also confer various natural benefits — half the world’s drinking water, for example (Image 591 to 991).

“The study suggests that this event could disrupt the function of mountaintop ecosystems as plant communities above and at treeline are thrown into turmoil faster than trees can migrate uphill in a warmer world.”

“Humanity relies on mountains,” says the new study that gathered data at treeline in New Zealand, Colorado, Canada, Australia, central Europe, Japan and Patagonia. “We found in all these places that temperature change drives many other kinds of change, potentially disturbing biodiversity and that could have a profound effect on the ecosystem services mountains provide to people — like clean water.”

The new study overcame a problem researchers have wrestled with for years: that the effects of climate change occur over a much longer time than the duration of traditional scientific experiments.

The study’s predictions are worrisome. For example, “we see that at lower elevations the nitrogen cycle speeds up with warming,” says co-author UVM ecologist Aimée Classen, Ph.D. “In the tropics, plants need more phosphorus — which can be limiting,” she says. “So the scientists expect that global warming will improve the nitrogen nutrition available to mountain plants. However, decreasing elevation did not increase the availability of phosphorus, another key nutrient for plants. In other words, as mountaintops warm, ‘you’re likely to get this discontinuity — a decoupling — between the balance of those two nutrient cycles that are needed to build plant materials’” Classen says.

Over decades and centuries, this loss balance between nitrogen and phosphorus could “slow productivity” of mountaintop ecosystems, threatening their health and the downstream benefits they provide to other plants, animals, and people.

“All the climate models assume that plants can just march uphill as it gets warmer,” says Classen, an associate professor in the Rubenstein School of Environment and Natural Resources. “But this study shows that march might not be so easy!”

The ice sheet covering Greenland is four times bigger than California — and holds enough water to raise the global sea level more than twenty feet if it were to melt. Today sea levels are rising, and the melting of Greenland is a major contributor. UVM geologist Paul Bierman, Ph.D., from the College of Arts and Sciences and his students have traveled to this remote island many times, seeking to better understand how fast, could Greenland melt in a warming world?

Bierman’s latest study published in December 2016 in the journal Nature, provides powerful insight into this question — and generated media stories around the world, including in TIME magazine, Scientific American, the BBC, Popular Science, Agence France Press, and many other outlets.

“This study looks at mountains to show how ecological linkages can become unlinked with climate warming,” says UVM’s Nathan Sanders, “and shows that it’s a global phenomenon.”

GREENLAND ON THIN ICE?

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“The melting we are seeing today,” Bierman says, “may be out of the bounds of how the Greenland ice sheet has behaved for many millions of years.”

To make better predictions about the future of the ice sheet, Bierman and other scientists have tried to understand its past, hoping to glean what the ice was doing millions of years ago when the Earth was three or more degrees Fahrenheit warmer than it is now. But their understanding of the ice sheet’s complex behavior before about 125,000 years ago has been fragmentary at best.

Bierman’s Nature study — performed with one of his students and a team of other scientists — was paired with another study in the journal. Both applied an innovative new technique: using radioactive isotopes found in quartz to estimate how long the island’s bedrock was exposed to the sky versus buried under the ice. This approach allowed the scientists to peer into the deep history of the Greenland ice sheet, looking back millions of years farther than previous techniques allowed.

But the new deeper view raised an important scientific debate about the ice sheet’s behavior, which played out in media coverage after their publication.

“We must recognize the importance of advancing polar science to understand how our world works. And right now, because we’re pumping huge plumes of greenhouse gases into the atmosphere, we really need to know how our world works,” Bierman says.

CLIMATE CHANGE AND LAKE CHAMPLAIN

Closer to home, new research published in the journal Environmental Research Letters in November 2016 suggests that Lake Champlain may be more susceptible to damage from climate change than was previously understood — and that, therefore, the rules created by the Environmental Protection Agency to protect the lake may be inadequate, to prevent algae blooms and water quality problems as the region gets hotter and wetter.

“This paper provides very clear evidence that the lake could be far more sensitive to climate change than is captured by the current approach of the EPA,” says UVM professor Asim Zia, Ph.D., the lead author of the study. “We may need more interventions — and this may have national significance for how the agency creates regulations.”

The study led by a team of ten scientists from UVM and one from Dartmouth College, used a powerful set of computer models that link the behavior of social and ecological systems. Their results show that accelerating climate change could easily outpace the EPA’s land-use management policies aimed at reducing the inflow of pollution from agricultural runoff, parking lots, deforestation, cow manure, litter, fertilizer, pet waste, streambank erosion — and other sources of excess phosphorus that cause toxic algae and lake health problems.

By connecting sub-models — of human behavior and land use, watershed dynamics, global climate models “downscaled” to the local region, and the hydrology of the lake itself — the overall model links together “the behavior of the watershed, lake, people and climate,” says Judith Van Houten, Ph.D., UVM professor of biology director of Vermont EPSCoR, and lead author on the study. This provides “a way forward to pull back the veil that often surrounds effects of climate change,” she says.

UVM hydrologist Anna Bomblies, Ph.D., a co-author on the study notes that, “We show through this modeling work the importance of a more comprehensive consideration of climate change impact mechanisms to achieve water quality goals, and the need to adequately address climate change uncertainty.”

“Lake Champlain’s future is sensitive to climate change,” Bomblies says. “And similar challenges are faced by other impaired waters throughout the United States.”

“Lake Champlain is more vulnerable to the effects of climate change than we previously knew,” Van Houten says. “Our model shows that as climate changes, the lake will need to employ more interventions — and this may have national significance for how the agency creates regulations.”

This new modeling framework is the first of its kind to incorporate economic models, sociological models, and a behavior model of “how we live near the water, how we use the lake,” Van Houten says. “We show that accelerating climate change could easily outpace the EPA’s land use policies aimed at reducing the inflow of pollution from agricultural runoff, parking lots, deforestation, cow manure, litter, fertilizer, pet waste, streambank erosion — and other sources of excess phosphorus that cause toxic algae and lake health problems. Connect these sub-models — of human behavior and land use, watershed dynamics, global climate models downscaled — to the local region, and the hydrology of the lake itself — the overall model links together “the behavior of the watershed, lake, people and climate,” says Judith Van Houten, Ph.D., UVM professor of biology director of Vermont EPSCoR, and lead author on the study. This provides “a way forward to pull back the veil that often surrounds effects of climate change,” she says.

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As the UVM Theatre 2016–17 season began, faculty, students, and staff of the Department of Theatre prepared to hit the boards at the Royall Tyler Theatre with, *Stupid F*#king Bird*, a provocative play by the award-winning writer Aaron Posner that presented, as its title suggests, an edgy, irreverent take on a classic of modern theatre, Anton Chekov’s play *The Seagull*. Ever-present and watching over the production from the wall at the back of the stage was the visage of Chekhov himself, painted by Professor and former Chair of Theatre JEFFREY MADEREGER, M.F.A., the department’s resident scenic designer. A scenic design expert with over 400 professional credits to his name, Madereger has worked on national tours of *Kiss Me, Kate* and *Singin’ in the Rain*, the Showtime series *The Brotherhood* and on the Disney film *Underdog*. Madereger and his colleagues’ work with students was recognized this year with a top 10 rating among B.A. programs in the nation by the popular theatre blog OnStage.
A mechanical engineering doctoral student at the University of Vermont, Ryan McDevitt, Ph.D.’14, found himself at the front lines of a revolution in satellite technology—one focused on making these giants of space exploration much, much smaller. Around 2009, just as McDevitt began his graduate work, CubeSats—micro satellites measuring 10cm by 10cm—had started to come into their own as a viable alternative to the larger, more expensive satellites that had been the standard since the time of Sputnik. The problem: Their lighter weight also makes them more susceptible to perturbations in orbit. They also can’t easily move out of the way of larger objects, and controlling how they “de-orbit,” or come back down to Earth, poses some challenge.

Enter UVM Professor of Mechanical Engineering Darren Hitt, Ph.D., an expert in small spacecraft propulsion, who had received a $750,000 NASA grant to continue his work on how to better maneuver micro satellites. McDevitt and Hitt teamed up as Ph.D. student and mentor, and their collaboration resulted in a viable concept for a new, cost-effective micropropulsion system. When McDevitt finished his degree and left UVM in 2014, the project could have ended there, never making it past the prototype they fabricated on a 3-D printer, or out of the pages of McDevitt’s doctoral thesis. But Hitt and McDevitt wanted to see it go further: They saw real potential in the system they developed to improve the function of these micro satellites.

“SPARK-VT was a lifeline,” says McDevitt. “We needed to show investors and companies that this is more than work in a lab.” McDevitt took the funds to the Vermont-based company he co-founded, now called Benchmark Space Systems (formerly GreenScale Technologies), to develop a prototype of the micropropulsion system that could be manufactured on a larger scale.

The work that resulted from the SPARK-VT grant helped launch McDevitt and Hitt onto a larger stage, and the accolades were quick to come in. In 2016, McDevitt’s company was named one of the nation’s top 36 university-spawned start-up companies by the National Council of Entrepreneurial Tech Transfer. McDevitt was also a finalist in the 2017 Launch VT competition, a program from the Lake Champlain Chamber of Commerce, cementing his place in the top echelon of entrepreneurs across the state.
Since its founding in 2013, SPARK-VT has helped to bridge the divide between academia and the marketplace for scores of UVM faculty with roots in the Department of Medicine, the largest academic department at UVM’s Larner College of Medicine. SPARK-VT came in part as an answer to what is known as the “valley of death,” or that period of time between the genesis of an idea and its commercialization. Often, researchers run up against funding and regulatory hurdles that prove too difficult to surmount, stopping potentially Game-exposure-induced suicide risk, replicating the thinking of an experienced psychiatrist using a novel neural network-based algorithm. SEARS helps to address an important public health problem: Suicide is among the top four leading causes of death in individuals between the ages of 10 and 54, and it claims 25 percent more lives annually than motor vehicle accidents. A study published in the Journal of Clinical Psychiatry in 2014 concluded that using multiple markers – not only to SPARK-VT grants but also to the program raising the “visibility of commercialization.”

“Each year, we see a growing number of faculty interested in commercialization of their work,” says UVM Provost David Rosowsky. “By providing strong support mechanisms for translating work into commercial application, we will continue to be able to attract outstanding faculty working in areas with the greatest potential for commercialization and societal impact.”

At the heart of this support system are the 21 SPARK-VT panelists, who hail from across the country and volunteer their time to the cause. Their expertise spans a wide range of fields, including patent law, biotechnology, clinical trial leadership, engineering, and entrepreneurship.

“They’re very motivated,” says Rincon, who has played a key role in cultivating the group over the years. She says panelists appreciate the opportunity to “elevate the conversation” around entrepreneurship, and are eager to help faculty develop critical skills in an ever more competitive funding environment. Gagnon points out that any time the group can leverage its network of experts to offer a workshop series on topics ranging from intellectual property to market analysis to the art of the pitch. And a partnership with the Grossman School of Business, led by Eric Munson, Ph.D., the Steven Grossman Endowed Chair in Entrepreneurship, links senior business undergrads with researchers to help them develop a business plan.

“SPARK-VT is connecting scientists and entrepreneurs,” says Desjardins. “It has created a space to have the kind of conversation that puts ideas into action.”

That conversation continues to expand. Thanks in part to the success of SPARK-VT, Rincon received funding to set up a FORtifying Idea State Entrepreneurship (FOR-ISE) program. Open to faculty and post-doctoral fellows in Alaska, Maine, New Hampshire, Puerto Rico, Rhode Island and Vermont, the goal is to support investigators in states where the aggregate success rate for applications to the NIH has historically low Gagnon notes that this often means a focus on communication.

“Feedback from the SPARK-VT panel helps researchers move from a science talk to an actual pitch,” he says. “How do you convey your ideas to a group of people who aren’t scientists?”

**EVIDENCE THAT SPARK IS CHANGING UVM CULTURE**

- Average number of invention disclosures (all of UVM), 2011–2013: 37
- Average number of invention disclosures (all of UVM), 2014–2016: 47
- Total number of invention disclosures in 2016: 56
- Average number of SBIR/STTR grants submitted per year (all of UVM), 2011–2015: 14
- Average number of SBIR/STTR grants submitted per year (all of UVM), 2014–2016: 23

*Sponsored by UVM’s Office of the President*
Yutaka Kono, D.M.A., knows the creative process as a performer on the tuba and as a composer. As a conductor, for both the UVM Symphony and the Burlington Chamber Orchestra, this assistant professor of music brings another dimension to his creative work — meeting the particular challenges that come with standing, baton in hand, dozens of musicians before him and hundreds of listeners behind him, bringing a composition to life at a moment in time. In rehearsal, the final sound emerges each time the musicians and conductor run through a piece. “It is always a two-way communication,” Kono says. “Sometimes students will bring an interesting way of playing a particular section or phrase. Say we have a melody played by the violins, clarinets, and flutes. If I like the way the violins are playing it, I’ll encourage the flutes and clarinets to listen to and imitate that way of playing. Ultimately, I see my job as trying to unify the sound of the orchestra.”

See Dr. Kono play and discuss the tuba at UVM.EDU/INQUIRY
Adolescence is a time of extraordinary physical, emotional, and intellectual growth, as well as a time of changing social environments full of new challenges and opportunities that help shape a young person’s adult identity, health, and well-being. There is much to learn about how varied adolescent experiences—participation in extracurricular activities, playing video games, sleep habits, head injuries from sports, experimentation with alcohol, tobacco, marijuana or other substances—affect development. This is particularly true in a rapidly changing world dominated by social media and other forms of communication in which adolescents readily engage.

“We know the brain is still developing well into the mid-20s, making it vulnerable to a host of influences,” says National Institutes of Health Director Francis S. Collins, M.D., Ph.D. Faculty members across UVM are paying close attention to the young brain in their research.

James Hudziak, M.D., professor of psychiatry and director of the Vermont Center for Children, Youth and Families, and his colleague Matthew Albaugh, Ph.D., turned their attention in recent years to children 6 to 18 years old. They found that children who play the violin or study piano could be learning more than just Mozart: musical training might also help kids focus their attention, control their emotions and diminish their anxiety. Their research was published in the Journal of the American Academy of Child & Adolescent Psychiatry. The authors noted that their study was “the largest investigation of the association between playing a musical instrument and brain development.” They found that music playing altered the motor areas of the brain, because the activity requires control and coordination of movement. Even more important to Hudziak were changes in the behavior-regulating areas of the brain. For example, music practice influenced thickness in the part of the cortex that relates to “executive functioning, including working memory, attentional control, as well as organization and planning for the future.”

In a different study, Hudziak has looked into the potential dangers of ice hockey for young athletes. He and Albaugh and UVM colleagues Catherine Orr, Ph.D., and Richard Watts, Ph.D., published a groundbreaking study in the Journal of Pediatrics that showed a relationship between concussions sustained by young ice hockey players and subtle changes in the cortex. The UVM team used advanced imaging technology and cognitive testing to assess 29 Vermont ice hockey players between ages 14 and 23, some diagnosed with a sports-related concussion. As the severity of the athletes’ concussion symptoms increased, the researchers found the cortex got thinner in areas where it should be dense at those players’ ages—areas that relate to attention control, memory, and emotion regulation.

“We believe that injury to a developing brain may be more severe than injury to an adult brain,” Hudziak says. “The concern is that what we are finding may be an early marker of brain damage.” Albaugh says, “Years of playing contact sports and repeatedly getting your head knocked around...”
Children, Youth and Families of Psychiatry James Hudziak, M.D., is also director of the Vermont Center for the ABCD study. Psychiatry faculty members Hugh Garavan, Ph.D., and Richard Watts, Ph.D., examined psychopathology and imaging data from 1,538 adolescents. The data included parent ratings of ADHD symptoms collected through the Strengths and Difficulties Questionnaire (SDQ), and self-reports from the adolescents in the study through the youth version of the SDQ. The team also derived ADHD symptom counts from parent interviews — and then related ADHD symptom counts to brain structure.

When they overlaid the imaging results from all of their analyses — using behavioral questionnaire data and symptom counts — they found an anatomical region of convergence: ADHD symptoms reported by parents and adolescents were related to reduced grey matter volume in an area of the prefrontal cortex, the ventromedial prefrontal cortex (vmPFC). This relationship was particularly true for symptoms of inattention.

The team also found that this area of anatomical convergence was related to an objective behavioral measure of attention that has been previously associated with ADHD — reaction time variability. Past research by others has shown that ADHD youths exhibit more variability in their response times, and this is believed to reflect inattention and distractibility.

Albaugh and colleagues found that greater variability in reaction time was associated with reduced volume in the vmPFC. The connection of reduced vmPFC volume to inattention sets the stage for follow-up research, says Albaugh, who believes these findings could affect future ADHD interventions to strengthen this region of the brain. The work may also help to identify which youth go on to experience elevated symptom levels later in childhood.

“We are very gratified with Vermont’s inclusion, given this study’s aim to characterize psychological and brain development in a representatively sampled group of U.S. youth,” says Garavan. “This research will generate a vastly large and detailed dataset that will yield insights for decades to come into the transition from childhood to adolescence through to adulthood.”

During the course of the next decade, the ABCD study scientists will use advanced brain imaging, interviews, and behavioral testing to determine how childhood experiences interact with each other and with a child’s changing biology to affect brain development and — ultimately — social, behavioral, academic health and other outcomes.

Understanding these relationships may help reveal the biological and environmental building blocks that best contribute to successful and resilient young adults. This enhanced knowledge also may lead to ways to predict potential developmental problems so that they can be prevented or reversed. Families that volunteer will be part of groundbreaking research that promises to inform future educational strategies, child development innovations, research priorities, more effective public health interventions, and science-based policy decisions.

The ABCD Coordinating Center is housed at the University of California at San Diego and recruitment is conducted through schools at 19 study sites across the country.

Other UVM faculty participating on the ABCD study research team include Albaugh and Hudziak, Julie Duman, Ph.D., associate professor of psychiatry; and Richard Watts, Ph.D.

Another effort focuses on a common but little understood condition. Despite diagnoses for attention-deficit/hyperactivity disorder (ADHD) accounting for a reported 1 percent of U.S. school-aged kids, clinicians still do not fully understand the disorder’s underlying causes. Now a brain marker may be on the horizon, thanks to a new approach by UVM faculty that provides evidence of a relationship between brain structure and dimensional measures of ADHD symptoms. The study’s results were reported in March in the journal Biological Psychiatry.

“Few studies have examined the relationship between ADHD symptomatology and brain structure in population-based samples,” says Albaugh and the study’s authors, who rather than taking what is called a “categorical” approach — a comparison of ADHD patients and controls — took a quantitative, dimensional, multi-informant approach. This method dovetails with work done by UVM’s Thomas Achenbach, Ph.D., and colleagues, revealing aspects of dimensionality with regard to many psychiatric conditions, including ADHD.

“It’s not whether or not one has attention problems, it is the degree to which one is instantiate,” says Albaugh.

For the study Albaugh and his colleagues, including Garavan, Potter; Robert Althoff, M.D., Ph.D., and Scott Mackey, Ph.D., examined psychopathology and imaging data from 1,538 adolescents. The data included parent ratings of ADHD symptoms collected through the Strengths and Difficulties Questionnaire (SDQ), and self-reports from the adolescents in the study through the youth version of the SDQ. The team also derived ADHD symptom counts from parent interviews — and then related ADHD symptom counts to brain structure. When they overlaid the imaging results from all of their analyses — using behavioral questionnaire data and symptom counts — they found an anatomical region of convergence: ADHD symptoms reported by parents and adolescents were related to reduced grey matter volume in an area of the prefrontal cortex, the ventromedial prefrontal cortex (vmPFC). This relationship was particularly true for symptoms of inattention.

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— MATTHEW ALBAUGH, PH.D.
ENCOURAGING HEALTHY DECISIONS

LIZZY POPE, PH.D., assistant professor in the UVM Nutrition and Food Sciences Department, also directs the Didactic Program in Dietetics. Pope enjoys looking at the thought process behind the food and exercise choices people make, and then testing ways to impact these decisions with minimal willpower expenditure. “Throughout my academic journey I’ve always gravitated toward the psychology behind food and exercise decisions and why people make the choices they do,” she says. “My current research uses behavioral economic strategies such as providing incentives or shifting default options to mindlessly promote healthy options. The overarching goal of my research is to make the healthy choice the easy choice across circumstances, populations, and environments.” This year, along with her colleague Bernice Garnett, Sc.D., assistant professor of education in the College of Education and Social Services, Pope created a new mobile game aimed at encouraging teens to exercise with similar virtual rewards. Called “Camp Conquer,” the project is one of the first in the area of gamification and obesity, and was test-launched with the cooperation of 100 Burlington High School students in January.

See Dr. Pope explain her incentive research at UVM.EDU/INQUIRY
Staffers in the Congressional Research Office were skeptical, to put it mildly, when University of Vermont political science professor Garrison Nelson, Ph.D., approached them in 1975 about producing the first comprehensive history of legislative committees in the U.S. Senate and House of Representatives. Such a volume would be impossible to produce, they said, with information buried in obscure resolutions deep in the archives.

Thirty-five years, tens of thousands of hours, and millions of scanned pages later, Nelson and co-author Charles Stewart of MIT proved the experts wrong with the publication in 2010, by Congressional Quarterly Press, of the seventh and final volume of a work — Committees of the U.S. Congress — that tracked every single member’s committee comings-and-goings from 1789 to 2010, and provided a wealth of additional committee information to boot.

While such a work might seem arcane at best to average citizens, it is of great use to insiders — by 2010, earlier volumes in the series were ragged and dog-eared from staffers’ use, according to the Senate’s chief historian, Richard A. Baker. The series appears on official congressional listings of standard reference works on the federal legislative branch.

Discerning the seemingly indiscernible has been a hallmark of Nelson’s long career at UVM, one that continued to be apparent this past year with the publication of his biography of one of the most important but least understood Speakers of the House of Representatives in the nation’s history.

This is the outgrowth of a career at UVM that began when Nelson joined the faculty in 1968, after earning his A.B. from Boston University and his M.A. and Ph.D. from the University of Iowa. He is one of UVM’s longest serving faculty members.

In 2015 Nelson was named the inaugural Elliott A. Brown Green and Gold Professor of Law, Politics and Political Behavior. Nelson received the Kroepsch-Maurice Teaching Excellence award in 2009, and was named the Fall 2013 College of Arts and Sciences Dean’s Lecturer.

“Beyond the formal recognition, his true legacy lies with the students he has taught, and the inspiration and knowledge imparted to generations of young, eager minds inside his classroom,” said UVM President Tom Sullivan at the Green and Gold investiture ceremony. Sullivan also quoted from one of Nelson’s former students, Maggie Steakley ’08, who wrote: “Garrison Nelson taught me what true commitment to a project looks like.”

That sense of commitment is apparent in Nelson’s latest scholarly work.

In early 20th century Boston, the path to political power required one of two backgrounds: Yankee Boston or Irish Boston. The former demanded a Pilgrim or Puritan ancestor and a degree from Harvard. The latter called for an Irish-born father, a widowed mother, and younger siblings that you helped raise in poverty.

John W. McCormack, the 44th U.S. Speaker of the House (1962–70) possessed neither of the Yankee requirements, and

“[McCormack was] the most secretive man I ever met... I couldn’t understand why he was the only Speaker without a biography until I started digging around.”

— Garrison Nelson, Ph.D.
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“GARRISON NELSON TAUGHT ME WHAT TRUE COMMITMENT TO A PROJECT LOOKS LIKE.”

— MAGGIE STEALLY ’08

had no Irish ancestry. He did, however, grow up in extreme poverty in South Boston — a.k.a. “Southie” — and used that as a basis to fabricate his personal history when he ran for the Massachusetts House in 1920.

The false narrative of the Irish kid from Southie propelled McCormack to a historic 43-year career in the U.S. House (1928–1971) and within a heartbeat of the presidency. Somehow, it remained intact until April of 2017, when Nelson published the first biography of McCormack.

Some 50 years in the making, John William McCormack: A Political Biography reveals stunning new facts about the background of a man considered the legislative architect of the New Deal and the Great Society. Nelson gives long overdue credit to a leading figure in the transformation of the 20th Century Democratic Party for passing a social welfare agenda that included Social Security, Medicare and Medicaid, immigration reform, and civil rights legislation.

The most politically disquieting discovery by Nelson was that McCormack’s father wasn’t Irish. He was a Canadian-born Scot who abandoned John and his younger — and older — siblings, and outlived his Boston-born wife. Nelson uncovered forgotten FBI files, falsified birth and death records, taped interviews with McCormack, and conducted his own interviews with family, friends and even cemetery caretakers as he chased clues from Ireland to Canada and across the U.S.

Previous attempts to write biographies of McCormack — the only post-1940 Speaker of the House without a biography until now — usually ended with the discovery of sanitized congressional papers located at Boston University, devoid of any pertinent personal information. Nelson was told early on by a political boss in Southie not to expect anyone to talk about their local hero and violate a code that says, “never write what you can speak; never speak what you can nod.”

“I kept waiting for someone to write the book, but no one ever did,” says Nelson, who spent over $100,000 of his own money to complete the book about a man referred to by his political boss in Southie not to expect anyone to talk about their local hero and violate a code that says, “never write what you can speak; never speak what you can nod.”

“I couldn’t understand why he was the only Speaker without a biography until I started digging around,” says Nelson.

Nelson caught a break when McCormack’s dying nephew gave him six boxes filled with family photographs, personal letters, news clippings, and gavels. “It was there that I found the inspiration for this particular book as well as for most of my published research on the U.S. Congress.”

Nelson消毒不 to keep McCormack’s falsified past in his 910-page book, which David Shribman of the Boston Globe described in his review this spring as “a brilliant portrait not only of ‘Boston’s Forgotten Man,’ but also of the place that spawned him and of the era he commanded.” Instead, Nelson gives McCormack long-overdue credit for forging key political alliances, allowing his party to pass legislation to help the nation’s most vulnerable.

Known as “Boston Brahmin’s favorite Irishman, the South’s favorite northerner, and the Jews’ favorite Catholic,” McCormack maintained relationships with Southern Democrats, mainly Sam Byrum of Texas, for 21 years during a period between 1940 and 1989 when the Speaker and Majority Leader positions were held by Democrats from Massachusetts and Texas. This so-called Austin-Boston Connection — the subject of a previous book by Nelson — reshaped the Democratic Party from a regional southern white Protestant party to one that embraced urban, religiously and racially diverse ethnic groups, according to Nelson.

“Their impact on House politics and the national agenda was profound,” says Nelson. “The moderate and liberal Democrats now had their own alliance to counter the Conservative Coalition.”

Ultimately, Nelson doesn’t claim to know why McCormack fabricated his past, but strongly suggests it was because he wanted to lift himself, and people back in Southie and across the country, out of poverty. “McCormack understood as clearly as the Irish political gatekeepers how politics could be used to advance oneself and to alleviate the economic hardship of their Irish-descended constituents.”
TRANSFORMING SPECIAL EDUCATION

In addition to her appointments as professor and vice chair in the UVM Department of Education, KATHARINE SHEPHERD, ED.D., is the project director and co-principal investigator of a five-year, U.S. Department of Education-funded study supporting future leaders in special education, and a three-year grant from the Spencer Foundation that deals with improving instructional intervention for struggling students. She’s also an author and editor — her latest book is titled The Art of Collaboration: Lessons from Families of Children with Disabilities; and recently she served as the guest co-editor of a special issue of the journal Teacher Education and Special Education. Shepherd is a past president of the Higher Education Consortium of Special Education, which presented her with its leadership and service award in 2016 to recognize her many contributions to the organization. In February, she was invested by UVM President Sullivan as the inaugural Levitt Family Green and Gold Professor.
Researchers at the University of Vermont Vaccine Testing Center (VTC) study human vaccines and human immunology with the goal of understanding and preventing infectious diseases around the globe. The VTC team is particularly interested in developing and improving vaccines, and understanding how they best work to establish an immune barrier to infection. “Our work focuses on developing and understanding vaccines to prevent infectious diseases that have a major impact on health in low-income countries,” says Professor of Medicine Beth Kirkpatrick, M.D., who founded and has directed the VTC for 15 years, “although in 2017, many of these same diseases now threaten all corners of the globe.”

The VTC predominately focuses on two areas in vaccinology. One area is flavivirus vaccines, which include mosquito-borne infections such as Dengue, Zika and West Nile viruses. The other is enteric infections, including bacteria, viruses and parasites infecting the intestinal tract. The VTC has studied several major enteric pathogens, including rotavirus, Cryptosporidium, Campylobacter, cholera, and typhoid.

For its U.S.-based studies, the center depends upon another important group — healthy volunteers — to accomplish its research mission. “Adult volunteers are critical to the evaluation of any new candidate vaccine,” says Kristen Pierce, M.D., associate professor of medicine and lead clinical investigator on the VTC’s Dengue vaccine program. “With this in mind, all of our human research studies are designed and performed with rigorous oversight and attention to safety.”

The VTC performs research at UVM and internationally. Their work depends on a diverse team of physician- and basic-scientists, international teams of collaborators, study coordinators, laboratory personnel, and data analysts focusing on vaccine development and human immunology from the vantage point of the laboratory, field or clinic. All share a common dedication to team-based science and an appreciation for the diverse skills that the team as a whole brings to the table.

In May 2017, the VTC hosted fifteen of the world’s leading Rotavirus researchers at their Symposium on Rotavirus Human Immunology: Advancing Science, Decreasing Disease. Visiting scientists joined investigators from the VTC, including Benjamin Lee, M.D., assistant professor of pediatrics and Sean Dziek, Ph.D., assistant professor of medicine, to tackle major outstanding scientific issues critical to controlling the disease burden from Rotavirus diarrhea.

Before the advent of rotavirus vaccination a decade ago, almost 600,000 child deaths occurred globally each year due to rotavirus. Despite the success of oral vaccines, rotavirus infections remain the leading global cause of diarrhea-related child deaths. The vaccines, which are 95 percent efficacious in high-income countries, are only about 50 percent effective in low-income countries. This is why VTC researchers and their colleagues are seeking an improved immune marker which correlates with vaccine-induced protection that will help identify at-risk children.

Participants at the May symposium shared their research and experiences toward understanding and improving vaccine performance and the development of new immunology assays at UVM which may be used as a new correlate of protection or risk. Scientists representing The Bill & Melinda Gates Foundation, the non-governmental organization PATH, and the U.S. Centers for Disease Control and Prevention were also in attendance. In addition, eleven U.S. and international academic institutions were represented, including ones from Columbia, India, and Bangladesh. In July 2017 the VTC hosted another team of international scientists at UVM to discuss the human immunology of Dengue and Dengue Vaccines. Scientists from Johns Hopkins University, The National Institutes of Health (NIH), The University of North Carolina, The Bill & Melinda Gates Foundation, and La Jolla
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Liquid-nitrogen-cooled tank.

In the process, the combined VTC-JHU-NIH team has identified an effective, live, single-dose tetravalent Dengue vaccine. This vaccine has now been tested by the VTC team for safety in all ages in Dengue-endemic Bangladesh. The vaccine’s final major test for efficacy which involves tens of thousands of persons in Brazil, is underway.

In efforts related to Dengue, as well as vaccines for enteric pathogens, the VTC has collaborated with the International Center for Diarrheal Disease and Research (icddr,b) in Dhaka, Bangladesh, since 2002. This partnership with pre-eminent icddr,b scientists such as Firdausi Qadri, Ph.D., and Bashidal Hague M.D., Ph.D., has yielded valuable information and deep relationships between the two centers.

One pathogen of interest to both is a bacterium that has serious impacts in the developing world, but is rarely seen in the U.S. — cholera. Cholera is caused by the bacteria Vibrio cholerae and occurs in areas with poor sanitation, limited access to safe drinking water, and inadequate health care. According to the World Health Organization (WHO), globally there are an estimated three to five million cases of cholera infection and as many as 120,000 deaths due to the disease annually. But there is hope for addressing this infectious disease. In June of 2016, the FDA approved the only vaccine to protect against cholera infection. The vaccine — Vaxchora — is currently available only in the U.S., but is undergoing modifications for global use. VTC researcher Caroline Lyon, M.D., M.P.H., associate professor of medicine notes, “Outbreaks occurring in Yemen and the Democratic Republic of Congo demonstrate the importance of a single-dose oral cholera vaccine. We are proud that our work has led to approval of a vaccine that will impact so many people worldwide.”

The VTC was one of only three sites that conducted human trials to test the effectiveness of this groundbreaking vaccine. VTC’s involvement is not an accident. “VTC’s Vaccine Testing Center is one of only four or five sites in the U.S. capable of doing this type of vaccine human challenge study” says Kirkpatrick.

Despite its name, the Vaccine Testing Center team has begun to expand outside the vaccine arena on other components of global infectious diseases. These areas include new avenues involving evaluation of new therapeutics, predictive modeling of emerging and epidemiology. For example, there are no vaccines to treat or prevent Cryptosporidium, a leading cause of severe diarrhea in infants and young children in the developing world. This single-celled intestinal parasite is found in contaminated water and causes significant illness and death in immunocompromised individuals.

VTC interest in Cryptosporidium has led to collaborations with the laboratory of a highly innovative UVM physician-scientist in infectious diseases, Christopher Hutton, M.D., associate professor of medicine, who has designed novel high-throughput techniques for testing libraries of chemical compounds which may serve as new therapies against Cryptosporidium. “Dr. Hutton’s novel drug-testing methods have been a major advance in the development of new drugs against Cryptosporidium,” says Kirkpatrick. “These methods are being used worldwide by investigators and industries to evaluate novel therapeutic agents. This VTC award brings us closer to testing the effectiveness of these drugs in human populations.”

In collaboration with the University of Maryland’s Center for Vaccine Development, Hutton, Lyon, and Kirkpatrick are designing a research platform upon which new Crypto treatments can be tested in humans. The work is being funded by a $5.3 million grant from the Bill & Melinda Gates Foundation.

“Diarrheal illnesses caused by Cryptosporidium and the long-term consequences of this illness, has been underappreciated in children in the developing world,” notes Huston. “Fortunately, recent international studies have brought this problem to the attention of the public health community.” Caroline Lyon, who leads the clinical arm of this research, adds, “The opportunity to combine Dr. Hutton’s laboratory innovation and the VTC’s clinical expertise to address this globally important need is truly exciting for us and the University.”

Kirkpatrick foresees that a name change may be needed to reflect the expanding focus of the VTC. “Over the past fifteen years, our interest in vaccines, the prevention of global infectious diseases, and the development of human immunity has allowed the team to expand into exciting and important new areas. Our team is increasingly working with scientists across the UVM campus so that it can leverage the creative thinking and the best new technologies of the 21st century into avenues to control the burden of pernicious problems with global infectious diseases.”

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“Inquiries have led to collaborations with the laboratory of a highly innovative UVM physician-scientist in infectious diseases, Christopher Hutton, M.D., associate professor of medicine, who has designed novel high-throughput techniques for testing libraries of chemical compounds which may serve as new therapies against Cryptosporidium.”

— CAROLINE LYON, M.D., M.P.H.
NEW SOLUTIONS

The University Scholars program recognizes distinguished UVM faculty members for sustained excellence in research, creative, and scholarly activities. The Scholars are selected by a faculty panel based upon nominations submitted by UVM colleagues. Along with professors Jane Kolodinsky, Ph.D., and Kelly Rohan, Ph.D., 2017 saw JIANKE YANG, PH.D., named as a scholar. Yang is a professor of applied mathematics in the Department of Mathematics and Statistics, where he joined the faculty in 1994. He has been editor-in-chief of the premier applied mathematics journal, Studies in Applied Mathematics, since 2014, the same year he received the inaugural College of Engineering and Mathematical Sciences Faculty Award for Excellence in Research. He also sits on the organizing board for two premier conferences, CLEO in the field of nonlinear optics, and IMACS in the field of nonlinear waves in general. His research in applied and physical mathematics has been supported by continuous extramural funding for the past 20 years. In 2016 he added to his 130 published peer-review articles with a study in Reviews of Modern Physics.
“This study shows quantitatively, and authoritatively, just how large that contribution is. We’re very proud of the role UVM plays in the state’s economy and have every confidence our impact will only grow in the future.”

— Tom Sullivan, President, University of Vermont

UVM’s Economic Benefit to Vermont: Over $1.3 Billion

According to a study published in October 2016, the University of Vermont created $1.33 billion in economic value for the state of Vermont in fiscal year 2014–15, the latest period for which complete data existed at the time. The University also supported 2,267 jobs throughout the state and generated $78.8 million in state and local taxes during that period.

“The University of Vermont is a powerful driver of the Vermont economy,” said UVM President Tom Sullivan. “This study shows quantitatively, and authoritatively, just how large that contribution is. We’re very proud of the role UVM plays in the state’s economy and have every confidence our impact will only grow in the future.”

UVM created economic value, the study reports, in three ways: through its spending in the state, through the employment opportunities it offers, and through state and local tax revenue generated from spending, research, and the activities and the jobs the University attracts to the region.

We now long known that the University of Vermont is a powerful driver of the Vermont economy,” said UVM President Tom Sullivan. “This study shows quantitatively, and authoritatively, just how large that contribution is. We’re very proud of the role UVM plays in the state’s economy and have every confidence our impact will only grow in the future.”

UVM SPENDING IMPACTS

UVM’s spending in Vermont takes three forms: direct, indirect and induced. Direct expenditures are for goods and services purchased by the University for its faculty, students, and visitors. Indirect and induced spending are “multiplier effects” when businesses in the chain that receive direct payments from the University and the employees who received salaries from these companies re-spend the money with suppliers, creating the need for even more jobs.

UVM’s direct expenditure totalled $756.7 million. Indirect spending was $270.4 million, bringing the total to $1.33 billion in economic activity.

UVM EMPLOYMENT IMPACTS

UVM also employs 4,400 faculty, staff and students. Their spending not only has a direct impact on the Vermont economy; it supports many other additional jobs in the state and region. These include jobs created by supply and equipment vendors, contractors, and laborers for the construction and renovation of University facilities, and jobs created in the community at hotels, restaurants and retail stores to support the University’s workforce and its visitors.

Combining UVM’s direct employees with jobs created by the University’s spending results in the 11,287 figure cited in the report.

UVM TAX IMPACTS

It’s a common misconception that public universities don’t generate tax revenue. Through UVM’s local spending, as well as its direct and indirect support of jobs, the University generates a significant amount of tax revenue that contribute to the local and state tax base.

UVM employees, students and the visitors the University attracts to the state also spend locally and create tax revenue, bringing the total to $78.8 million in state and local taxes.

FIRST STUDY TO SHOW ECONOMIC IMPACT OF UVM RESEARCH

The study looked at a variety of subsets of the University’s contribution to the state economy. A critical one is the effect UVM’s large research enterprise — UVM is the state’s only research university — has on economic activity in the state. The Tripp Umbach study is the first to gauge the economic impact of UVM research.

In the year covered by the study, UVM reported $258 million in research and educational grants and contracts, 94 percent of which came from out of state. As a result of its research activity, $157.9 million was generated in the state. UVM’s innovative research efforts also supported 859 jobs in Vermont and added $5.3 million in state and local taxes.

UVM research also affects the Vermont economy via new product development and technology commercialization, according to the study. The study also broke out the impact of UVM’s Larner College of Medicine and the College of Nursing and Health Sciences. The economic contributions of both were calculated separately from those contributed by the University of Vermont Medical Center.

The Larner College of Medicine generated $403.3 million in economic activity supported 2,316 jobs and generated $80.9 million in state and local taxes. The College of Nursing and Health Sciences had an economic impact of $38.2 million, supported 419 jobs and produced $28 million in state and local tax revenue.

The presence of the University is felt through donations made to community organizations such as the United Way or YMCA, as well as time donated for volunteer activities such as Habitat for Humanity or tutoring services for adolescents.

Finally, the study gauged UVM’s economic impact, via the larger earning power its undergraduate and graduate students have once they earn their degrees. Comparing the earning power of the 2,339 UVM undergraduates who earned degrees in 2014-15 to what would have been their earning power if they had only a high school degree, the report concluded that the additional wage premium amounted to $30.8 million. A similar calculation with the 586 UVM students who earned advanced degrees in 2014 found that the additional dollars in salary came to $25.9 million.

“We are confident that the report presents a highly accurate picture of UVM’s impact on the state’s economy,” said Richard Cate, the University’s vice president for finance.

The cost for the Tripp Umbach study was $15 million, which was privately funded.

ECONOMIC IMPACT IN VERMONT

$1.33B

$78.8M

$403.3M

$809

$15M

IN ECONOMIC VALUE FOR THE STATE OF VERMONT

STATE AND LOCAL TAX REVENUE GENERATED BY THE LARNER COLLEGE OF MEDICINE

COMMUNITY WORK ADDS $15 MILLION

JOBS SUPPORTED THROUGHOUT THE STATE BY UVM

STATE AND LOCAL TAX REVENUE GENERATED BY THE LARNER COLLEGE OF MEDICINE

STATE AND LOCAL TAX REVENUE GENERATED BY THE COLLEGE OF NURSING AND HEALTH SCIENCES

JOBS SUPPORTED BY RESEARCH EFFORTS IN VERMONT

JOBS SUPPORTED BY RESEARCH AGENCY GENERATED BY THE LARNER COLLEGE OF MEDICINE

11,287

419

$18.8M

$28M

$1.33B

$403.3M

$15M

2,616

$38.2M

COMMUNITY IMPACT BY FACULTY, STAFF, AND STUDENTS AT UVM

$28M

$15M

$403.3M

$15M

$1.33B

$18.8M

$38.2M

$78.8M

$809
Research Partnership Yields More Efficient Maple Syrup Process

It’s a rite every Vermont child learns at sometimes early in elementary school: to make a gallon of maple syrup, 42 gallons of sap need to be boiled down. Now, a maple company and a university have announced a research collaboration to improve the efficiency of the maple syrup process.

The research partnership focuses on developing and testing a newly developed device that concentrates sap before it is boiled in the evaporator. With the new device, only 2.2 gallons of concentrate are needed, producing large energy and time savings compared to boiling raw sap. The new technology represents a leap forward. Most RD (reverse osmosis) systems currently in use in the maple industry can concentrate up to about 8 percent by volume, but this new technology can realize up to 20 percent, which is close to 95 percent of the water removed from the sap. The reason for this is simple — some amount of boiling is necessary to develop good flavor. We have completely redesigned the evaporator to optimize performance while maintaining excellent caramelization.

As part of the collaboration, Lapierre Equipment has supplied the Proctor Maple Research Center with the state-of-the-art HYPERBRIX RO and evaporator. The device concentrates sap so it is 28 percent sugar before it is boiled in the evaporator. With the new Lapierre system, only 2.2 gallons of concentrate are needed, producing large energy and time savings compared to boiling raw sap.

In fall 2017, the Catamount Innovation Center, which connects students and alumni in the life sciences, technology, health and environmental fields to a plethora of early stage ideas, launched its first-year student cohort. There’s definitely no shortage of student entrepreneurs in the Vermont maple industry, and the Proctor Maple Research Center is known for its work on the science and application of technology in the maple industry.

Funding Student Startups

In a city and state known for its innovative spirit, it’s no surprise that student entrepreneurs at UVM are trying to get in on the action. To help these students bring their ideas to market, UVM students have developed a new innovation fund, which offers funding and expertise.

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Researchers Richard Gailburd, M.D., Ph.D., and Timothy Perkins, Ph.D., have collaborated on new research in the field of cancer genetics. Their research has the potential to improve the accuracy of cancer diagnosis and treatment.

Researcher Richard Gailburd, M.D., Ph.D., and through collaboration of numerous students, including medical student Al Marcus ’19 and economics graduate Andrew Dasso ’17, a graduate in a major that has raised capital for the fund to form an innovation team for the 2017-18 academic year. The group has received proposals from a broad range of disciplines, including the engineering department’s deed program, healthcare-themed startups from medical students, with guidance from Marchesi, and environmental innovations from students at the Rubenstein School of Environment and Natural Resources.

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Matching funds come from an employer match, and the group has raised capital for the fund to form an innovation team for the 2017-18 academic year.

Lamar College of Medicine cancer researcher Julia Dragan, Ph.D., is one of many UVM faculty and staff benefiting from UVM’s Internet2 connection. She and her colleagues supplement the relatively small number of cancer samples available in Vermont with large downloads of publicly available genomic data — up to ten terabytes a week are possible — from the Cancer Genome Atlas at the National Institutes of Health, giving their analysis of the mutations that may cause the disease statistical reality in the context of the larger population. Each terabyte is equivalent to about 350 DVDs; download times would be impossibly long using the commercial internet.

As crucial as the network was to its faculty, University leaders saw that it could also give an information-age advantage to UVM’s role as the state’s land grant university. When a new National Science Foundation grant program was announced in 2011 to enable Internet2 universities to do just that, UVM saw its chance. Vermont EPORO, a UVM-led research consortium of Vermont colleges, played an integral role in winning the Internet2 grant. EPORO was a collaboration of 38 institutions in the state and included Vermont’s biggest colleges and universities. The virtual writing workshop was just the kind of activity a team of University of Vermont faculty and student-staff envisioned seven years ago when they took steps, first, to connect UVM to a broadband superhighway called Internet2, a national initiative providing ways for academic and government research, to universities and government agencies, and second, to link institutions across the state, like the Vermont State Libraries, to the high-performance information network. In 2011 and research higher ups at the flagship universities in Vermont, New Hampshire, Maine, Rhode Island and Delaware decided that the time had come to give their major a major internet upgrade, enabling them to easily exchange large data sets with their colleagues at other institutions — a hallmark of the age of big data — by connecting to Internet2, which was attracting more universities every year.

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“IT’S REALLY HARD TO MIMIC THE FEELING OF AN IN-PERSON WRITING WORKSHOP ONLINE… BUT HAVING THAT INSTANTANEOUS CONNECTION, AND EVEN SETTING UP YOUR CHAIRS AND TABLES IN A WAY THAT IT LOOKS AND FEELS LIKE YOU’RE ALL SITTING AROUND ONE TABLE, IT’S REALLY POWERFUL.”

— DOUG DEMAOI, YOUNG WRITERS PROJECT

On a Saturday afternoon in January, Vermont young adult author Sarah Stuart Taylor found herself immersed in an animated discussion about writing. After watching carefully written reactions at the Young Writers Project writing workshop, the lead at the Kellogg Hubbell Library in Montpelier, Taylor had asked the 20 teens in attendance to write a short piece of “micro-fiction.” Fifteen minutes later, the largest oval in the group read their creations aloud, launching a spirited back and forth.

The meeting was typical of the writing workshops that the Young Writers Project periodically hold in Vermont in every way but one: Taylor and the teens were located at libraries in the different Vermont towns connected by state-of-the-art videoconferencing software and a lightning fast broadband network.

“It’s really hard to mimic the feeling of an in-person writing workshop online… but having that instantaneous connection, and even setting up your chairs and tables in a way that it looks and feels like you’re all sitting around one table, it’s really powerful,” said Doug Demai, support and instruction coordinator for the Young Writers Project.

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Vermonters Benefit from UVM-Created Statewide Fiber Optic Network

A new gigabit fiber optic network is now available to Vermont public schools, libraries, law enforcement, municipalities and health care providers.

The network was created through a collaboration between Vermont’s Education and Research Network (Vermont E-RN), the University of Vermont, the Vermont Technology Network (VTech), the Vermont Education and Research Network (Vermont E-RN), and the Vermont Technology Network (VTech).

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Deans of the University of Vermont

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