



UVM

i

INQUIRY

2020

RESEARCH, SCHOLARSHIP, AND THE ARTS
AT THE UNIVERSITY OF VERMONT



VARIED AS THE WORLD ITSELF

HAVING ARRIVED IN BURLINGTON to join the University of Vermont community this past summer, I have the benefit of seeing our many strengths and advantages with new eyes. We are one of the nation's leading small public research universities, a scale that facilitates opportunities for the collaborative, transdisciplinary work essential to discovering innovative solutions to vexing problems. The integration of our Larner College of Medicine and the University of Vermont Medical Center with the broader campus creates connections across multiple areas of study. Similarly, the deeply rooted environmental ethos of the Green Mountain State is intertwined with the ethos of our university. This is reflected in the research, scholarship, and curriculum in departments and fields as diverse as philosophy, art, and complex systems—united, in many instances, by our pioneering Gund Institute for Environment.

I've also been pleased to discover the high percentage of UVM undergraduates who deepen their academic experience by joining in the research enterprise, working side by side with faculty mentors. I look forward to meeting these students and seeing the fruits of their efforts at this spring's Student Research Conference in the Davis Center.

Inquiry 2020 provides a window on the research, scholarship, and creative work of our faculty all through the past year. Considered collectively, as they are in the pages of this publication, our faculty's endeavors are especially remarkable for the variety of intellectual and creative pursuits. The subjects at hand are as varied and fascinating as the world itself—from spiders in Madagascar to river dolphins in Brazil, from the world's strongest silver to sustainable small farms. And you will also find commonalities, places where multiple faculty are drilling into critical, far-reaching issues such as climate change, immigration, and public health.

Inquiry's closing section, American Land Grant, shines a spotlight on published work and new initiatives that are particularly in sync with our land grant mission, places where the assets of our university come to bear on our community. Down the street, across the state, around the world, community is defined broadly, as the intellectual capital of the University of Vermont contributes to the greater good.

SURESH V. GARIMELLA
President
University of Vermont

SALLY MCCAY

UVM INQUIRY 2020

RESEARCH, SCHOLARSHIP, AND THE ARTS
AT THE UNIVERSITY OF VERMONT



2 OUR INTELLECTUAL HERITAGE

NEW KNOWLEDGE
Exhibitions, publications, honors, new research—a broad overview of faculty endeavors during the past year.

20 TEAMING UP
Joining the efforts and perspectives of MD and PhD scientists creates a potent force in the fight against cancer. *By Sarah Zobel*

26 INTO THE WILDERNESS
For artist Steve Budington, comfort with the unresolved and trust in detours are fundamental to his process. *By Thomas Weaver*

32 RESEARCH BEYOND THE BINARY
LGBTQ issues, perspectives, health, and history draw the attention of faculty in multiple disciplines. *By Kaitie Catania*

38 WATER, WATER EVERYWHERE
Engineer Raju Badireddy is rising to one of our century's greatest engineering challenges: clean water. *By Joshua Brown*

KING OF PROVERBS
Faculty veteran Wolfgang Mieder has built an international reputation as a leading proverb scholar, a legacy celebrated and perpetuated with a new collection in Billings Library. *By Jeffrey Wakefield*

50 AMERICAN LAND GRANT
Bringing the assets for our university to bear on our community.

BIG PICTURE

- 18 GAYE vs. SHEERAN
- 24 FINDING OUR HAPPY PLACE
- 30 HUNGRIER INSECTS
- 36 JOINING THE ACADEMY
- 42 A WRITER'S CHALLENGE
- 48 STRONG AS SILK

COVER: Detail from *partial map with water and partial frame*, 2016-19, by Steve Budington, associate professor

UNIVERSITY OF VERMONT

OUR INTELLECTUAL HERITAGE

FOUNDED IN 1791, the University of Vermont was the fifth university established in New England, following Harvard, Yale, Dartmouth, and Brown. This deep history is abundantly visible on our campus, from Old Mill, where Revolutionary War hero Marquis de Lafayette dedicated the cornerstone, to the graceful acres of the University Green on the original land pledged by our founder Ira Allen, to Billings Library, a recently restored gem of nineteenth-century American architecture.

Deeper than red brick and red stone, our centuries-old intellectual heritage is passed down across generations of faculty. The University of Vermont is where president and professor James Marsh in 1829 wrote an essay on Samuel Taylor Coleridge's *Aids to Reflection* that would become a seminal text for American Transcendentalist thought. This is where Raul Hilberg, a young professor of political science in 1961, published *The Destruction of the European Jews*, a foundational work documenting the Holocaust with a rigor and authenticity never before approached. This is where Jerold Lucey pioneered light therapy in the United States for treating jaundice in premature infants. This is where Professor Hubert "Hub" Vogelmann analyzed forest decline on Camel's Hump, research that brought national attention to the impact of acid rain and helped drive clean-air legislation.

With 2019's successful conclusion of Move Mountains: The Campaign for the University of Vermont, UVM is poised to move forward, buoyed by new and renovated facilities and dramatic growth in the number of endowed professorships and chairs. Today's UVM faculty, some of their work glimpsed in the pages of this publication, are well-positioned to carry forward our long tradition of intellectual and artistic exploration.

ALMOST CANADA

Photographs by **William McDowell**, professor in studio art, were included in the exhibition "Crossing Lines, Constructing Home: Displacement and Belonging in Contemporary Art" on display at the Harvard Art Museums in 2019.

Describing his collection of work titled "Roxham Road," from which the photographs on display at Harvard were drawn, McDowell writes: "The North Country was once part of the Underground Railroad, a stopover point for slaves on their way to Canada. Recently, this role has been reprised as people now travel to Plattsburgh from around the world to seek asylum in Canada. Roxham Road, a small rural road near Champlain, New York, is recognized on social media as the preferred illegal entry point into Canada. I have been making regular trips to Roxham Road since June 2017 to photograph and to collect items left behind as migrants entered into Canada. These objects illuminate the lives of people who feel they're not welcome in either the United States or their home countries."

WILLIAM MCDOWELL, *Men's Suit, Roxham Road*, 2017

Young Prof Honored by *Forbes*

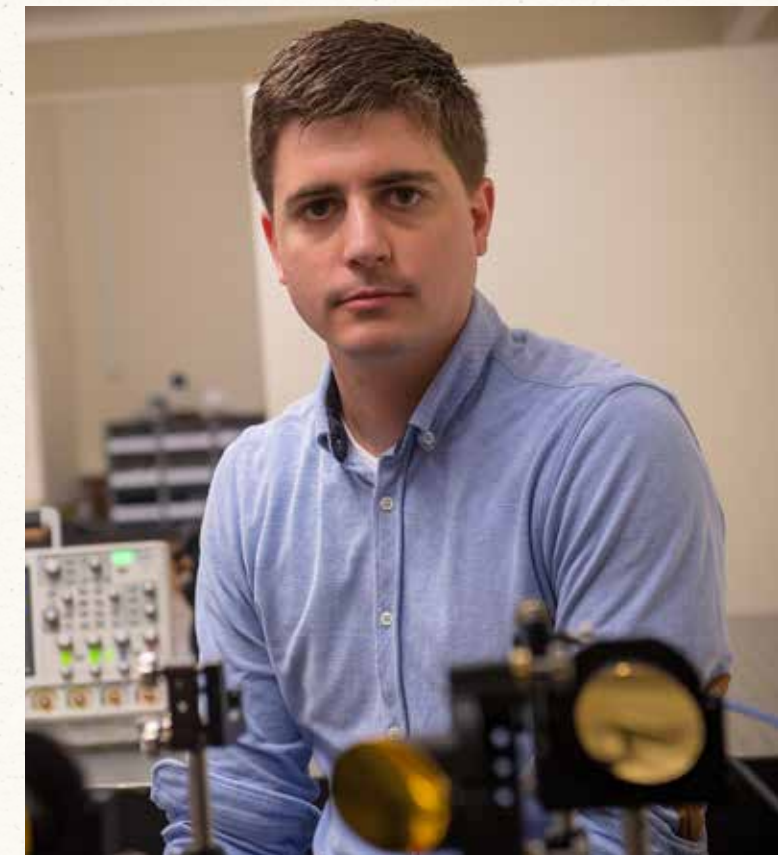
Trillions of atoms in motion could take the form of a new cancer drug or a bendable phone. At the quantum scale, "atoms vibrate, combine, and pile up in very complicated ways," says UVM chemist **Michael Ruggiero**.

For his remarkable work in better understanding how these subtle, but very specific, motions of atoms influence the bulk properties of materials people can use, the UVM assistant professor was selected as one of *Forbes*' "30-Under-30" leaders in science, their "annual list chronicling the brashest entrepreneurs across the United States and Canada."

In his Discovery Hall laboratory, Ruggiero and his students hit materials with a powerful laser to tease out the quantum mechanics of molecules. Then they take what they learn in these real-world materials and model their motions on a supercomputer.

"We go from the very basic to the very applied," Ruggiero says. For example, with insights he gains about the motions of specific molecules, he's working to help pharmaceutical companies better understand how materials may be interacting to degrade a medication.

"The kind of work we do could lead to drugs with a longer shelf life," he says. Other examples of where Ruggiero's research program aims to help: improving the ability of semiconductors to work in flexible displays, and better understanding the mechanical properties of gas storage materials for improved hydrogen fuel cells.



HELPING CATCH ANXIETY AND DEPRESSION EARLY

Anxiety and depression are surprisingly common among young children—as many as one in five kids suffer from one of them, starting as early as the preschool years. But it can be hard to detect these conditions, known as "internalizing disorders," because the symptoms are so inward-facing that parents, teachers, and doctors often fail to notice them.

A new tool developed by UVM biomedical engineer **Ryan McGinnis** and **Ellen McGinnis**, UVM clinical psychologist, and colleagues in the Department of Psychiatry at the University of Michigan promises to better screen children for internalizing disorders, catching them early enough to be treated.

Their innovative approach was having children in a test group wear motion sensors as they completed a "mood induction task," a common research method designed to elicit specific behaviors and feelings such as anxiety. Typically, trained researchers would watch a video of the task and score the child's behavior and speech during the task to diagnose internalizing disorders. In the new study, the wearable motion sensor monitored movement and a machine learning algorithm analyzed that movement to distinguish between children with anxiety or depression and those without.

After processing the movement data, the algorithm identified differences in the way the two groups moved that could be used to separate them, identifying children with internalizing disorders with 81 percent accuracy—better than the standard parent questionnaire. The work was published in the journal *PLOS ONE*.



SAFE SKIES

UVM'S Spatial Analysis

Laboratory, pioneers in using drones to assess emergencies and natural disasters, joins an international team providing expertise as the Federal Aviation Administration examines regulation of unmanned aerial systems, AKA drones. As part of the FAA's Alliance for System Safety of UAS through Research Excellence, the UVM team will research the use of drones in disaster situations, providing the agency with data for their safe operations in times of disaster.

PRIVACY MATTERS

Individual choice has long been considered a bedrock principle of online privacy. If you don't want to be on Facebook, you can leave or not sign up in the first place. Then your behavior will be your own private business, right?

Not so much. A study by a team of scientists at UVM and the University of Adelaide shows that privacy on social media is akin to second-hand smoke. It's controlled by the people around you.

Led by UVM mathematician **James Bagrow**, the team gathered more than thirty million public posts on Twitter from 13,905 users. With this data, they showed that information within the Twitter messages from eight or nine of a person's contacts make it possible to predict that person's later tweets as accurately as if they were looking directly at that person's own Twitter feed.

The study, published in *Nature Human Behavior*, also shows that if a person leaves a social media platform—or never joined—the online posts and words of their friends still provide about 95 percent of the "potential predictive accuracy," the scientists write, of a person's future activities—even without any of that person's data.

The research raises profound questions about the fundamental nature of privacy—and how, in a highly networked society, a person's choices and identity are embedded in that network. The new study shows that, at least in theory, a company, government, or other actor can accurately profile a person—think political party, favorite products, religious commitments—from their friends, even if they've never been on social media or deleted their account.



Beyond the Slumdog Spotlight

ACROSS YEARS OF TRAVEL and research in India, **Jonah Steinberg** has encountered scores of children in trying circumstances or outright peril. And for more than a decade, the UVM associate professor of anthropology has built relationships with these children and compiled their stories for an ethnographic exploration of the cultural, social, and historical forces that draw them away from their rural Indian homes and into high-risk cities. His latest book, *A Garland of Bones: Child Runaways in India* (Yale Press), serves as a reflection on the issues at play and illuminates this highly marginalized population.

The majority of street kids featured in Steinberg's book are not abandoned, but actively choose to leave troubling situations at home. They travel hundreds of miles, usually via train, to populated cities where they plan to acquire work. Many die, but nearly all face some degree of daily threat—getting struck by trains and cars, drug addiction, disease and illness, human trafficking and sexual exploitation, to name a few. Some kids return home, but most do not. So why would they choose to live this life?

Over the course of his work, which was supported by a grant from the National Science Foundation, Steinberg says many of the children he came to know cited familial abuse and poverty in their villages as reasons for running away. Yet, Steinberg notes, those children had the autonomy and resources to physically leave. "On one hand, it appears to be a choice to run away, but on the other, it's also a lack of choice. There are large historical forces at work that make rural livelihoods more difficult and stressful," he says.

As an anthropologist, Steinberg strives to connect swaths of history to contemporary life. In *A Garland of Bones*, he makes the case that runaway children are pushed by centuries of history to leave their rural lands. For example, Indian indigo farming during British colonialism in the 1800s indebted families, devastated once-fertile lands, and resulted in massive agrarian exploitation at the time. Two hundred years later, villagers on those same lands still suffer from depleted soils and inescapable poverty, which causes high stress and preventable illness among families.

"That's not something that can absolutely be proven," Steinberg says, "but the book is more of a meditation on that process. It looks to disrupt what we think of as normal. Poverty is directly related to vast systems of history, of which we're a part."

COURTESY JONAH STEINBERG

FOOD INSECURITY ON THE FARM

Since the late 1990s, undocumented Mexican and Central American farm workers on Vermont's dairy farms have played an essential role in bringing milk and other products to market. But while the laborers help to feed others, many face significant barriers in accessing food themselves, according to **Theresa Mares**, professor of anthropology.

Her exploration of food insecurity among the state's undocumented farm workers is documented in *Life on the Other Border, Farmworkers and Food Justice in Vermont* (University of California Press). In the book, the first to measure food insecurity in this population, Mares writes that 18 percent of Vermont's undocumented migrant farm workers are food insecure, defined as lacking reliable access to a sufficient quantity of affordable, nutritious food. That compares to between 13 and 14 percent for Vermonters as a whole. While that number is troubling, it's likely much too low, given the unique circumstances of Vermont's migrant farm workers, Mares says.

Though economic difficulties are certainly part of the equation, many of Vermont's migrant laborers face a stiffer challenge with access, fearing that leaving the farms where they work to buy food will expose them to arrest by Border Patrol agents.

"Food insecurity is about getting enough food and the right kind of food, but it's also about the emotional and mental health impacts of being isolated and constantly under stress and anxiety—being worried about food," Mares says.

While the book focuses on Vermont, its insights are applicable to a wide swath of the nation's northern border. "Wisconsin, New York, and Washington have similar issues," Mares says. "Wherever you have large dairy operations, you have undocumented labor. If the farms are near the Canadian border, they're experiencing many of the problems Vermont is seeing, including, and especially, around the issue of food insecurity."

QUOTE UNQUOTE

"I recognize the need to occasionally escape from the ugliness of the real world into fictional ones with happy endings. But in a media environment dominated by entertainment, it's also important to be periodically shocked into remembering that things don't always work out so nicely."

Anthony Gierzynski in an essay published by *The Conversation*. The professor of political science discussed "Game of Thrones" and his studies of the impact of media consumption upon political perspective.

CALEB KENNA

CANARIES OF THE REEF

UVM SCIENTIST **Nate Sanders** was part of an international research team that found that when water temperatures heat up for corals, fish “tempers” cool down. The study provides the first clear evidence of coral bleaching serving as a trigger for rapid change in the behavior of reef fish.

Publishing in *Nature Climate Change*, the researchers show how the iconic butterflyfish, considered to be sensitive indicators of reef health, can offer an early warning sign that reef fish populations are in trouble.

The team of scientists spent more than six hundred hours underwater observing butterflyfish over a two-year period encompassing the unprecedented mass coral bleaching event of 2016. Led by marine ecologist Sally Keith of Lancaster University, the team examined seventeen reefs across the central Indo-Pacific in Japan, the Philippines, Indonesia, and Christmas Island in the Indian Ocean.

“This matters because butterflyfishes are often seen as the ‘canaries of the reef,’” says Nate Sanders, director of UVM’s Environmental Program and professor in the Rubenstein School of Environment and Natural Resources. “Due to their strong reliance on coral, they are often the first to suffer after a disturbance event.”

Such changes in behavior may well be the driver behind more obvious changes such as declining numbers of fish individuals and species.

“It’s not just that we’ve documented a climate change effect on these reefs,” adds Sanders, a fellow in UVM’s Gund Institute for Environment. “It’s important that we’re beginning to understand why these changes happen and are building the knowledge to try to predict when, and where, these kinds of changes may happen in other ecosystems in the future.”



HELPING CLEAR A BARRIER TO WEIGHT LOSS

For weight loss, research shows, the single best predictor of success is recording calorie and fat intake throughout the day. “Write it when you bite it,” so to speak. But dietary self-monitoring is commonly viewed as so unpleasant and time-consuming, many can’t muster the will power to do it.

However, new research published in *Obesity* suggests that the reality of dietary self-monitoring may be far less disagreeable than the perception. The study, conducted by researchers at UVM and the University of South Carolina, is the first to quantify the amount of time that dietary self-monitoring actually takes for those who successfully lose weight. **Jean Harvey**, professor of nutrition and food sciences and interim dean of UVM’s College of Agriculture and Life Sciences, was lead author of the study.

The research established that after six months of monitoring their dietary intake, the most successful participants in an online behavioral weight-loss program spent an average of just 14.6 minutes per day on the activity. Program participants recorded the calories and fat for all foods and beverages they consumed, as well as portion sizes and preparation methods.

What was most predictive of weight-loss success was not the time spent monitoring—those who took more time and included more detail did not have better outcomes—but the frequency of log-ins, confirming the conclusions of earlier studies.

The study’s most important contribution may be in helping prospective weight-lossers set behavioral targets, Harvey suggests. “We know people do better when they have the right expectations. We’ve been able to tell them that they should exercise 200 minutes per week. But when we asked them to write down all their foods, we could never say how long it would take. Now we can.”



Eye on Climate Change

The National Climate Assessment is the United States government’s premier resource for articulating the risks and impacts posed to the nation by climate change. The interagency effort brings together experts from not only the thirteen federal agencies of the U.S. Global Change Research Program, but the broader federal government, and hundreds of experts in the academic, nonprofit, and private sectors.

UVM Professor of Geography **Lesley-Ann Dupigny-Giroux**, who also serves as the Vermont State Climatologist, was the lead author of the Northeast chapter of Volume II of the Fourth National Climate Assessment, issued in late 2018.

Without substantial and sustained global efforts to reduce greenhouse gas emissions and regional initiatives to prepare for anticipated changes, the report anticipates climate change is expected to have implications for human health and wellbeing, cause growing losses to American infrastructure and property, and impede the rate of economic growth over this century.

Dupigny-Giroux is an expert on floods, droughts, and geospatial technologies and the ways in which climate affects Vermont’s landscape and people. Speaking to regional impacts, in particular, she said: “One of the key takeaways are the observed and anticipated risks posed to our ‘forests, wildlife, snowpack, and streamflow’ in our rural environments as our climate changes. Another is that the ongoing impacts to human health are also of great concern to our region. Climate change is also affecting the interconnectedness of the urban centers of the northeast. Finally, northeastern states, including Vermont, continue to be very proactive in planning for and implementing actions to reduce risks posed by climate change.”

BETTER TRACKING GREENHOUSE GAS

Each year brings new research showing that oil and natural gas wells leak significant amounts of the potent greenhouse gas methane. A UVM study published in the journal *Environmental Geosciences* is the first to offer a profile of which wells are the most likely culprits.

The research, conducted by Civil and Environmental Engineering Professor **George Pinder** and **James Montague**, his former doctoral student, is based on a study of 38,391 natural gas and oil wells in Alberta, Canada. Companies in that province are required to test wells at the time they begin operating to determine if they have failed and are leaking natural gas, which contains methane, and to keep careful records of each well’s construction characteristics.

The study used a machine learning algorithm to correlate wells that leaked and those that didn’t with a set of sixteen characteristics.

“The big picture is that we can now have a tool that could help us much more efficiently identify leaking wells,” Pinder says. “Given that methane is such a significant contributor to global warming, this is powerful information that should be put to use.”





BOOKS & MEDIA

Ensuring Poverty: Welfare Reform in Feminist Perspective
Gwendolyn Mink and
Felicia Kornbluh, History
University of Pennsylvania Press

Ecology and Recovery of Eastern Old-Growth Forests
Edited by Andrew M. Barton and William S. Keeton, Forestry
Island Press

Lingua Franca: Chamber Music of David Feurzeig
CD featuring multiple musicians performing the compositions of
David Feurzeig, Music and Dance
AMR-Naxos

The Baseball Glove: History, Material, Meaning, and Value
David Jenemann, English
Routledge

Nazism, the Holocaust, and the Middle East: Arab and Turkish Responses
Edited by Francis R. Nicosia and Boğaç A. Ergene, History and Holocaust Studies
Berghahn Books

How Color Works: Color Theory in the 21st Century
Pamela Fraser, Art and Art History
Oxford University Press

Golden Fruit: A Cultural History of Oranges in Italy
Cristina Mazzone, Romance Languages and Linguistics
University of Toronto Press

Still Lives
Novel by **Maria Hummel, English**
Counterpoint

Bacterial Pathogens and Their Virulence Factors
Douglas I. Johnson, Microbiology and Molecular Genetics
Springer

A Dictionary of Cultural Anthropology
Luis Vivanco, Anthropology
Oxford University Press

Halal Food: A History
Febe Armanios and Boğaç Ergene, History
Oxford University Press

The Birds and the Bees... and the Coffee



ON SABBATICAL in Costa Rica, Taylor Ricketts drank a lot of coffee. “Everything is done over coffee there,” he says. Including launching a new research project with two scientists at a tropical agriculture center in the mountains—to study coffee. As an ecologist and director of UVM’s fast-growing Gund Institute for Environment, Ricketts wants to better understand how nature benefits people—like the pollination work that bees do in coffee farms, and the pest-control work that birds do, eating beetles that would otherwise eat the seeds of the coffee fruit. “We found more than thirty different species of native Costa Rican bees visiting coffee flowers,” Ricketts says—such as the orchid bee, *Euglossa viridissima*, pictured here—“so it’s not just a couple of bees that do this work. It’s a really a diverse community.” Like many plants, coffee can produce a crop without animals moving pollen around. But bees increase yields by about twenty percent and migratory birds can reduce beetle infestations by half. Ricketts and his two collaborators—

one from Mexico and one from Nicaragua, as well as a new UVM doctoral student, Natalia Aristizabal, from Colombia—hope to understand the interplay within this system more clearly. “We want to see how dependent coffee is on native species that live in and around it,” Ricketts says. “And we want to know how much each is worth—bees and birds—and, crucially, how much they’re worth together.” Will it pay for Costa Rican farmers to increase the number and diversity of shade trees on their farms? How about using organic methods? The team is studying thirty farms, where they have covered some plants with bee-excluding nets, others with bird-baffling mesh sheds, some with both. Early in the new year, the scientists will be harvesting the coffee from their experiments—just steps ahead of the commercial harvesters—to start answering some questions. “Is there synergy between what bees need and what birds need? To be profitable, what kind of land management should farmers choose?” Ricketts says. “That’s what we’re trying to figure out.”

THE DOWNSIDE OF OPTIMISM

Most people think of optimism as a good thing—a positive outlook in challenging circumstances. But in a healthcare setting, it’s a psychological state that can be “contagious” in a bad way.

A June 2019 study in the journal *Psycho-Oncology* details how a seriously ill patient’s optimism can impact a clinician’s survival prognosis in palliative care conversations. Senior author Robert Gramling, associate professor of family medicine and the Miller chair in palliative medicine at the Larner College of Medicine, feels that clinicians have a duty to estimate prognosis as accurately as possible. If survival is overestimated, Gramling and his coauthors from Purdue University, the University of Rochester, and University of California San Francisco write, “these errors in judgment can prevent patients from making timely decisions about their end-of-life care.”

For their study, the researchers enrolled 189 hospital patients with advanced cancer undergoing palliative care consultations at two geographically distant sites. The study’s findings showed a generally high level of both dispositional and prognostic optimism just before palliative care consultation, as well as a correlation between higher levels of patient optimism and clinicians’ greater likelihood of overestimating survival, even after adjusting for clinical markers of survival time.

“Our study suggests that patient-level optimism might exert an unforeseen influence over palliative care clinicians’ prognostic judgments,” wrote Gramling and his co-authors. “If so, then raising clinician awareness about these effects and including debiasing steps in prognostication skills training may lead to more accurate estimates.”

Data analyses for the study took place at UVM’s Vermont Conversation Lab, where Gramling and his colleagues both conduct research and develop training sessions through their TalkVermont program to help clinicians gain conversational proficiency. This study was funded by a Research Scholar Grant from the American Cancer Society.

TREES IN CITIES: WHAT’S NOT TO LIKE?

Trees are a hallmark of vibrant neighborhoods. So why did nearly one-quarter of eligible residents in Detroit, Michigan, turn down free street trees? That’s the mystery UVM researcher **Christine Carmichael** solves in one of the first studies to explore opposition to city tree planting programs.

As cities from New York to Los Angeles embark on major tree planting initiatives, the research helps to explain why more than 1,800 of 7,425 eligible Detroit residents—roughly 25 percent—submitted “no-tree requests” between 2011 and 2014 alone.

Carmichael, a postdoctoral researcher at UVM’s Gund Institute for Environment and Rubenstein School of Environment and Natural Resources, found that the opposition in Detroit resulted primarily from negative past experiences with street trees, particularly in low-income neighborhoods grappling with blight from vacant properties.

For many long-term residents, wariness of the new trees was driven by past experiences of caring for vacant properties in their neighborhood. Carmichael also found that skepticism of the program was tied to wider distrust of the city government and outside groups in parts of Detroit. As a result, residents wanted greater decision-making power in selecting which trees to plant in particular locations, adds Carmichael who completed the three-year study for her PhD with co-author Maureen McDonough of Michigan State University.

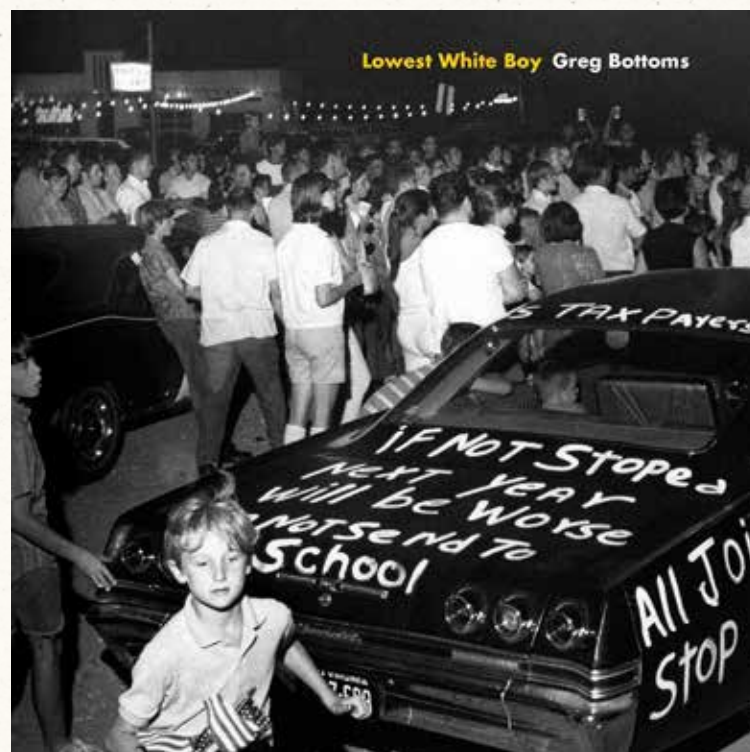
Carmichael’s study, published in *Society and Natural Resources* journal, is gaining attention from city planners across North America hoping to learn Detroit’s lessons. Local governments and non-profits in Austin, Denver, Indianapolis, Sacramento, Toronto, and Vermont have reached out for help implementing her research.

“We need to broaden the measurable outcomes that we can gauge success by,” says Carmichael. “Healthy urban forests cannot be measured just by the number of trees planted. We also have to capture who is involved, and how that involvement affects the well-being of people and trees in the long-term.”

WORLDWIDE PRESS

More than two hundred stories featuring the University of Vermont, most of them focused on UVM research and scholarship, appeared in international, national, and regional outlets during the past academic year. A “Share of Voice” analysis conducted by Cision indicates UVM’s coverage routinely exceeds that of institutions such as Northeastern University, University of Massachusetts, Syracuse University, and University of New Hampshire. Outlets that have shared UVM’s story in the past year include:

■
 BBC
 Science
 Reuters
 ABC News
 Fast Company
 CNN
 United Press International
 CBS This Morning
 New York Times
 Wired
 Marketplace
 Public Radio International
 Boston Globe
 Today.com
 NSF’s Science 360
 Washington Post
 Chronicle of Higher Education
 Salon
 Newsweek
 U.S. News



A Difficult American Story

“IF YOU CAN CONVINCE the lowest white man he’s better than the best colored man, he won’t notice you’re picking his pocket. Hell, give him somebody to look down on and he’ll empty his pockets for you,” quotes English Professor **Greg Bottoms**. Those words came from President Lyndon B. Johnson at a time when opposition to civil rights was escalating and racial anxieties were the strings pulled by political puppet masters to get voters to dance. Growing up in Tidewater, Virginia, under the influence of a white working-class family, Bottoms admits he was that “lowest white man,” or better yet, boy.

In his latest book, *Lowest White Boy* (West Virginia University Press), Bottoms confronts our vulnerability to white supremacy and racism—himself included—and exposes the

racial forces that have perpetuated American racism for centuries. Part memoir, part history book, part academic textbook, and part visual essay, Bottoms declares it a “hybrid” book that offers anecdotes from his own experience with racism, old newspaper photographs, and a deep dive into the history, policies, and psyche of America and the South.

“Racism and white supremacy have been foundational and carefully enacted through policy and law and are systematically enmeshed and sometimes hidden, rather than just some personal, correctable attitudes,” he says. “I’d like to think I’m offering a way to understand some part of the background to our really deranged current social, cultural, and political foreground.”

“If you can convince the lowest white man he’s better than the best colored man, he won’t notice you’re picking his pocket.”

—President Lyndon B. Johnson



THREE FACULTY NAMED TO LIST OF WORLD’S MOST INFLUENTIAL RESEARCHERS

Three UVM faculty were named to a list of the world’s most impactful researchers for 2019, based on the number of times their published studies have been cited by other researchers over the past decade. Researchers on the list are in the top one percent of all scholars whose work has been cited by others. The prestigious Highly Cited Researchers list is compiled and published annually by Clarivate Analytics.

Vermont faculty named to the list are:

William Copeland, professor of psychiatry in the Larner College of Medicine and director of research, Vermont Center for Children, Youth and Families

Mary Cushman, professor of medicine and of pathology and laboratory medicine in UVM’s Larner College of Medicine

Taylor Ricketts, director of UVM’s Gund Institute for Environment and Gund Professor at the Rubenstein School of Environment and Natural Resources



ENVIRONMENT OF DISCOVERY

The recent completion of Discovery and Innovation halls—part of the university’s \$104 million investment in new science and technology facilities—has greatly improved research and teaching laboratories, and better enabled collaboration. Discovery’s tall windows and glass walls fill fourteen new teaching labs and twenty-two faculty research labs with light. The open floor plans allow

for research teams to work across disciplines; scientists from chemistry, physics, engineering, mathematics, and computer science merge their efforts here.

With some 1,200 undergraduates taking introductory chemistry each year, the new spaces have allowed faculty to, “totally revamp how we teach courses, closely linking lectures and lab time,” says Chris Landry, chemistry chair. “It’s the building that’s driving all sorts of curricular change outward.”



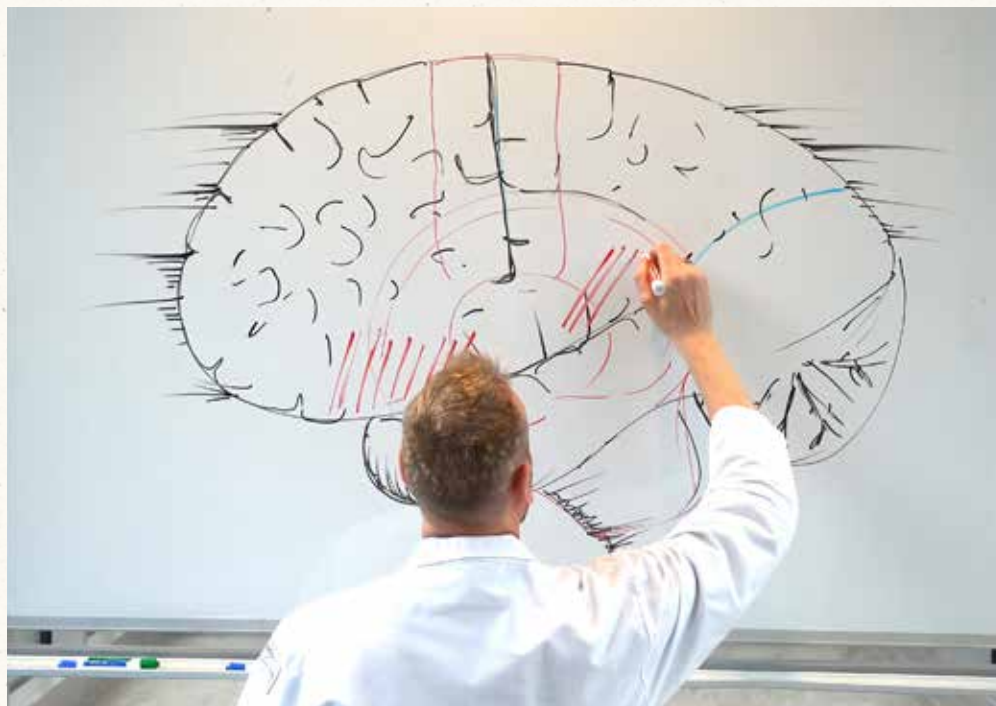
BUSINESS IS BETTER TOGETHER

Entering midway through a conversation with **Chun Zhang** about her research, one might easily mistake the Grossman School of Business professor for a relationship coach. And to some extent, Zhang says, her research examining business-to-business (B2B) relationships may be applied to personal relationships.

"I'm interested in understanding relationship management after disruptions, and I'm trying to find a practical solution for companies and people who want to continue a valuable relationship, but can't solely count on the other party. High quality relationships are fundamental to our wellbeing," Zhang says.

Her latest B2B research, published in *Industrial Marketing Management*, explores ways that companies can recover trust in a business relationship after they've been offended by an opportunistic partner company. Zhang navigates three routes an offended company might take: tolerance, aggression, or collaboration.

Ultimately, Zhang finds that it's better to "be collaborative rather than punitive if you want to restore trust. Sticking together may be a less costly solution than switching to something completely new." Zhang says the best route to repair trust with a business partner after an offensive, opportunistic incident may be socializing and engaging with employees of the offending company, specifically outside of standard business settings, like teeing up on the golf course, for example. "You need to work on their motive or their values to make them feel and see that pursuing common goals is more advantageous than thinking and acting self-servingly."



Prescribing Exercise for Mental Health

A LECTURER IN rehabilitation and movement science, and inpatient psychotherapist at UVM Medical Center, **David Tomasi** notes that the number of psychiatric patients seeking acute, inpatient treatment has steadily increased since the '90s at the start of the opioid crisis. A majority of the patients he treats at UVMMC are young adults suffering from dual-diagnoses of a mood disorder and addiction, typically to opioids.

"There aren't enough beds. We have struggles with opioid addiction and suicidality, and it's a crisis we've never seen before on a national level in the United States. Especially in the northeast, especially in New England, but even more so in Vermont. We are really struggling," he says.

At UVMMC, where Tomasi and his colleagues Sheri Gates and Emily Reyns treat patients suffering from a range of mood and mental health disorders, a new idea surfaced: What if practitioners prescribed patients exercise as part of their treatment plans?

To explore the potential of this mind-body connection, Tomasi, Gates, and Reyns were awarded an inaugural University of Vermont

Medical Center Fund grant that enabled them to build a gym, exclusive to patients in UVMMC's inpatient psychiatry unit. For roughly one hundred patients in the unit, treatment plans included new sixty-minute nutrition education programs and structured exercise classes, all monitored by psychotherapists.

A remarkable 95 percent of patients reported that their moods improved after doing the structured exercises. Overall, patients reported reduced levels of mood disorder symptoms like anger, anxiety, and depression and higher levels of self-esteem and improved moods.

Based on the study's positive results, Tomasi believes incorporating American College of Sports Medicine-approved exercises into inpatient treatment would not only improve patients' symptoms faster than classic pharmacological intervention alone could—thus increasing facilities' bed and patient turnover rates—but would also offer patients an alternative, holistic, and cost-effective approach to maintaining their mental health after discharge.

ABOVE: David Tomasi offers a primer on brain function. See the video: go.uvm.edu/tomasi



DEEP GREEN

With a massive upgrade in summer 2019, UVM now has one of the fastest supercomputers in New England and one of the 100 fastest academic supercomputers in the country. The new computing cluster at the Vermont Advanced Computing Core, dubbed DeepGreen, was expanded on the strength of a \$1 million grant from the National Science Foundation.

The upgrade positions the university well, says **Adrian Del Maestro**, associate professor of physics, director of the VACC and principal investigator on the NSF grant. According to Del Maestro, the increase in processing speed, combined with hyper-fast network connections within the cluster, will enable faculty to take on new types of research projects they did not have the computational power to explore in the past.



A Toolbox for Better Health

Professor and Chair of Microbiology and Molecular Genetics **Beth Kirkpatrick** sees the new UVM research center for which she is principal investigator as a toolbox

for improving lives around the globe. "Effective responses to infectious disease burdens and threats must capitalize on new technologies and analytical tools," she says.

The new Center of Biomedical Research Excellence (COBRE) called the "Translational Global Infectious Disease Research Center" (TGIR) was announced in October 2018 with \$12.3 million in funding from the National Institutes of Health. The research initiative will leverage UVM expertise in the Larner College of Medicine, the College of Engineering and Mathematical Sciences,

and the College of Agriculture and Life Sciences to develop strategies for decreasing the burden of infectious diseases, particularly in low-income countries.

The TGIR-COBRE aims to bridge the gap between the biologic and quantitative data fields of biomedical research by developing institutional strengths in global infectious disease research and supporting the research careers of outstanding junior faculty in this field.

The TGIR center incorporates existing research strengths in human infectious diseases and the platforms of the UVM Vaccine Testing Center. The center also makes use of UVM's substantial expertise in complex systems and mathematical/computational modeling.

Co-principal investigators on the TGIR-COBRE are **Jason Bates**, professor of medicine, and **Christopher Huston**, professor of medicine.



GROSSMAN DEAN HONORED FOR SUSTAINABLE ENTERPRISE SCHOLARSHIP

Sanjay Sharma, dean of the Grossman School of Business, was a 2018 Fetner Sustainable Enterprise Fellow. The prestigious research fellowship is made annually to a leading international scholar in sustainable enterprise.

A Fulbright Scholar with extensive experience in the private sector, Sharma has expertise in corporate environmental strategy, corporate sustainability, competitive strategy, stakeholder engagement, and organizational innovation. He has written and co-edited nine books on corporate sustainability and has won several prestigious awards for his research, including the Academy of Management ONE Division's Distinguished Scholar Lifetime Achievement Award in 2016.

Fetner Fellows participate in a three-day residency, delivering a series of research lectures to faculty and graduate students at Syracuse University's Whitman School of Management and L.C. Smith College of Engineering and Computer Sciences, and the SUNY College of Environmental Science and Forestry.

ENDING AN ACADEMIC EMBARGO

CUBA HAS BECOME a key nation in global research efforts by UVM's Gund Institute for Environment and the Rubenstein School of Environment and Natural Resources. But while teaching UVM courses on-site in Cuba and collaborating with Cuban scientists, UVM conservation biologist **Joe Roman** learned of a significant impediment to advancing knowledge of the island and surrounding sea.

Working with Patricia González-Díaz, director of the University of Havana's Center for Marine Research, Roman heard of the challenge she faced in publishing in the Florida-based *Bulletin of Marine Science*, a leading journal in the field. In short, her PhD dissertation was rejected for publication without review, due to the journal's strict reading of the 1962 embargo barring economic cooperation with Cuba.

Technically, the journal could publish research papers by Cubans, but editing or peer reviews were considered as economic assistance, which the editorial and legal team believed was forbidden by U.S. policy. "That basically rendered every submission impossible to accept," says Rafael Araujo, managing editor of the *Bulletin of Marine Science*, which is based at the University of Miami. Roman's focus typically is on endangered species, not international sanctions. His research on whales has helped strengthen global anti-whaling standards. He created a program on biodiversity and human health at the Environmental Protection Agency, studies the impacts of invasive species, and has held visiting positions at Harvard University and Duke University's Marine Lab.

But González-Díaz's rejection and the *Bulletin's* apparent ban on Cuban scholarship stuck with Roman; he couldn't let it go. Through a chain of events, he connected with an Environmental Defense Fund attorney, who found varying

interpretations of the embargo among U.S. journals. Some published Cuban research, others did not.

The Defense Fund found an updated U.S. Treasury Department policy that they believed allowed the editing and publication of non-government scientists in American journals. The University of Miami's legal counsel agreed, and in 2016 the *Bulletin of Marine Science* began accepting Cuban submissions for the first time in decades.

At the urging of Gund Institute for Environment director Taylor Ricketts, Roman pitched the *Bulletin* the idea of a special edition dedicated to Cuban marine science. The journal agreed, naming Roman and González-Díaz as guest co-editors. The historic edition appeared in spring 2018, featuring dozens of Cuban scholars, including some previously rejected by the journal without review.

With ninety miles of ocean separating the United States and Cuba, the proximity of the two nations means cooperation is essential to understanding shared risks facing endangered species and ecosystems. "Fish, manatees, sea turtles—they don't know boundaries, they freely cross between the United States and Cuba all the time," Roman says. "You can't manage the oceans simply by managing your own coastlines."



Super Silver

A TEAM OF SCIENTISTS has made the strongest silver ever—42 percent stronger than the previous world record. But that's not the important point.

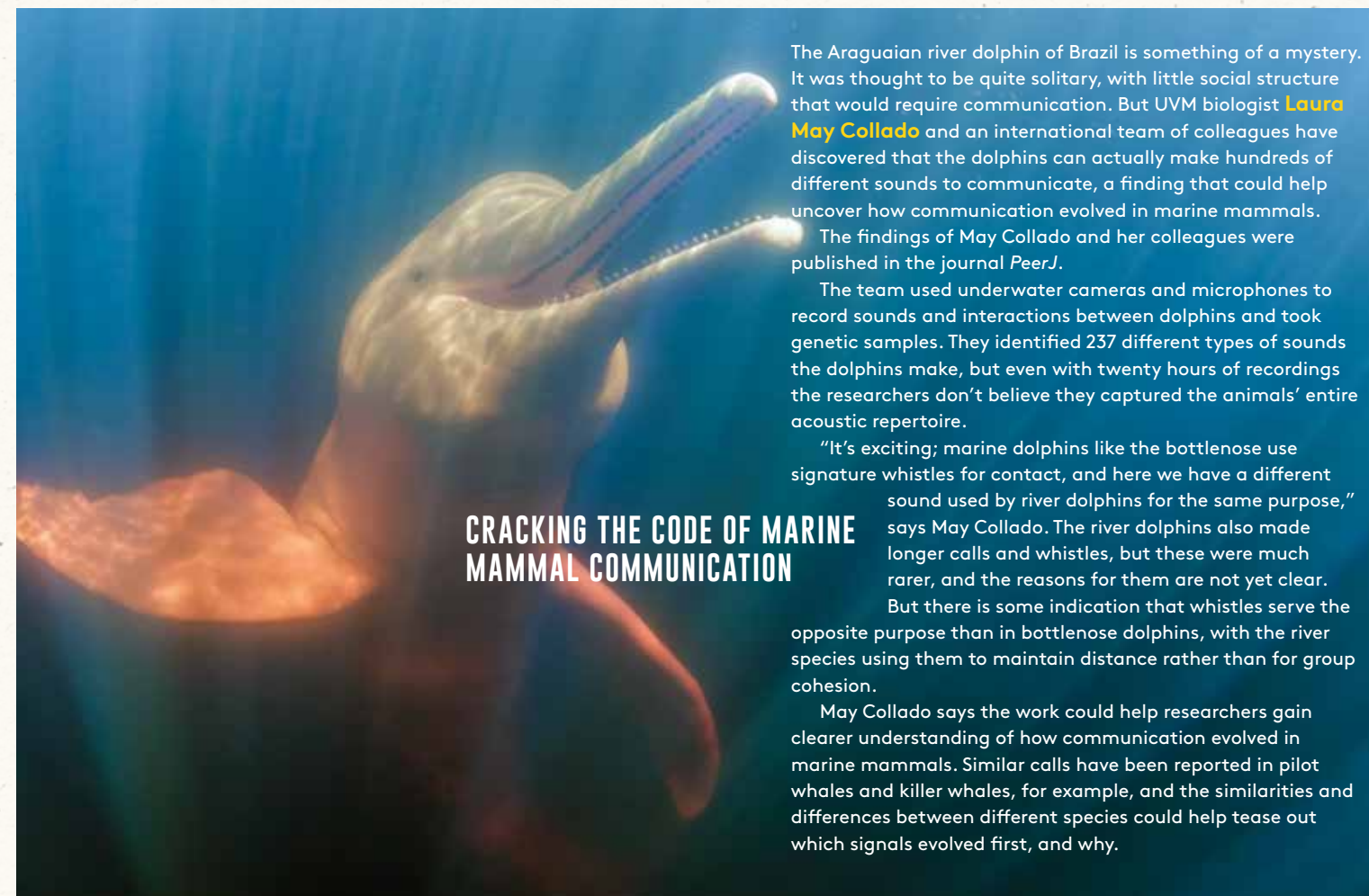
"We've discovered a new mechanism at work at the nanoscale that allows us to make metals that are much stronger than anything ever made before—while not losing any electrical conductivity," says **Frederic Sansoz**, UVM materials scientist and mechanical engineering professor who co-led the new discovery.

This fundamental breakthrough promises a new category of materials that can overcome a traditional trade-off in industrial and commercial materials between strength and ability to carry electrical current. In addition to UVM, the research team included scientists from Lawrence Livermore National Lab, the Ames Laboratory, Los Alamos National Laboratory, and UCLA. Their results were published in the journal *Nature Materials*.

By mixing a trace amount of copper into the silver, the team showed it can transform two types of inherent nanoscale defects into a powerful internal structure. "That's because impurities are directly attracted to these defects," explains Sansoz. In other words, the team used a copper impurity—a form of doping or "microalloy" as the scientists style it—to control the behavior of defects in silver. Like a kind of atomic-scale jiu-jitsu, the scientists flipped the defects to their advantage, using them to both strengthen the metal and maintain its electrical conductivity.

Sansoz is confident that the team's approach to making super-strong and still-conductive silver can be applied to many other metals. "This is a new class of materials and we're just beginning to understand how they work," he

says. And he anticipates that the basic science revealed in the new study can lead to advances in technologies—from more efficient solar cells to lighter airplanes to safer nuclear power plants. "When you can make material stronger, you can use less of it, and it lasts longer," he says, "and being electrically conductive is crucial to many applications."



The Araguaian river dolphin of Brazil is something of a mystery. It was thought to be quite solitary, with little social structure that would require communication. But UVM biologist **Laura May Collado** and an international team of colleagues have discovered that the dolphins can actually make hundreds of different sounds to communicate, a finding that could help uncover how communication evolved in marine mammals.

The findings of May Collado and her colleagues were published in the journal *PeerJ*.

The team used underwater cameras and microphones to record sounds and interactions between dolphins and took genetic samples. They identified 237 different types of sounds the dolphins make, but even with twenty hours of recordings the researchers don't believe they captured the animals' entire acoustic repertoire.

"It's exciting; marine dolphins like the bottlenose use signature whistles for contact, and here we have a different sound used by river dolphins for the same purpose," says May Collado. The river dolphins also made longer calls and whistles, but these were much rarer, and the reasons for them are not yet clear.

But there is some indication that whistles serve the opposite purpose than in bottlenose dolphins, with the river species using them to maintain distance rather than for group cohesion.

May Collado says the work could help researchers gain clearer understanding of how communication evolved in marine mammals. Similar calls have been reported in pilot whales and killer whales, for example, and the similarities and differences between different species could help tease out which signals evolved first, and why.

GAYE vs. SHEERAN

Professor **Alex Stewart**'s unique blend of musical and academic expertise has put him in the thick of some of the most celebrated music copyright battles of the last twenty years. His current cases say it all: Led Zeppelin's alleged rip-off of the band Spirit in the opening guitar riff of "Stairway to Heaven" and Ed Sheeran's alleged theft of musical elements from Marvin Gaye's "Let's Get It On" in his hit "Thinking Out Loud." In both cases, Stewart is the musicologist for the legal team representing the original artist, although he has worked for both defendants and plaintiffs over the years.

Most people on campus know Stewart as the founding director of the university's Jazz Studies program, a talented tenor saxophonist, and an ethnomusicologist with a book and numerous journal articles to his credit. His journey from the bandstand to the witness stand only seems unlikely. Stewart's skill as a music transcriber—honed through years of writing out jazz solos from recordings and in his ethnographic work—is perfectly matched to the needs of a music infringement case, where two pieces of un-notated pop music have to be written out, so they can be compared to help determine whether similarity crosses the line to theft.

LENI SINCLAIR/GETTY IMAGES



“COLLABORATION IS REALLY THE FABRIC OF THIS CANCER CENTER, AND WHAT WE HAVE DONE IS TRY TO ACCELERATE THE TRANSITION FROM DISCOVERY TO CLINICAL APPLICATION.”

GARY STEIN, DIRECTOR OF THE UVM CANCER CENTER



Delphine Quenet
and Alissa Thomas

Teaming Up

THROUGH “BENCH-TO-BEDSIDE” COLLABORATIONS, UVM CANCER CENTER RESEARCHERS ACCELERATE THE TRANSLATION OF LABORATORY DISCOVERIES INTO CLINICAL PRACTICE

BY SARAH ZOBEL

PICTURE, IF YOU WILL, A CANCER CELL. Alone, it is just a harmless anomaly. But free to divide exponentially, the cells explode to take over an organ. There’s nothing like cancer to show the sheer power of multiplication.

Now imagine instead of cancer cells, two UVM Cancer Center members, a basic researcher and a clinician, each working away in their own areas. The two decide to collaborate, combining the researcher’s lab work and the physician’s knowledge of the patient care dimension of the disease. With this doubled-up approach, they are able to tackle with focused and multiplied power some of the biggest questions in cancer today. This multiplication is the heart of what is known as “translational research.”

“We developed the UVM Cancer Center to be able to support those types of relationships,” says **Gary Stein, PhD**, director of the center and professor and chair of biochemistry at UVM’s Larner College of Medicine. “Collaboration is really the fabric of this Cancer Center, and what we have done—and it’s by design, not just by happenstance—is try to accelerate the transition from discovery to clinical application.” At present, more than a dozen translational teams are working at the UVM Cancer Center with new partnerships emerging each year among the center’s more than two hundred members.

“You’re really thinking about both ends of the spectrum: What is the science involved, and what is the clinical outcome you want?” says the center’s associate director for clinical and translational research, **Chris Holmes, MD**. “Research is a long process that starts at the platform of the patient and patient needs, and then moves forward toward identification

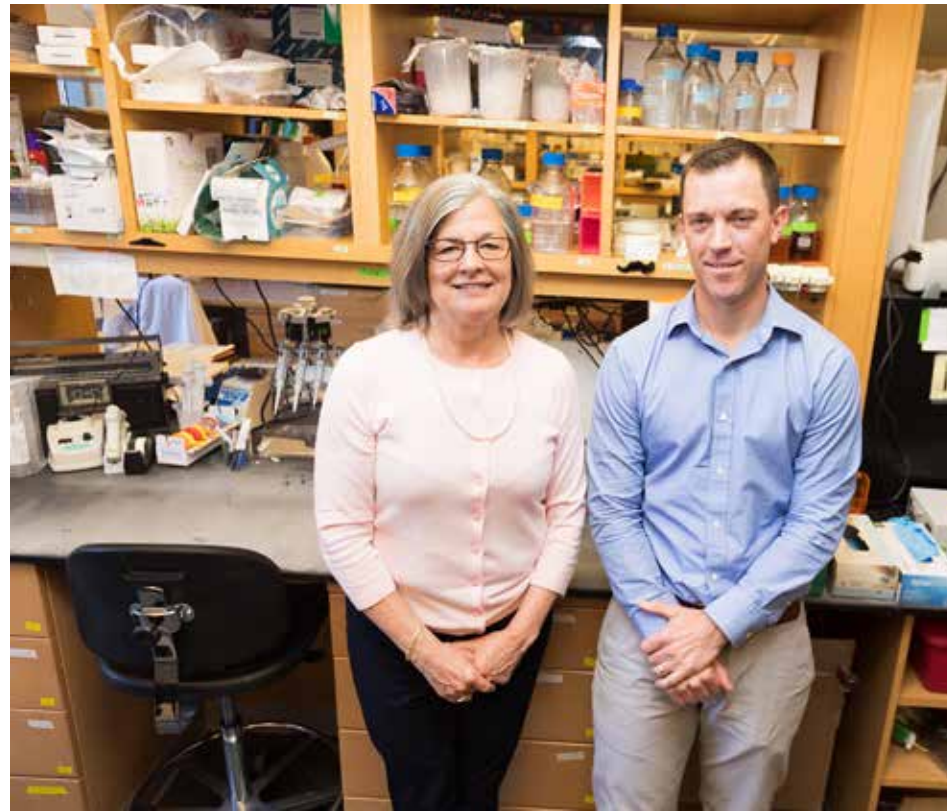
of a biomarker, or an actual new treatment, or a treatment approach.” Although such partnerships are not unique to UVM, they thrive here thanks, in part, to the university’s size and structure.

“This is pivotal, essential work,” says Vermont Health Commissioner Mark Levine, MD. “So much research in this decade is truly collaborative across states and sometimes across nations, so the fact that we’re playing a role is highly appropriate and will continue to be very valuable.”

Glioblastoma is rare among cancers—Vermont’s registry shows only thirty cases of it annually. Despite its relatively low numbers, it has piqued the interest of researchers, partly because of its aggressiveness.

“Glioblastoma is a very invasive cancer, so you can never get a clean surgery with nice margins,” says **Alissa Thomas, MD**. “It has tentacles that grow deep into portions of the brain, so you can’t treat it surgically. It’s a cancer that tends to acquire a lot of different mutations, so it develops resistances to radiation and chemotherapy relatively quickly. And it grows fast, so most of the time patients show up with a couple

Marie Wood, MD, professor of medicine and associate director for cancer control and population health science for the Cancer Center, and Jason Stumpff, PhD, associate professor of molecular physiology and biophysics.



weeks' worth of symptoms at most; the survival average is somewhere between one and two years."

Because there is no cure and no effective therapy for glioblastoma, Thomas, a neurologist and neuro-oncologist, and **Delphine Quenet, PhD**, a basic science researcher and assistant professor in the Department of Biochemistry, are exploring whether a specific Poly (ADP-ribose) polymerase inhibitor (called PARP for short) could serve as an adjuvant to standard chemotherapy.

Quenet's lab has been focused on the effect of PARP inhibitors on the metabolism and biology of glioblastoma cell lines, specifically PTEN, which is an enzyme that acts as a tumor suppressor and is often mutated or deleted in patients.

Thomas and Quenet note the tremendous support they've had from patients in allowing use of tumor samples. The pair has been inspired by the desire of patients to play a role in advancing treatment for this disease. With initial support from the UVM Cancer Center through an American Cancer Society Institutional Research Grant, their team has further evolved and is even more fully transdisciplinary; it now includes pathologist **John Dewitt, MD**, and neuroscientist **James Stafford, PhD**. Neuroscientist **Diane Jaworski, PhD**, has mentored Quenet and Thomas as they've applied for studies and grants—even helping Quenet by blinding her first samples.

"We've started to have a stronger mini-group around not only glioblastoma, but brain tumors, and that's good for everybody," says Quenet.

Associate Professor of Molecular Physiology and Biophysics **Jason Stumpff, PhD**, came to Vermont from a large medical center whose size precluded him from having routine interactions with clinicians. But at UVM, Stumpff was assigned to an office suite with another basic science

researcher and two medical oncologists.

"Putting clinicians and basic scientists together is really never easy because you don't talk the same language," says **Marie Wood, MD**, professor of medicine and associate director for cancer control and population health science for the Cancer Center, and one of those suitemates. "Basic scientists spend so much time thinking about this little part of the world, whether it's a mitochondrion or an endoplasmic reticulum or a piece of DNA, and physicians focus on the bigger picture as they deal with patients. To bring both the clinicians diving deeper into the cellular layers, and the laboratory people up a little bit more to look outside the weeds is so helpful."

For Stumpff and Wood, meeting in the middle evolved after repeated chats about cell division around the office coffemaker. Stumpff had been studying the organization and division of chromosomes and "stumbled onto" an observation that a particular molecule involved in that process is required for cancer cells—but not normal cells—to divide. Wood was intrigued, because most chemotherapeutics operate by keeping cells from dividing, but make no distinction between cancer and normal cells.

They decided to focus on triple negative breast cancer because it has so few targeted treatment options. Compared to other kinds of breast cancer, TNBC (so named because it lacks the three receptors most commonly associated with breast cancer—estrogen, progesterone, and the human epidermal growth factor receptor 2) tends to occur in younger women, is more likely to recur, and has a greater ability to metastasize. Stumpff received a Susan G. Komen



Jos van der Velden, PhD, assistant professor of pathology and laboratory medicine, and Matt Kinsey, MD, assistant professor of medicine.

Cancer Center, and pilot funding through the center, Kinsey and van der Velden undertook a collaboration to explore targeted therapies to treat lung cancer, the most lethal and intractable of all the common cancers—its five-year survival rate in the mid-

career development grant; Wood was named one of the members of the mentoring committee, and indeed, their collaboration has evolved as a mentorship.

"We're rigorously testing the idea that one particular molecule is required for cancer cell divisions and not normal cell division," Stumpff says, further noting preliminary findings that suggest there are weaknesses in the "molecular machinery" TNBC cells need to divide—specifically, in the mitotic spindle structures.

One of the cruel ironies of cancer is that it never grows where you want it to.

"It's one of these stunning problems that we can't get cancer to stop growing—particularly lung cancer—in the body, but as soon as you take it out and try to put it on a dish, it dies," says interventional pulmonologist **Matthew Kinsey, MD**, assistant professor of medicine. There's little point in applying potential therapeutic treatments to cells that are no longer living, of course. Fortunately, Kinsey found an answer and a counterpoint in a partnership with **Jos van der Velden, PhD**, assistant professor in the Department of Pathology and Laboratory Medicine, who had a grant to study lung cancer but little access to patient samples.

The lung does not lend itself to casual study: with more than forty different cell types, it's challenging enough, but add in the heterogeneity of cancers in that organ, and things get even trickier. Thanks to prodding from **Gary Stein** and **Claire Verschraegen, MD**, then the co-directors of the

teens is virtually unchanged since the 1970s.

Kinsey procured samples from his patients ("People are really amazing" in their willingness to participate in research, he says), and van der Velden began to grow cultures. In late March 2019, the two enrolled their one-hundredth patient, a number that once seemed an unattainable goal. The collaboration has already proven fruitful: since they began working together, Kinsey has received an NIH K-series grant and van der Velden has received a five-year NIH R01 grant, which, he says, has about a 10 percent funding rate. They agree that the translational nature of their work made the grant applications more attractive to the NIH, and are already talking about the focus of their next application.

Gary Stein gauges the level of success of Cancer Center-affiliated translational partnerships by the multi-year duration of many of the teams, and by their ability to glean extensive extramural funding and to repeatedly publish multi-author articles in peer-reviewed journals. But the secret ingredient may be compatibility. When Stein and his leadership team propose a collaboration, they look for people who have not only complementary interests and skillsets, but complementary personalities as well.

"If you really want a partnership to work, you need to make certain the individuals make contributions that are going to be more than what either one can do by themselves," says Stein. "I think we've been fortunate to have folks who come together in that way."



FINDING OUR HAPPY PLACE

A first-of-its-kind study by UVM scientists shows that visitors to urban parks use happier words and express less negativity on Twitter than they did before their visit—and that their elevated mood lasts, like a

glow, for up to four hours afterwards. Published in *People and Nature*, an open-access journal of the British Ecological Society, this research may have powerful implications for public health and urban planning.

Aaron Schwartz, a doctoral student in the Rubenstein School of Environment and Natural Resources and graduate fellow in the Gund Institute for Environment, led the study, which analyzed tweets from 160 San Francisco parks. The research relied on the hedonometer, an online instrument invented by Vermont Complex Systems faculty and The MITRE Corporation. Co-authors included faculty from Complex Systems, the Gund Institute, and UVM Spatial Analysis Laboratory.

The greener the space—forested park versus paved plaza—the greater the mood boost. “In cities, big green spaces are very important for people’s sense of well-being,” says Schwartz; meaning that efforts to protect and expand urban natural areas extend far beyond luxury and second-tier concerns.

CONSTANZA HEVIA



“MY WORK IS MOSTLY ABOUT A RELATIONSHIP TO THE NATURAL WORLD, SOMEWHERE IN BETWEEN THE POLES OF MAPPING AND DIRECT EXPERIENCE.”

STEVE BUDINGTON

partial map with weather flag, 2016-18,
oil on canvas over wood panels in seven parts, 78" x 60"



Into the Wilderness

PAINTER STEVE BUDINGTON'S PROCESS
TRUSTS IN THE DETOURS

BY THOMAS WEAVER

WEIGHING A QUESTION about research that might precede his work on a painting, **Steve Budington** pauses to consider. “I think it’s hard to tease that out as a separate event,” he says. “There is not a ‘before the studio, and during the studio, and after the studio.’ It is more of a living organism; it’s never really been a linear progression for me.”

Take the paintings and sketches—some complete, some in-progress—leaning along the walls of the associate professor of art’s office/studio on the ground floor of Williams Hall. The abstractly painted triangular canvases have their origins in Budington’s response to a Buckminster Fuller invention, the Dymaxion world map. But it is not, of course, so simple as “follow point A to point B.” The creative and research processes are intertwined, fed by Budington’s broad curiosity, deep affinity for nature, and keen, ever-vigilant eye on the world.

Budington was a sophomore at the University of Massachusetts-Amherst when he saw a Jasper Johns retrospective that expanded his perspective and aspiration, a pivotal moment in his development as an artist. “You can do that?” Budington recalls thinking. “It was permission to think in this much different way about painting.” Among the works in that exhibition: *Map (Based on Buckminster Fuller’s Dymaxion Airocean World)*.

Fuller’s original variation on a world map produced an image of Earth’s surface projected onto an icosahedron (a twenty-faced polyhedron) that could be unfolded and flattened. Originally created in 1943, Fuller’s later iteration, the 1954 Airocean World Map, is the best-known.

Artist Jasper Johns created *Map (Based on Buckminster Fuller’s Dymaxion Airocean World)* for the Montreal International and Universal Exposition in 1967, where it was exhibited in the U.S. pavilion, a geodesic dome designed by

Buckminster Fuller. Budington says that for him the initial intrigue of Johns’s take on Fuller’s map was the unusual shape: triangular canvases fitted together. That intrigue, sparked as a college undergrad, got filed away in memory as his work took other directions through the years.

In ways, Budington has thought about the visual representation of mapping, its challenges and its opportunities, for a long time, most of his life, in fact. Growing up in western New York, Maryland, and Connecticut, he was inclined to spend hours exploring alone, following the banks of rivers or streams where they led. Back home, exploration complete, he would make drawings, “almost imaginary,” Budington says, of where he had trekked. That childhood exercise finds form in the work of the adult artist. “My work is mostly about a relationship to the natural world, somewhere in between the poles of mapping and direct experience,” Budington says.

Several years ago, he again came across the Jasper Johns *Map* painting that was among the horizon-expanding work he’d first seen as an undergraduate. Intrigue rekindled, he read more about the circumstances around the work, discovering that Johns was initially dissatisfied with his first response to the Dymaxion map.

The artist had worked on the massive painting, fifteen feet high and thirty feet long, in eighteen sections. Since his studio was too small to accommodate them fully assembled, he never saw the work complete until it was installed in Montreal. Johns immediately felt that he’d hugged the shore of Fuller’s work too closely; it was simply a map. When it was returned to him post-Expo ’67, the artist began to rework it and “changed it into a painting.”



Learning of Johns's unhappiness with that initial map painting, Budington considered what differentiated it from the painter's target paintings. "If you make a painting of a target, then use it as a target, it's not really a painting anymore," Budington says. "And if you use it as a painting, it is not a target. There is a friction there. But in Johns's first painting of Fuller's map, that sort of friction wasn't present."

The division where representation meets and/or splits from reality has been a theme in Budington's work throughout his career. His paintings have grown out of his thinking about how science understands the human body versus how we, as individuals, experience our own—sample of one—human body. Or consider a map versus navigating real terrain, Budington says, then ventures into the reality of twenty-first century mapping—navigating in real time in the real world, walking down a city sidewalk, Google Maps open, our own presence a blue dot moving forward.

Budington's recent paintings echo the shapes of Fuller's Dymaxion map as a platform for his own exploration. "I'm drawn to the Dymaxion map and other world maps for their utopian desire to create a 'big picture' out of things, even as partial views and contingent viewpoints replace such overarching visions today, when the terrain moves around us as we navigate with GPS devices," he says. "What happens when wholes are replaced by parts, and how do those parts relate to one another?"

Though his process is grounded in faith in improvisation, Budington adds that he prepares himself "with a vocabulary of possibilities." His triangle-based map paintings are guided

by "direct observations of visual phenomena in the landscape, library research, notes, drawings, and other studies."

But Budington also shares a Zen-like truth: the work happens within the work. Again, there's no "ready-set-go" where idea meets canvas; rather ideas evolve and take shape as he paints. "As I work, I keep things unresolved for as long as possible," Budington says. "I try to find unfamiliar situations, where a chance joining of two colors or a fragment of imagery can take a painting on interesting visual and conceptual detours that wouldn't otherwise occur. There's a sense of wilderness in this endeavor, of remaining open, of participating in a kind of travel."

A similar sense of improvisation is behind a set of clear plastic three-ring binder sleeves, full of images clipped from magazines or his own sketchbook, displayed alongside some of his recent paintings. Something like a visual journal, they are things that have sparked thoughts or caught his eye—an old etching of an explorer falling off an icy cliff; a swath of orange paint; a black-and-white news photo of Bucky Fuller's geodesic dome in Montreal ablaze, black smoke pouring from the transparent acrylic skin accidentally ignited during a repair in 1976.

Budington has come to see these "assisted documents" as, in and of themselves, works that are complementary to his paintings, examining scientific, cultural, and lived experiences of the natural world. He likens them to the "cut-up" method of artists such as poet William Burroughs, who clipped individual words out of the newspaper and let them fall on the page, or surrealist collage. "These are in that spirit—chance relationships,

loosely assisted without being overly authored," he says.

Budington followed another avenue of improvisation this summer during a three-week residency through the Hotel Pupik program in Schrattenberg, Austria. At the exhibition/festival weekend, he played electric guitar in a live performance of experimental music with a percussionist. He's been invited back for six nights of performance in Vienna and Graz, Austria, this winter, coinciding with an exhibition of his paintings.

Back in Burlington for the opening of fall semester, Budington's twin pursuits as artist and art professor join in his studio/office in Williams. Though there's a lot to be said for the quiet and privacy of an off-campus studio, which he had in the past, Budington is finding positives in simplifying to one locale. Paintings in progress are a constant, often seen out of the corner of his eye throughout his days on campus, even when he doesn't have a brush in hand. "I think that so much artistic work, in a way, happens obliquely; when you're not thinking about the thing is when you actually solve the problem. I think that's been good about having my studio right here in Williams," Budington says.

Also good, the opportunity UVM art majors have to view an accomplished artist's process on display. "They see that I'm struggling with this, too," he says. "It is actually hard to make interesting work, and it doesn't always work out. You fail all the time. Sometimes I'm making disasters happen and the students who walk in here can see that. But that's also the reality of making artwork."


Detours, even dead-ends, all essential terrain an artist must learn to navigate.

CLOCKWISE FROM LEFT:

partial map with water and partial frame, 2016-19, oil on canvas over wood panels in five parts, wooden frame with enamel, 26" x 90"; *assisted document (fall)*, 2018, found images and cut and folded double sided inkjet print in plastic document sleeve, 11" x 9"; *assisted document (Fuller's plan)*, 2019, found images in plastic document sleeve with stainless clip, 11" x 9"



Steve Budington received his MFA in painting from the Yale School of Art and his BFA in painting and art history from the University of Massachusetts-Amherst. His work has been exhibited nationally and internationally, including in New York, at Exit Art, Fordham University, and Dorsky Gallery Curatorial Programs; in San Francisco, at Mirus Gallery; in Los Angeles, at Whittier College; and in Italy, at the Fondazione Ambrosetti Arte Contemporanea. The artist received a 2019-20 Vermont Arts Council Creation Grant to support work on a set of paintings shaped after world map projections.



Crop losses for critical food grains will increase substantially with global warming, as rising temperatures boost the metabolism and population growth of insect pests, according to research co-authored by **Scott Merrill**, research professor in the Department of Plant and Soil Science and Gund Institute for Environment.

Merrill and colleagues at the universities of Colorado and Washington

looked at how the insect pests that attack three staple crops—rice, maize, and wheat—would respond under a variety of climate scenarios. They

found that rising global temperatures would lead to an increase in crop losses from insects, especially in temperate regions. Losses are projected to rise by 10 to 25 percent per degree of warming.

Just a two-degree rise in global average temperature will result in total crop losses of approximately 213 million tons for the three grains, according to the study, published in *Science*.

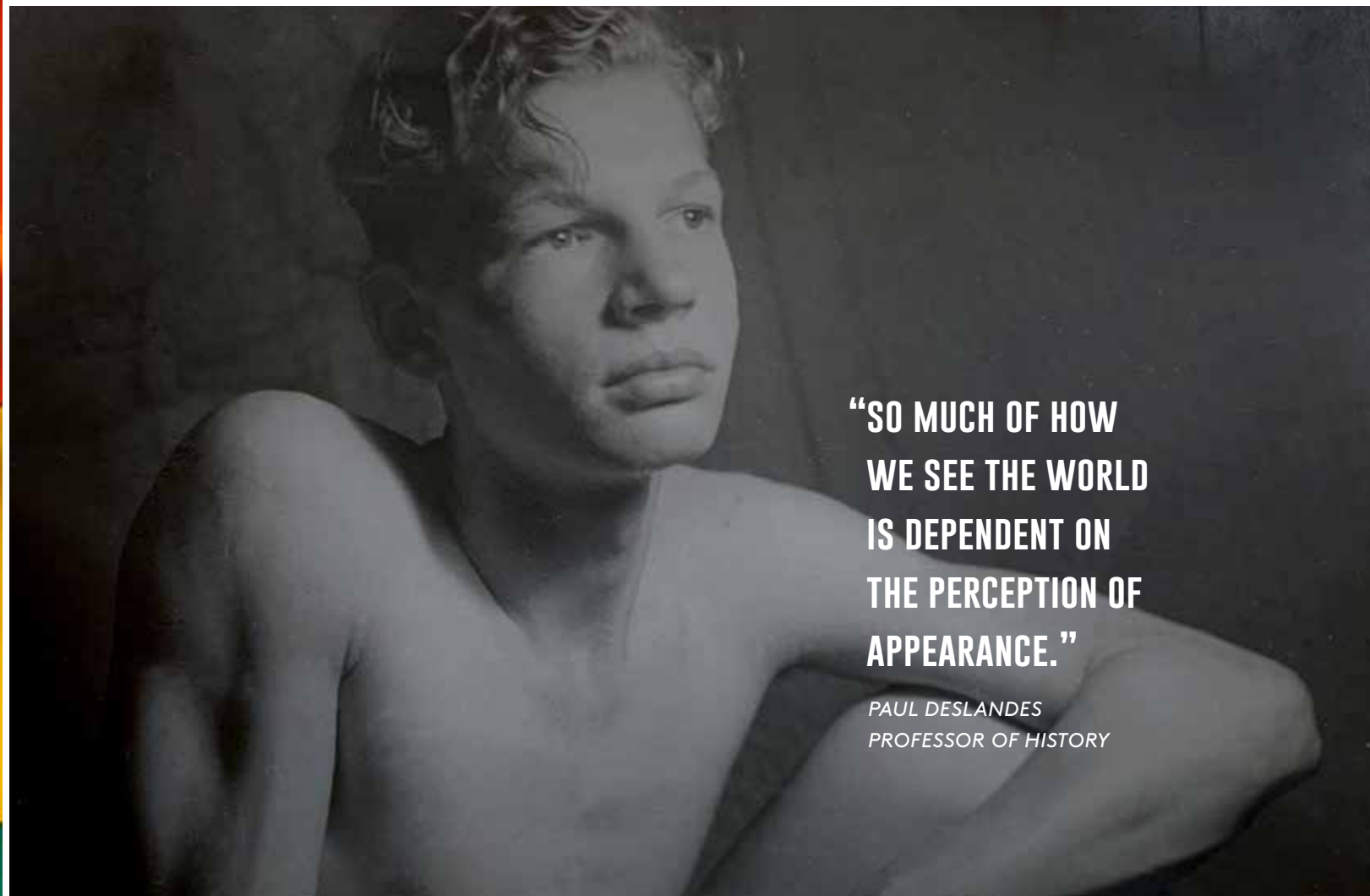
The losses will come from an increase in insect metabolism, and from faster insect population growth rates. The link with metabolism is straightforward. “When the temperature increases, the insects’ metabolism increases so they have to eat more,” says Merrill. “That’s not good for crops.”

The link with population growth, however, is more complex. Insects have an optimal temperature where their population grows best. If the temperature is too cold or too hot, the population will grow more slowly. That is why the losses will be greatest in temperate regions, but less severe in the tropics.

Reduced yields in these three staple crops are a particular concern, because so many people around the world rely on them. Together they account for 42 percent of direct calories consumed by humans worldwide. Increased crop losses will result in a rise in food insecurity, especially in those parts of the world where it is already rife, and could lead to conflict.

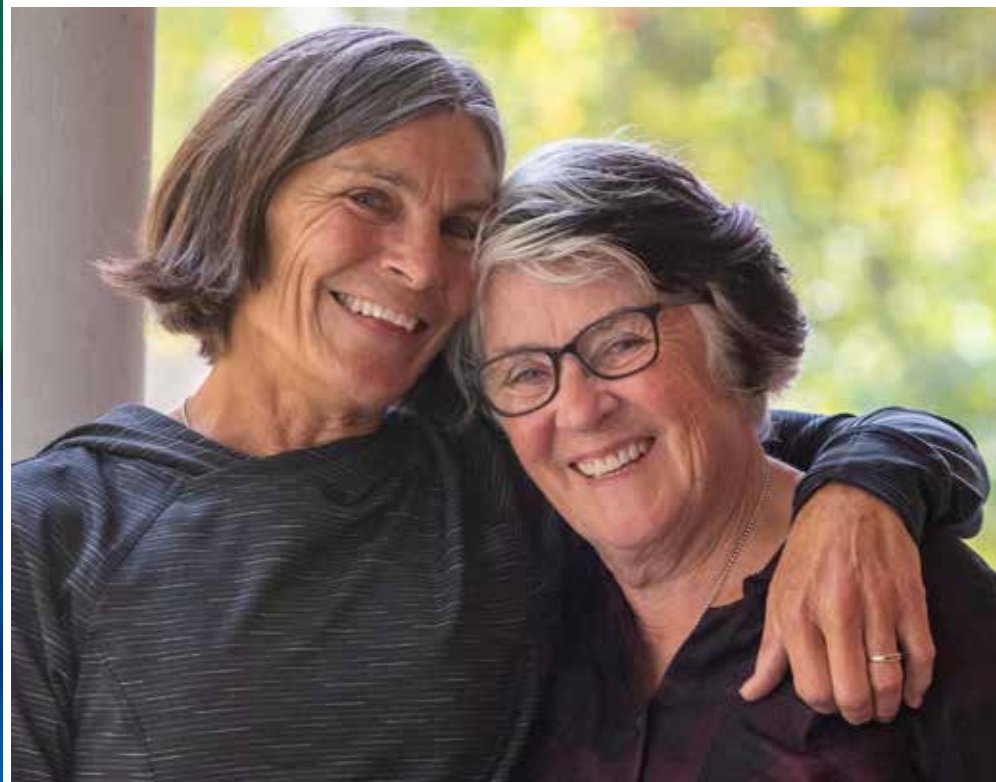
GLOBAL WARMING

MORE INSECTS, HUNGRIER FOR CROPS



“SO MUCH OF HOW
WE SEE THE WORLD
IS DEPENDENT ON
THE PERCEPTION OF
APPEARANCE.”

PAUL DESLANDES
PROFESSOR OF HISTORY



Research Beyond the Binary

CHALLENGING NORMS AND OFFERING FRESH
PERSPECTIVES THROUGH RESEARCH AND
SCHOLARSHIP FOCUSED ON LGBTQ ISSUES

BY KAITIE CATANIA

THE PIONEER JACQUELINE WEINSTOCK

Associate Professor of Human Development
and Family Studies

Jacqueline Weinstock often revisits the first day she taught what would become HDFS 167: Sexuality & Gender Studies, the university's first permanent LGBTQ-focused course. She designed it more than twenty years ago for LGBTQ students who were “yearning for classes that included them. They were yearning to see role models who were willing to be out and caring about, addressing, and studying LGBTQ issues.” She also believed it was imperative that human development and family studies students understand LGBTQ identities and experiences.

A scholar of human development and various marginalized communities, and an active listener above all else, Weinstock had the foresight to relocate the class to a lounge in the Living/Learning Center, “because I wanted us to have a comfortable setting.” In the moments before the class started, she recalls a handful of students she knew to be queer were “walking around, bouncing off the walls while the heterosexual students were all squished together on the couch, a little overwhelmed and a little scared about being in that room.” By the end of class, her students met on common ground, but that visual alone has stayed with her and is why the class was necessary, she says.

Flash forward to 2019 and you'll find that the course's content, Weinstock's knowledge, and her students' acceptance of LGBTQ issues have advanced dramatically since that day in 1997. But one thing has not: her emphasis on respect and listening as a tool for change, which has been a consistent thread in her decades of research, teaching, and community engagement.

Weinstock has published extensively on lesbian relationships and friendships, gender and sexual identities, and the aging process. Her most recent book *What's Next? The Continuing Journey of the Wake Robin Life Care Community* (Onion River Press 2019), coauthored with Professor Emerita Lynne Bond, delves deep into gerontology issues through a case study on the local Wake Robin senior-living community. However, Weinstock looks forward to bringing her research full circle by exploring cultural gaps that exist between elders, aging same-sex couples, and caregivers in senior-living environments to improve inclusivity for same-sex couples in these settings.

THE QUANTITATIVE QUEER JASON C. GARVEY

Program Coordinator and Associate Professor
of Higher Education and Student Affairs Administration

With every data set he analyzes or builds, Jay Garvey considers whether or not the numbers ultimately reflect the people or ideas behind them. As a professor of higher education and student affairs administration and a self-proclaimed “quantitative queer,” Garvey is equal parts data enthusiast, LGBTQ activist, and all-around student affairs and higher education expert. In his effort to improve national education research and campus climates for queer and trans students, it's difficult to parse out where exactly one role ends and another begins.

As cohesive and intentional as his work is today, Garvey admits that improving the college experience wasn't always

“making a case for a philosophy of reading that works toward the acceptance of contingency, slippage of meaning, and not knowing,” applied to the books she teaches her students.

his aim. In fact, it wasn’t until a queer-phobic experience during graduate school that he realized his long-term plan to become a K–12 educator wasn’t the right fit. “I took a quick turn and dove straight into student services at colleges and universities. It was around the same time that I came out as queer,” he says.

Since then, Garvey has worked to fill a void in national education research that widely excludes LGBTQ students, and to eliminate biases and methodologies that contaminate data. He pioneered his own national survey and collected data and climate feedback from 3,500 queer and trans graduates; he’s explored methodological problems with studying queer and trans students; and he’s written studies about how to operationalize sexuality in survey designs and about the general complexities of researching queer identity.

“When you tie college access to the numbers game, it creates a hierarchy of oppression and renders some people as less important. I think this largely affects people with disabilities and trans people who, according to the data, may not be largely representative. But when you start peeling back those layers, you realize the ways in which we collect data are biased. It’s all relative to how you’re collecting the data,” he explains.

In just four short years, however, Garvey says he’s noticed an uptick in LGBTQ student populations at higher education institutions and improvements in national research efforts to collect information about them. “The swift change in the fluidity of sexuality and gender is thrilling. Students are demanding that they no longer be placed in binary boxes of man or woman; or gay, lesbian, or straight, which provides interesting horizons for policies.”

THE LITERARY VALERIE ROHY

Professor of English

Professor of English and one of four 2019–2020 University Scholar Award recipients, Valerie Rohy jokes that much of the theorizing she does in 19th- and 20th-century American literature can be boiled down to simply this: “I think I gravitate toward a sense of play or possibility, even in the face of very real issues that aren’t fun. That’s sort of my approach in general.”

But at her October talk for the University Scholar Lecture Series, the humble professor acknowledged that her work and scholarly field are difficult to describe. “Queer theory is an open question that doesn’t settle on one meaning, not even its own,” she said. In many ways, her new book—which blends philosophy with psychoanalytic, queer, and narrative theories—exemplifies and embraces the ambiguity and open-endedness that LGBTQ studies facilitate.

Chances Are: Contingency, Queer Theory and American Literature (Routledge Press 2019) challenges readers to ask what can be understood about our attitudes toward sexuality



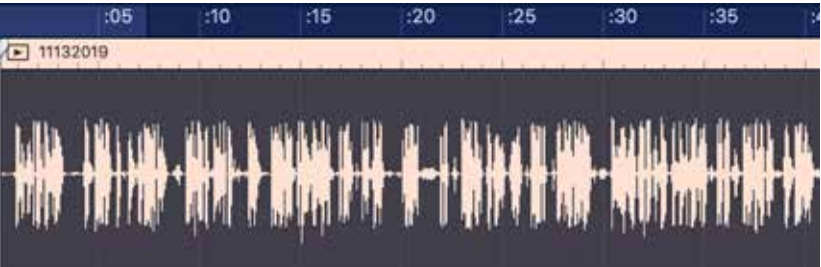
from literary plot points involving chance, luck, mutation, and accidents. From Edgar Allan Poe’s failed murder mystery “The Mystery of Marie Rogêt” (1842) to Alison Bechdel’s acclaimed lesbian memoir *Are You My Mother?* (2012) Rohy dissects decades of scripted coincidences and accidents, like a character’s fatal abortion in “The Mystery of Marie Rogêt,” to parse out what they articulate about heterosexuality and homosexuality. “I’m looking at abortion as analogous to queerness, as a threat to the reproduction of homo sapiens,” she says of this example.

But *Chances Are* doesn’t dispense many definitive conclusions about the complicated characters and circumstances it explores. And to a certain extent, that abandonment of absolutes and acceptance of open-endedness is precisely what Rohy set out to accomplish as a scholar. “I come out of this school of lit theory that tries to not pin things down, but rather to open up multiple theories,” she says. In fact, the most pointed description she offers about the book is that it’s “making a case for a philosophy of reading that works toward the acceptance of contingency, slippage of meaning, and not knowing. Insisting on knowing is usually the strategy of a tyrant,” she says, half kidding.

THE SPEECH PATHOLOGIST NANCY GAUVIN

Henderson Post-Doctoral Fellow and Clinical Assistant Professor of Communication Sciences and Disorders

A typical patient Nancy Gauvin might treat as a speech pathologist could have a swallowing disorder, facial difference, or cleft palate that can affect their healthy voice, speech and/or resonance, or ability to swallow safely. But a typical transgender patient that Gauvin treats at UVM’s Eleanor M. Luse Center for Communication: Speech, Language and Hearing already has a healthy voice. The real work is in keeping those patients’ voices and vocal cords that way while she safely transitions their voices to their chosen genders.



involves everything from blowing into straws to phonate and funnel-focus the voice, humming, moving and breathing exercises that practice using the diaphragm to breathe versus the chest, which supports full lung capacity, and vocal recordings. Left, an audio recording of a current patient from August 2016, prior to treatment; below a recording of the patient from November 2019, shortly after beginning treatment.

“Because vocal cords are so sensitive and delicate, they could develop nodules or polyps, which are growths that develop over abuse and misuse, and that’s what we’re trying to avoid,” explains Gauvin.

She and a team of graduate students at the center design holistic treatment plans that address patients’ unique physical and emotional needs through the long transition process. While each voice is different, treatment generally starts by identifying the patient’s baseline fundamental frequency and where their voice falls along what’s considered the “normal” cisgender male and female ranges. Then, using a piano, Gauvin and her team identify a pitch in the opposite cisgender voice range and begin exercises to attain it.

“It’s not just about the voice, it’s about how their inflection, intonation, prosody, how they use their voice, how they use their words—sometimes even their positioning, how they move and how they sit can affect the message they’re conveying. We look at everything, not just how we sound but how we use our sound,” she says.

In the center, they practice a range of expressions by role playing and acting out various situations like road rage, waking up in the morning, laughing, or answering a phone call. Because it can be a highly emotional experience, Gauvin incorporates gratitude sessions and family support therapy as part of the holistic treatment they receive.

“This is a brave thing that these patients are doing, and it’s also hard. They’re switching their lives in real-time from one perspective to another so that other people can make observations about them,” Gauvin says. “Everyone wants to feel like themselves, and if this is what’s going to help our clients feel like their true selves, then it matters. If even just one person feels good about who they are, then it matters.”

THE HISTORIAN PAUL DESLANDES

Chair and Associate Professor of History

Beauty is pain. Beauty is in the eye of the beholder. Beauty is...the cornerstone of our modern economy? According to

British historian Paul Deslandes’s latest research, not only is beauty a critical component of how we engage with consumer capitalism, but it’s also a currency in our competitive social marketplaces.

“Appearance is something that everyone is considering on a daily basis, minute by minute. It’s evident in the ways we interact with each other and it’s how we assess worth and value. It seems superficial, but it’s a human reality. To understand how that operates is important,” Deslandes says.

His forthcoming book, tentatively titled *The Culture of Male Beauty in Britain from the First Photograph to David Beckham* (University of Chicago Press 2020), explores more than a century of modern British history through archival documents detailing shifts in male beauty, sexuality, and appearance over time. Poring over research materials like nineteenth-century hairdressing catalogs, art, World War II-era advertisements, personal letters, and even pornography, Deslandes came to understand that “so much of how we see the world is dependent on the perception of appearance.”

He notes, for example, that the visible deterioration of male bodies during the AIDS epidemic signaled the severity of each individual’s condition, as well as the crisis as a whole; that preferences for clean-shaven faces, as portrayed in advertisements for safety razors during WWII, reveal much about gender relations and aesthetic standards; and that dreadlocks, afros, and other hairstyles were worn by people of color in Britain, as they were in the United States, to disrupt white standards of beauty.

Having written extensively about male bodies and British same-sex desiring men in the past, Deslandes approached this project to “reflect on the intersection of the queer and straight. I realized the two are constantly influencing each other,” he says. “From my perspective as a historian, part of what I’m doing is trying to say we shouldn’t necessarily think about LGBTQ people as only on the margins, but actually as informing the mainstream.”



JOINING THE ACADEMY

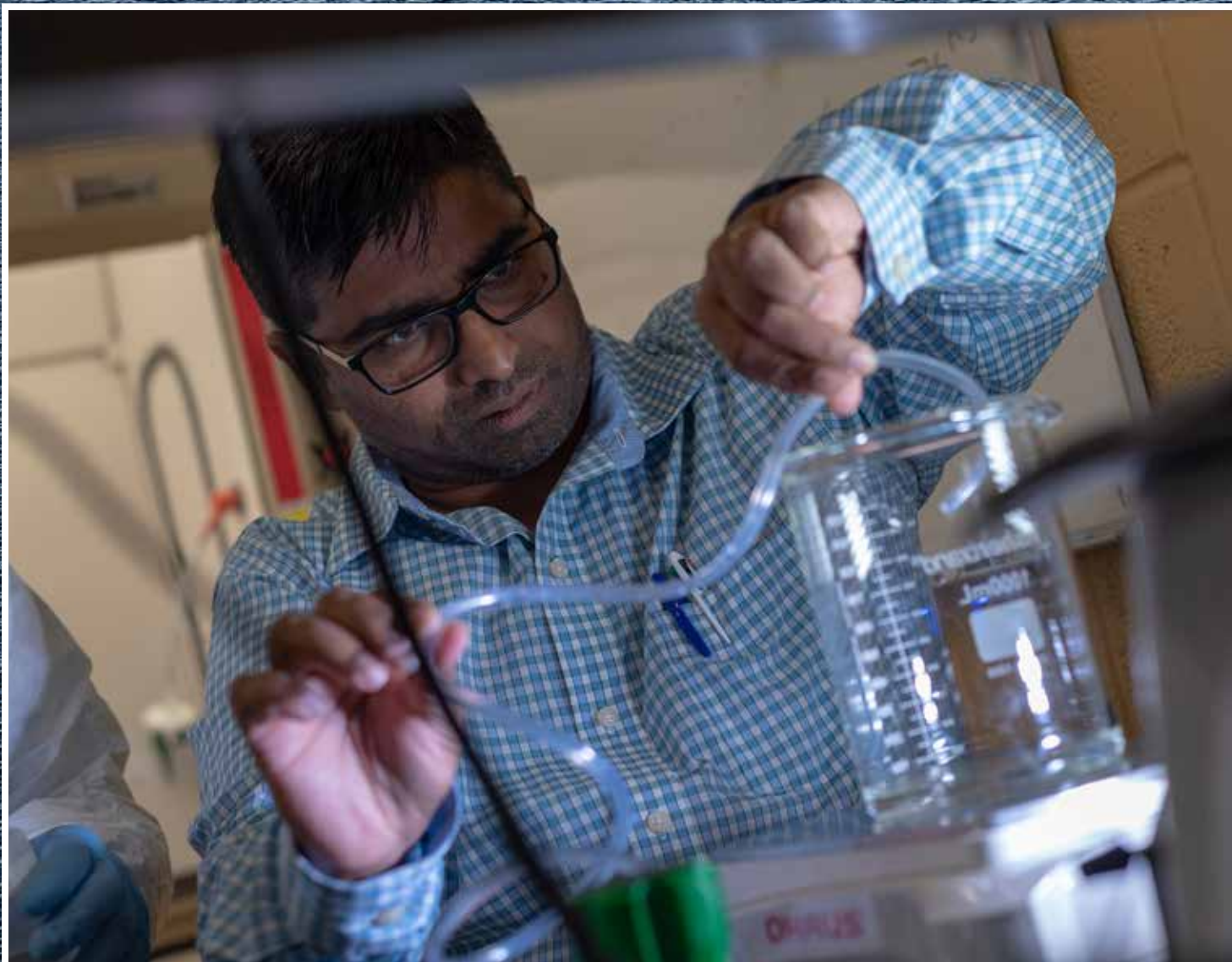
Professor **Mark Nelson**'s election to the National Academy of Sciences in 2019 celebrated the UVM chair of pharmacology's career-long quest to deepen our understanding of blood flow within the brain. "One discovery after another, this excitement never fades away, it increases," says Osama Harraz, a postdoctoral associate in Nelson's lab.

The role calcium plays in the complex communication happening among neurons, smooth muscle cells, and other cells is a particular focus for the team in his lab. The "information currency," Nelson says, of these cells is calcium. "If we can understand what it's doing, we'll be able to come up with some new ideas for treatments," of vascular diseases like strokes and dementia.

Election to the National Academy of Sciences is the latest in a string of honors Nelson has received over his career—from the National Institutes of Health, the American Society for Pharmacology, and the American Physiological Society, among others.

"Mark's discoveries have set the investigative direction for researchers around the world," says David Warshaw, chair of molecular physiology and biophysics, who championed Nelson's election to the National Academy.

SALLY MCCAY



**“SEVENTY PERCENT
OF THE PLANET IS
COVERED WITH
WATER—AND WE’RE
RUNNING OUT OF
DRINKING WATER.”**

APPALA RAJU BADIREDDY



Water, Water Everywhere

ENGINEERING FILTRATION SYSTEMS TO MEET THE
GLOBAL CHALLENGE OF WATER SCARCITY

BY JOSHUA BROWN

THE ORIGINS OF WATER remain a mystery. In the earliest history of Earth, our planet was too close to the hot sun for oceans to have condensed. Instead, water must have been carried to our rocky planet later, probably from the cold outer reaches of the solar system. So, it may be that a rain of comets, water-packed meteoroids, or minor planets called “trans-Neptunian objects,” crashed down with the water that now gives us rain.

This alien origin of water, the most intimate substance of life, is a strange irony of our liquid-coated planet. A second irony is that we’re running out.

“Think about it,” says engineering professor **Appala Raju Badireddy**, “seventy percent of the planet is covered with water—and we’re running out of drinking water.”

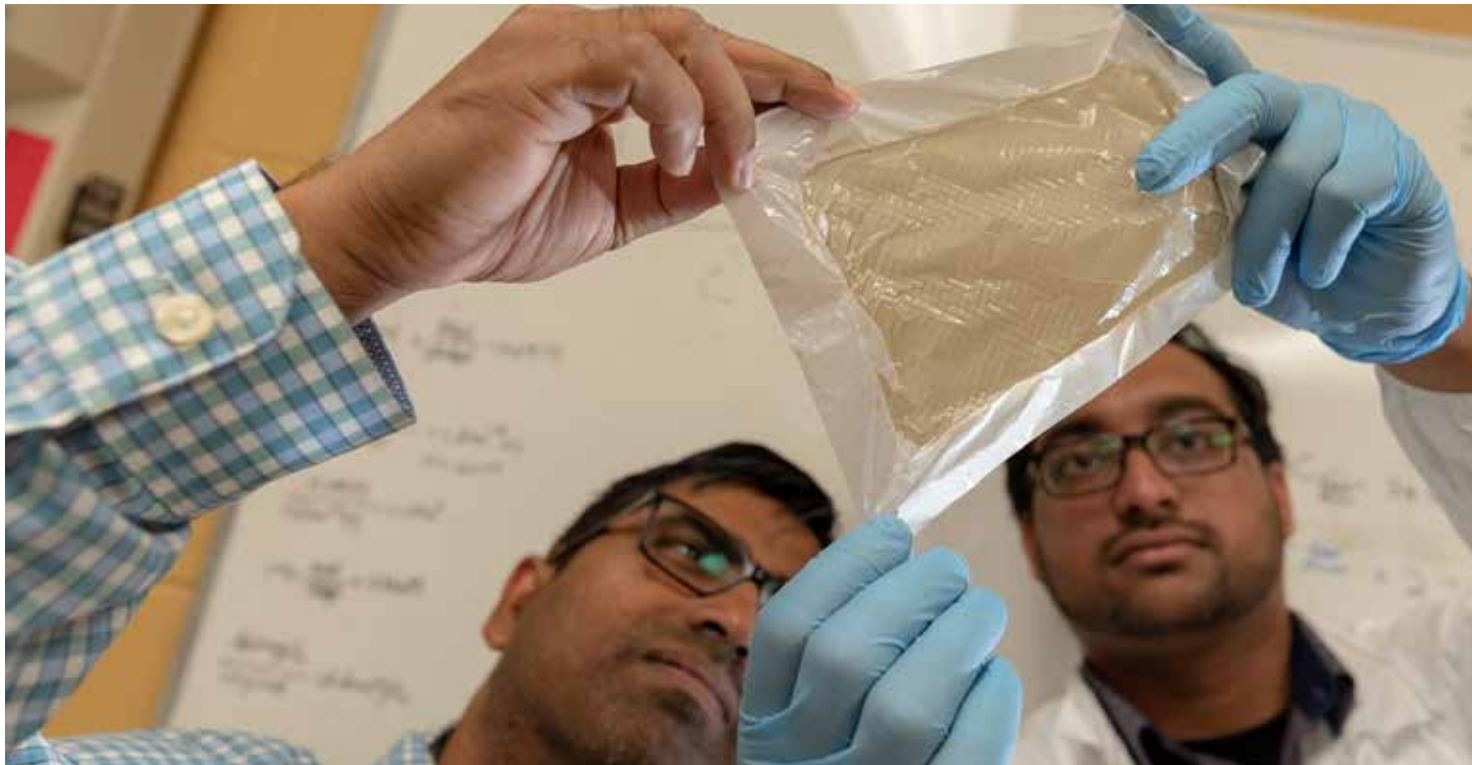
He’s leading a research effort to help solve that problem. As the director of UVM’s Water Treatment and Environmental Nanotechnology Laboratory, he and his students are designing and creating a new generation of filtering membranes to make clean water—quickly and cheaply. As identified by the U.S. National Academy of Engineers, “providing access to clean water” is one of the twenty-first century’s engineering grand challenges.

A membrane is, in some ways, simple: it’s a barrier with holes. If the holes—the pores—are of a certain size they’ll keep out bulk items, like grains of sand. If they’re smaller, they can keep out microscopic threats, like parasites. Smaller still, viruses. And, below the nanoscale, molecular filtration membranes can separate out dissolved substances, like toxic chemicals or the salt in seawater.

“It’s a nearly perfect technology,” says Badireddy. “You can capture pathogens. Without adding any chemicals, you can make seawater, or even sewage, drinkable.” Indeed, in Singapore about a third of the drinking water supply comes from membrane-filtered sewage. “It comes straight from the toilet and it’s completely safe,” he says. And many other places in the world from Florida to California, Saudi Arabia to India, have major investments in desalination plants that use membranes to extract drinking water from the ocean.

Except that membranes have one central flaw. “They clog,” says Badireddy. “Everything clogs the pores.”

But what would happen if you put an electrical field really close to a membrane surface—or run current through the membrane itself—and polarized it? Badireddy asked himself that question and discovered a powerful, low-cost repellant to keep membranes clear of a host of materials that can clog them. “Everything in the water is charged,” Badireddy explains, “it’s all negatively charged or positively charged.” Using an alternating field, that flips its charges very frequently, attracts both positive and negative particles. This oscillation—pushing bits of waste or bacteria back and forth—keeps them in suspension while the water passes through the membrane.



“And then the contaminants get carried away during the crossflow,” Badireddy says, a bit like leaves that wash over and past a storm drain while the rainwater pours down.

Early in the spring of 1993, people all over Milwaukee, Wisconsin, began to get sick. They came down with stomach cramps, diarrhea, and fevers. Over about two weeks, more than 400,000 people became ill. It turned out that the city’s water purification plant on Howard Avenue was contaminated with a parasite called cryptosporidium, probably from cattle farm runoff. The plant was treating its water with chlorine, polyaluminum chloride, rapid mixing, mechanical clumping, and sand filtration.

But none of this was sufficient to stop the parasite that caused the largest waterborne disease outbreak ever documented in the history of the United States.

“Now we know that cryptosporidium can be very resistant to chlorine,” says Badireddy, “and after that incident in Milwaukee, membrane technology boomed.”

In the nearly thirty years since, a range of membrane-based filtration systems have come to market. But nearly all of them are made of some kind of polymer or ceramic. “The membranes that are commercially available today are passive, very inert,” Badireddy says. “So how can I apply electrical fields on them if they have insulator-like behavior?” he asks. “How can I induce fields easily with low voltages?”

He needed some new materials. “That’s where nanotechnology comes into the picture,” Badireddy says. A core project of his UVM lab in Votey Hall is transforming conventional polymeric membranes into electrically con-

ductive ones. “So how do we do that?” he says. “With nanomaterials such as graphene and carbon nanotubes.” These bizarre forms of pure carbon—in two-dimensional sheets of interlocked atoms and straw-like hollow tubes with walls just one atom thick—are extremely strong, can create vanishingly small pores, “and they have very good electrical conductivity,” he says.

Badireddy and his graduates students in the College of Engineering and Mathematical Sciences—including doctoral candidates **Kamruzzaman Khan** and **Yuxiang Shen** and master’s student **Logan Werner ‘18**—take powdered bits of graphene and nanotubes and disperse them, re-engineering commercial polymers. The result is a new class of experimental, electrically-conductive membranes.

“If we can address the fouling or the clogging problem with membranes, that is huge,” Badireddy says. “It would be a revolutionary advance in the membrane field.”

On a fall afternoon in the lab, Badireddy and Khan are putting one of their experimental membrane filters through some tests. Later in the week, officials from the Vermont Agency of Natural Resources will be stopping by to get a tour of the new technologies.

“What’s the field strength?” Badireddy asks, as he adjusts some wires and hoses that flow into a glass box that looks like an aquarium with a mysterious electronic panel on top. “Sine wave and one megahertz. Twenty-four volts.” Khan replies. “That’s too high,” Badireddy says. “If it’s too fast, it will not be oscillating. You have to find the resonant frequency that will keep things in suspension.” He and Khan talk through some

calculations to find the needed frequencies for different sizes of contaminants: “do one for globular protein, one for bacteria—about one micron—, one for viruses, one for calcium ions,” Badireddy says.

But their real target with this particular membrane system is phosphorus—to help farmers and Lake Champlain. Phosphorus is a key nutrient for agricultural plants, but also a persistent pollutant in lakes and streams that contributes to eutrophication and toxic algae blooms. Badireddy wants to use membrane filtration to capture phosphorus in the water—and return it to the farm before it reaches the lake. Khan holds up a small round dish that glints under the fluorescent lights. “Do you see the crystals? That’s struvite,” Khan says.

“Those are made from phosphorus in the wastewater,” Badireddy says. “We can use them directly as fertilizer.” When the membrane system is tuned correctly, it oscillates the phosphorus crystals as they form in the water, letting clean water flow through while collecting struvite: recycled plant food. “This approach could benefit Vermont farmers and wastewater treatment facilities,” Badireddy says. “It’s resource recovery. The difference between pollution and a resource is often just where something’s located.”

Dirty water can be dirty in many ways. And fouling of membranes can occur when contaminants of many sizes deposit on the membrane surface. “In water there is so much stuff!” Badireddy says. “Dissolved molecules, viruses, bacteria, particles, sand you can see,” he says. Which is why he and his team are developing membrane systems that use a combination of types of fields. “Electrical, yes, but also magnetic and acoustic fields,” he says.

One of his students is trying to better understand the synergy between electrical fields and acoustic ones. “He applies an electrical field to pull a lot of stuff away from the membrane, but, still, heavy pieces deposit on the membrane,” Badireddy says. To dislodge these large particles, before they’re too stuck in the pores, he sends a powerful sound wave. “It works. They hop off the surface of the membrane,” Badireddy says.

For much of the world, a high-tech membrane filter will need to be married with low cost and easy operation. “If this requires huge amounts of electricity, there’s no way it’s going to fly,” Badireddy says, whether for use in the developing world where drinking water is scarce or for military use, where sterile water is needed for battlefield surgeries. “These things can be connected with solar power because we are dealing with extremely low current,” he says, “just a few minivolts and no harsh chemicals.”

“The amount of water on the planet is constant,” Raju Badireddy says. “But the challenge for the twenty-first century is rising water scarcity and rapidly deteriorating water quality. We need to use water—and reuse it.”

TRANSDISCIPLINARY H2O

Not only is water essential to life, but “water is the driving force of all nature,” Leonardo da Vinci famously wrote. It makes blood, builds clouds, tears down mountains, shapes politics, drives warfare, and, of course, crowns Vermont as one of the world’s great skiing destinations. “It may be that UVM’s longest and strongest suite of research efforts is on water,” says Richard Galbraith, the university’s vice president for research. Over fifty faculty members across six colleges and nineteen departments lead water research projects. These range from tracking trout with acoustic tags at the bottom of Lake Champlain to tracking stormwater as it flows down from the top of Mount Mansfield; from improving freshwater management in Madagascar to measuring melting tundra in Alaska. Across the university, aquatic ecologists, food scientists, hydrogeologists, foresters, climate change modelers, groundwater engineers, water diplomacy specialists, rural economists, infectious disease physicians, and other experts are not only diving deep into the details of water’s myriad values and movements—they’re building a truly transdisciplinary set of discoveries to help people and all life on this blue planet. With more than thirty-four grants drawing more than \$7 million in support each year, UVM leads in exploring the depths of water.

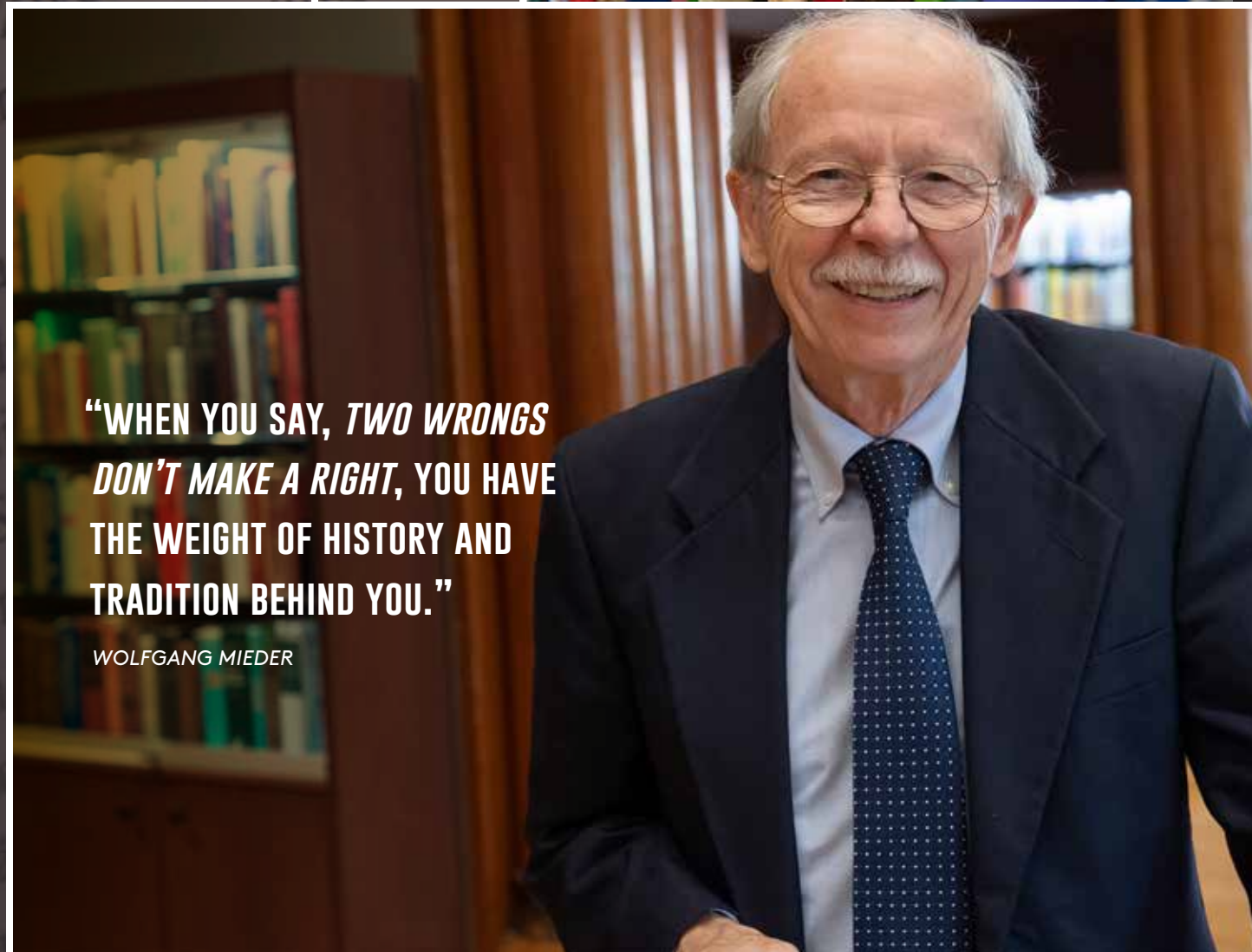
A WRITER'S CHALLENGE

"I am most interested in blackness at its borders, where it meets whiteness, in fear and hope, in anguish and love, just as I am most drawn to the line between self and other, in family, friendship, romance, and other intimate relationships. Blackness is an art, not a science. It is a paradox: intangible and visceral; a situation and a story. It is the thread that connects these essays, but its significance as an experience emerges sometimes randomly and unpredictably in life as I have lived it."

A professor of critical race and ethnic studies and the inaugural Julian Lindsay Green and Gold Professor of English, **Emily Bernard** confronts difficult topics like race, identity, family, and history in both her teaching and writing. She's authored books about Carl Van Vechten, a white man who played a role in the Harlem Renaissance; former first lady Michelle Obama; successful and meaningful interracial friendships; and, with her widely praised 2019 book, *Black Is the Body: Stories from My Grandmother's Time, My Mother's Time, and Mine* (quoted above), her own experience.



ANDY DUBACK



**“WHEN YOU SAY, *TWO WRONGS*
DON’T MAKE A RIGHT, YOU HAVE
THE WEIGHT OF HISTORY AND
TRADITION BEHIND YOU.”**

WOLFGANG MIEDER

King of Proverbs

BILLINGS LIBRARY IS A FITTING HOME FOR THE RESEARCH
COLLECTION AND SCHOLARLY LEGACY OF WOLFGANG MIEDER

BY JEFFREY WAKEFIELD

OF ALL PEOPLE, **Wolfgang Mieder** would seem to deserve the peace of mind that comes from hard work and goals accomplished.

Over his nearly half century at UVM, the gregarious German professor has written or edited well over two hundred books and published more than five hundred articles on proverbs, his academic specialty. For decades, he’s produced *Proverbium*, a massive annual of proverb criticism. He’s given hundreds of talks in two dozen countries and been honored with no fewer than six *festschriftenn*, collections of essays written by scholars commemorating a fellow expert.

But for a good decade, Mieder has been troubled.

The source of his worry? A bulging addition to his home, the largest room in the house, that held—in floor-to-ceiling shelves covering all four walls—the massive array of proverb collections and proverb studies he had accumulated across five decades.

It wasn’t the strain on the domestic infrastructure caused by his habit of adding one hundred new books a year that was making him anxious; it was what would happen to all those volumes in the future. Mieder turned seventy-five this year.

“It was such a unique library, I didn’t want it to be dispersed,” Mieder says. “That was my big worry—seeing the books end up at some book sale, selling for a dollar apiece.”

That would be a significant loss, and not just for sentimental reasons. In the last few years, proverb scholars from around the world have trooped to Mieder’s home in Williston to access his proverb collections in twenty-plus languages and dip into studies with titles like *The Adages of Erasmus* and “*Right Makes Might*”: *Proverbs and the American Worldview*, Mieder’s latest.

The logical way to preserve such a treasure would be to transfer it to the special collections department of a university. But time and again, at universities abroad and in the United States, including UVM, Mieder heard the same story—his collection was too much of a good thing.

No one had the space.

If a bulging book collection in serious need of a home is the end phase of a celebrated scholarly career, how did things begin?



After earning a PhD from Michigan State University in German literature in 1970, Mieder thought he'd be content to live the life of a traditional German professor. "I love teaching German and always have," he says. But after joining UVM's German and Russian Department the next year, he began to expand his horizon.

"I thought my career could be broader and more international if I used my language skills"—he speaks three languages fluently and can get by in another half dozen—and brought them to bear on what was becoming a scholarly specialty, proverbs, the subject of his PhD dissertation and of several papers he'd published in German.

His CV shows that Mieder leapt into the life of proverb scholarship with a vengeance. By his mid-twenties, he had already published several books, in English as well as German, and numerous articles on his specialty.

It helped that Mieder found proverbs—which he defines as distilled generalizations and observations of human behavior and experiences expressed so concisely they are easily repeated—to be endlessly fascinating.

For starters, they span the history of human civilization, he will tell you. The first recorded proverbs—including *Big fish eat little fish* and *One hand washes the other*—were etched in cuneiform on Sumerian tablets about 2500 B.C.E.

Antiquity was a golden age for proverbs, giving rise to

many gems still in use today, from *Times flies* to *Many hands make light work*.

"Then there are the ones that all of us like so very much that got their start in medieval Latin and were translated to other languages," Mieder says, like *Strike while the iron is hot* or *When the cat's away, the mice will play*.

Humans have been spouting proverbs since time immemorial for several reasons, Mieder says. Importantly, they lend an air of authority.

"It isn't just the speaker saying something," he says, "When you say, *Two wrongs don't make a right*, you have the weight of history and tradition behind you. It gives your words extra force."

One thing proverbs don't represent, Mieder says, is absolute truth. The proof? They often contradict one another.

The most famous pair of contradictory proverbs, Mieder says, is *Out of sight, out of mind* and *Absence makes the heart grow fonder*.

"We pick the proverb that fits a particular case," he says. "If a relationship a young daughter or young son is in breaks up, what should the mother or father say to console the youngster? You might say, *Out of sight, out of mind*, or you could say, *Absence makes the heart grow fonder*. It all depends what message you want to send."

One of Mieder's favorite areas of inquiry is what he calls

the "anti-proverb," a term he coined that has become so useful to proverb scholars, it now merits its own Wikipedia entry. "Proverbs can be played with," he explains, so their meaning is subverted or changed entirely. Advertising copywriters have long made great use of this technique, often for comic effect.

But there are more serious uses of anti-proverbs, too. "We all know the proverb, *Nobody is perfect*; we've said it a thousand times," Mieder says.

"But if you just take the word nobody and split it, you all of a sudden have *No body is perfect*. And that is, of course, a completely different meaning," one that has been adopted by feminists, among others.

Contemporary proverb scholarship includes examining the increasing influence of American proverbs spinning out worldwide on the wings of pop culture and modern media. Mieder counts *There's no such thing as a free lunch* and *Garbage in, garbage out* as distinctly American proverbial wisdom. He finds that development "exciting," not because he is a cultural imperialist, "but because you can now study the dissemination of proverbs."

While research, including his own, shows that young people use fewer proverbs than earlier generations, Mieder is skeptical of those results. It's true that "they don't use traditional proverbs as much as the older generation did. But the modern generation also has its own proverbs."

He has that fact on good authority. In the proverb course he's taught to UVM undergraduates over the past decade, Mieder challenges his students to identify new proverbs. Some of his favorites gathered over the years? *There's an app for that*. *Sun's out, guns out*. And the snowboard-culture inspired *Go big or go home*.

Of course, to do all of that scholarship—across time and cultures—requires access to scholarly materials, especially for a scholar as exacting as Mieder.

"If you really want to become an expert in something, you've got to stick with the program," he says, referring to the books and articles he amassed year after year. "If I write an article, and I know that there's this little note in a book somewhere in distant Australia, then I need to get it before I write because it might be relevant."

All that care resulted in a huge oeuvre of first-rate work—and a household library groaning with books and articles.

The topic of what would happen to his collection, in light of the polite rejections he'd received from libraries around the

world, was never far from Mieder's mind. And he wasn't above giving voice to his worries with his friends, some of whom—like Leslie and Tom Sullivan, UVM's former president—were not only sympathetic, but in a position to help.

After hearing Mieder's tale of woe at lunch one day, Sullivan paid a visit to then library dean Mara Saule and Special Collections director Jeff Marshall. Saule and Marshall, Sullivan knew, had a challenge of their own—how best to stock shelves in the recently re-opened Billings Library North Lounge space.

Sullivan sensed a fit. Mieder's books could be a top-drawer working collection, a scholarly complement to hallowed Billings, but wouldn't require the same level of security and climate control of volumes in the permanent collection.

Within a week, his collection of eight thousand volumes—six thousand from Mieder's home and another two thousand in a proverb archives housed near his office in Waterman Building—had taken up residence in Billings, moved in two giant truckloads and fastidiously placed on the shelves in careful order by Mieder and three library staff.

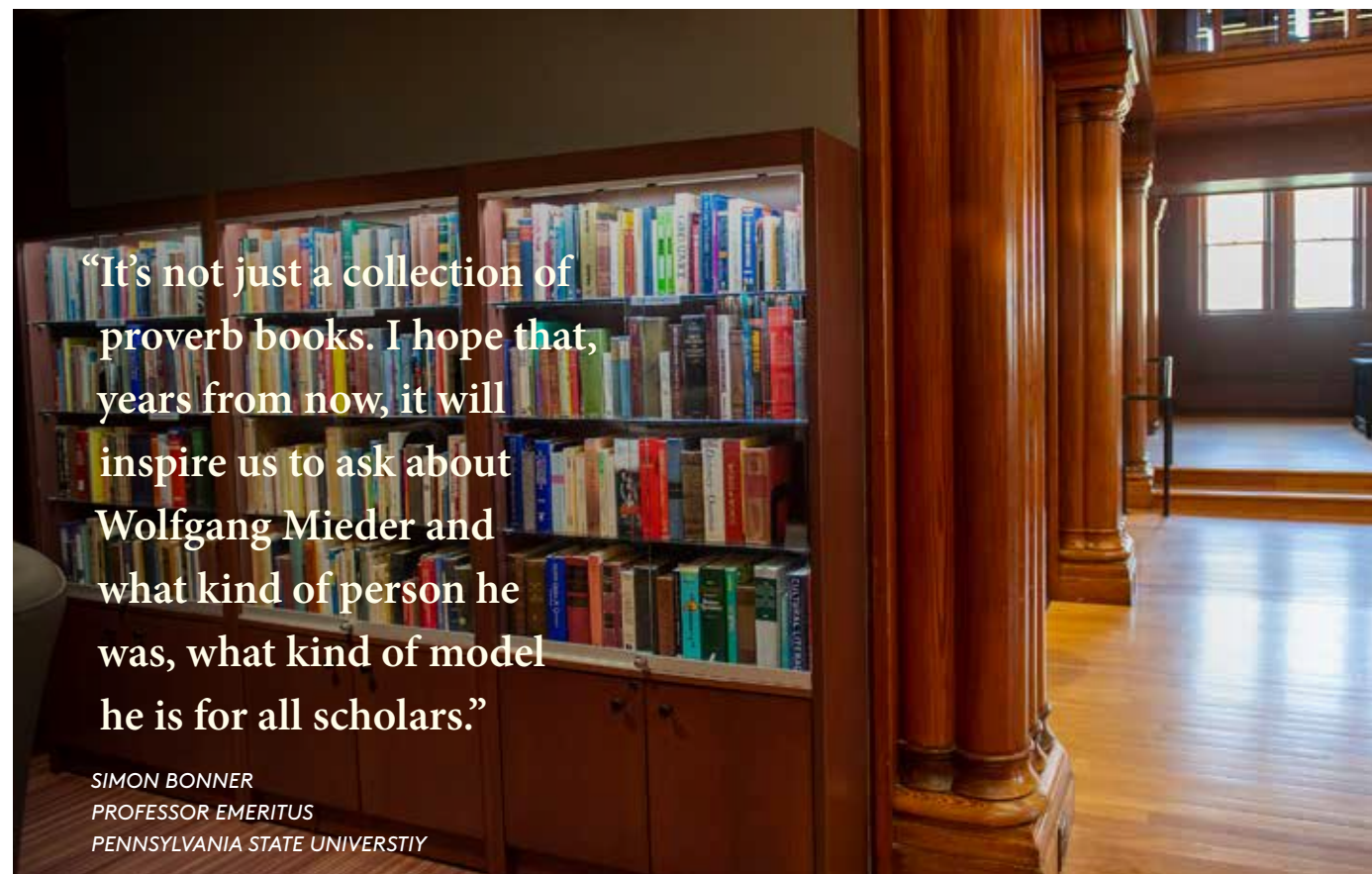
The Wolfgang Mieder International Proverb Library, the only one remotely like it in the world, officially opened in May 2019.

For Mieder, the worry is gone. "It's a dream come true, and I couldn't be more grateful," he says.

It couldn't have happened to a nicer, or a finer, scholar, say his peers.

"He is the king, the world's leading proverbs scholar," says Dan Ben-Amos, professor of Folklore, Asian and Middle Eastern Studies at the University of Pennsylvania, and a top proverb scholar in his own right.

Simon Bonner, professor emeritus of American Studies and Folklore at the Pennsylvania State University and currently dean of the College of General Studies at the University of Wisconsin-Milwaukee, goes further. He calls Mieder's proverb library "a monument to one of history's great scholars. It's not just a collection of proverb books. I hope that, years from now, it will inspire us to ask about Wolfgang Mieder and what kind of person he was, what kind of model he is for all scholars."



STRONG AS SILK

In 2001, conducting field work as a George Washington University graduate student, **Ingi Agnarsson** and fellow student Matjaz Kuntner came upon enormous, orb-shaped spider webs stretching across a river in the jungle of Madagascar. Collecting specimens of the spiders and their webs, they were unaware they had discovered a new species. Years later, they would publish their first work on the spiders, giving them the scientific name *Caerostris darwini* in honor of Charles Darwin.

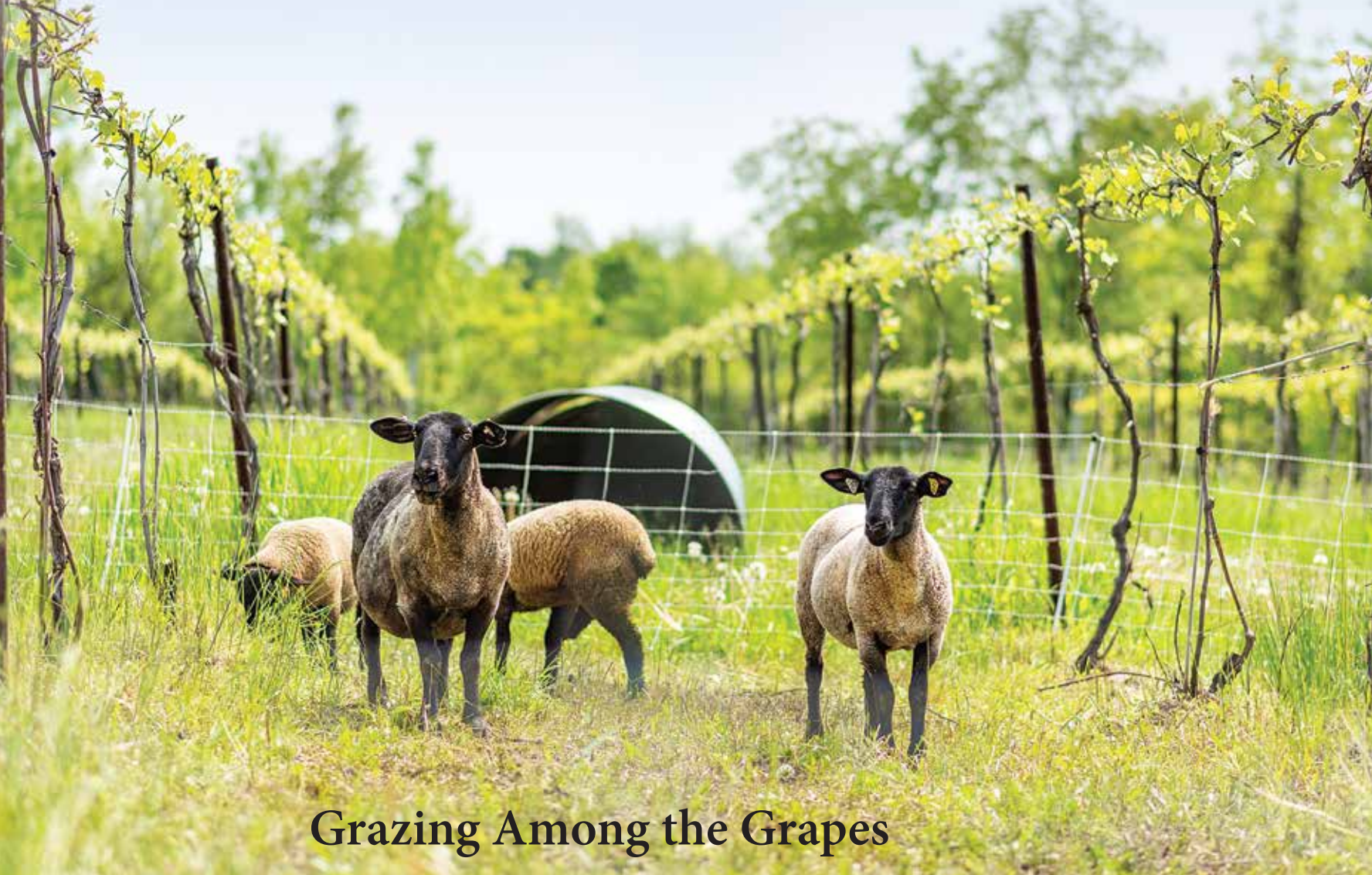
Agnarsson is now a professor of biology at UVM; Kuntner, now director of the National Institute of Biology in Slovenia; and their eight-legged discovery, now known commonly as Darwin's bark spider. The scientists, with the support of \$900,000 in grant funding from the National Science Foundation, and colleagues continue to probe the mysteries of this species and its silk, exceptional for strength and stretch, the toughest organic material in nature. Long range, the research may yield profound insights into the evolution of silk and radical design principles for a new generation of biologically inspired fibers, with uses such as better sutures for surgeons or safer armor for police officers.

JOSHUA BROWN



AMERICAN LAND GRANT

BRINGING THE ASSETS OF OUR UNIVERSITY TO BEAR ON OUR COMMUNITY



Grazing Among the Grapes

THE FIVE SUFFOLK SHEEP grazing contentedly between the rows of grape vines at Shelburne Vineyard are at the heart of a research project seeking to quantify the benefits of a symbiotic agricultural practice long-used in countries such as New Zealand, where both sheep and vineyards are plentiful.

Standard practice down under, but unconventional in Vermont, and under study thanks to a collaboration among UVM researchers **Meredith Niles** and **Juan Alvez**, Shelburne Vineyard winemaker Ethan Joseph, and Greylaine Farm owner Mike Kirk.

Niles, assistant professor of food systems, has been investigating the practice in New Zealand, where an estimated 59 percent of vineyards are integrating sheep. Niles's research

has shown the practice has resulted in substantial savings for farmers—reducing or eliminating mowing, pesticide, and feed costs—and identified potential benefits to the soil and ecosystem. Some wineries have also started incorporating the sheep into their branding message, a potential selling point as more consumers seek sustainably produced wine.

“What we’re doing in Vermont is actually really unique,” says Niles, a fellow of UVM’s Gund Institute for the Environment. “We designed the study to look at the whole system—the health of the grapes, the animals, the forage and soil, as well as the consumer perceptions, or marketability potential. The existing research on this work has largely looked at these different components in pieces, rather than trying to understand all of these interactions together.”

JOSHUA BROWN



HELPING BRIDGE THE BORDER DIVIDE

As an assistant professor of history, **Sarah Osten** focuses upon modern Latin America and has taught courses exploring issues of drug trafficking

and gang violence that plague some Central American countries. As a volunteer, she spent a week in October 2018 gaining a firsthand look at the realities of lives in these troubled regions through work helping immigrant families.

Working with the Dilley Pro Bono Project, an offshoot of the Immigration Justice Campaign, Osten assisted families seeking U.S. asylum at the South Texas Family Residential Center in Dilley, Texas. Fluent in Spanish, she spent twelve-hour days interpreting detainee stories for volunteer attorneys versed in immigration law. Then she dispensed legal advice back to the detainees, most of them from Honduras, El Salvador, and Guatemala.

Osten's perspective from the time in Texas helped inform her teaching, and she drew on help from her students in developing a website providing background for attorneys representing asylum seekers. “As a historian working with this volunteer team in Texas, I had many people asking questions like: ‘What is the origin of Mara Salvatrucha (MS-13)?,’ and ‘Why are there so many gangs in El Salvador?’” Osten says. “I think making this resource available will help provide attorneys with important context for their work.”

PATRICK LANGLOIS '19



SPECIAL ED FUNDING: TOO COMPLICATED TO FIX?

“We don’t actually know how much we spend on special education for children with disabilities in this country,” says **Tammy Kolbe**, faculty member in the College of Education and Social Services and an expert on educational policies and resources. “Taxpayers should find that really disturbing.” According to her research, the most reliable cost estimate is nearly twenty years old and outdated by current classroom practices and technologies. A recent policy brief she wrote for the National Education Policy Center calls out serious challenges surrounding special education, like sticker shock and a litany of complicated legislations, that make it nearly impossible for policymakers to improve the broken system.

“How do we do a better job being effective and fair with the dollars so that certain districts aren’t burdened with costs and potentially jeopardize whether students with disabilities have access to the services they need?” Kolbe asks. The short answer: “This brief is a place to start.”

Kolbe points to specific actions that policymakers can take to begin moving the system in a better direction immediately. At the top of her priorities: creating a new data source that monitors special education spending and provides periodic benchmarks of the costs. She also suggests dividing special education funds fairly among states and districts, and implementing flexible funding.



Artist and Citizen

Mildred Beltré’s neighborhood in Crown Heights, Brooklyn, has it all: the sprawling greenery of Prospect Park, world-class art and events at the Brooklyn Museum, beautiful brownstones around every corner, and nearly any cuisine one could crave—all within walking distance. But after twenty years in her apartment, the native New Yorker and UVM professor of drawing and printmaking says the rest of the borough has finally caught on. Gentrification is rapidly transforming Crown Heights.

For longtime residents like Beltré and Oasa DuVerney, a fellow teaching artist in Beltré’s building, the influx of people and renovations that come with gentrification create a revolving door of fleeting neighbors and businesses, a vulnerability to rent inflation and landlord corruption; increased policing; and a sense of mistrust and suspicion. But the duo isn’t letting their block on Lincoln Place get swallowed up by Brooklyn’s growing hipster scene so easily.

Nearly ten years ago, the two artists

took their art supplies, pop-up tents, tables, and chairs out to the sidewalk in front of their building. Together, they hoped to attract curious passersby and befriend their neighbors while they made art. Since then, the “Unofficial Official Artists in Residence” of Lincoln Place have evolved the experiment into Brooklyn Hi-Art! Machine, a collaborative public art project that builds gentrification resilience and community on their block through art.

She and her neighbor have taught mediums like weaving, dance, sculpture, drawing, and silk screening to their community; they’ve planted gardens and invited guest artists to create site-specific installations on their block; and have hosted barbecues and tenants’ rights meetings through BHAM. Beltré, DuVerney, and BHAM’s work was recently displayed by the Brooklyn Museum, has appeared in the Brooklyn Children’s Art Museum, and has been awarded a Brooklyn Community Foundation grant to support neighborhood strength.

MAKING CLIMATE CHANGE PERSONAL

CLIMATE LEADERS, international ambassadors, and teen activists from around the world gathered at the United Nations in April 2019 for a panel highlighting the unique role of women and parents in developing innovative climate solutions.

Organized in partnership with DearTomorrow, an organization co-founded by UVM behavioral and environmental economist **Trisha Shrum**, the event aimed to relaunch an international “Our Kids’ Climate” coalition to mobilize parents, grandparents, and families around the world to take action in their own lives, in their communities, and to push for serious political action around climate change.

“Fighting for our children’s future is a core, primal instinct that crosses all political and social boundaries,” says Shrum, a professor in the Department of Community Development and Applied Economics and mother of two. “The work of DearTomorrow and Our Kids’ Climate aims to leverage the universal power of parental love across the globe to push back climate change.”

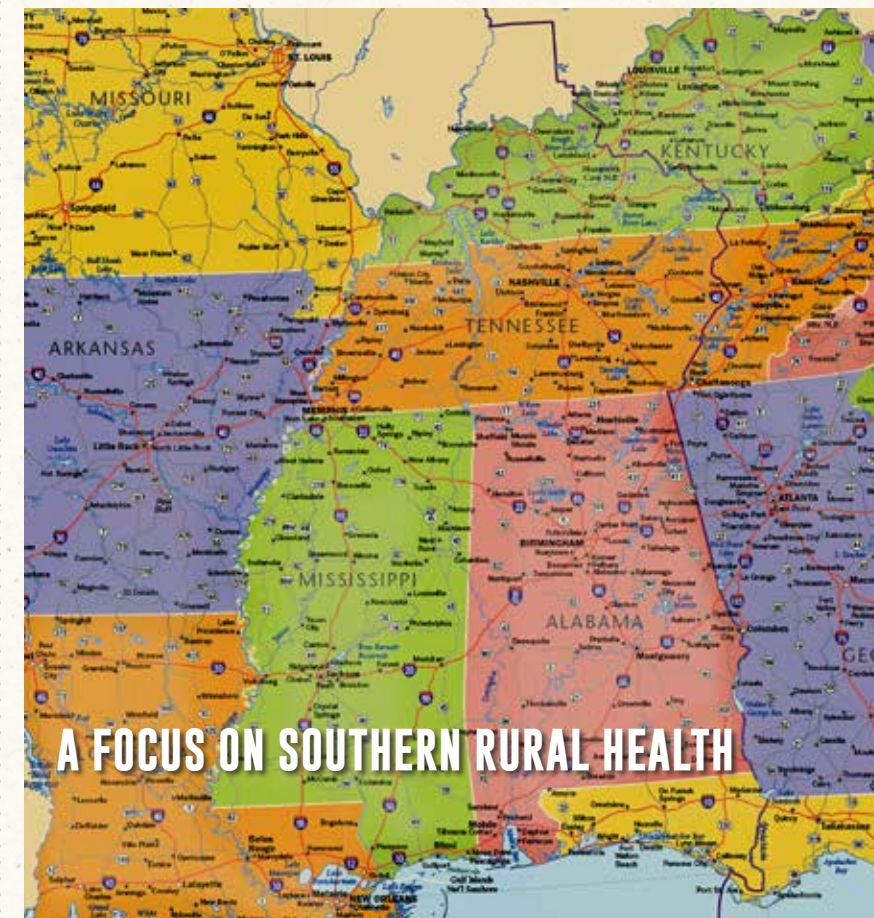
Shrum began conducting transdisciplinary research on behavioral science and climate communication while receiving her PhD at Harvard University. Her research, as well as the birth of her first child, motivated her to start DearTomorrow with Harvard colleague Jill Kubit. Their goal is to open up conversations across generations about why climate change is important in order to create the cultural shift necessary to transition to a world fueled by renewable energy.

DearTomorrow functions as a digital archive that gives people the opportunity to write messages to their children and grandchildren about climate change that can be accessed when their children are grown. The messages are shared through social media, traditional media, and community art.

dear my grandchildren,

I pledge to work hard to make the Earth a better place for all of you.

by Anonymous



WHY ARE SOME PEOPLE born in the rural South of the United States less healthy and prone to die sooner?

Researchers from the Larner College of Medicine are participating in a new longitudinal cohort study aimed at finding answers to this question. The Risk Underlying Rural Areas Longitudinal Study (RURAL) hopefully will lead researchers to learn what causes the high burden of heart, lung, blood, and sleep (HLBS) disorders in Kentucky, Alabama, Mississippi, and Louisiana—and offer clues regarding how to alleviate them. UVM is one of twelve institutions participating in RURAL.

With funding from the National Heart, Lung, and Blood Institute, part of the National Institutes of Health, the six-year, \$21.4 million multi-site prospective cohort study will include fifty investigators from fifteen other institutions, including UVM University Distinguished Professor of Pathology and Laboratory Medicine **Russell Tracy**.

To better understand why certain factors amplify risk in some rural counties and what renders some communities more resilient, the researchers will be recruiting and studying 4,000 multi-ethnic participants from ten of the most economically disadvantaged rural counties in southern Appalachia and Mississippi Delta and parts of the rural South.

“RURAL is a unique opportunity to work with participants in economically challenged areas, people who have not had much opportunity to participate in NIH epidemiological studies,” says Tracy, who has more than thirty years of experience in population studies of heart disease, diabetes, and other chronic diseases of aging, and currently directs a national-level biorepository at UVM with more than 4.5 million biosamples.

Adapting to a Stormy Future

RESIDENTS AND PROPERTY OWNERS are more likely to adopt some green stormwater infrastructure practices if they have experienced flooding or erosion on their property or in their neighborhoods, according to recent UVM research. With the number of extreme precipitation events on the rise, the research, published in *Landscape and Urban Planning*, suggests more households will turn to ecologically friendly practices to manage and direct stormwater.

Importantly, successful adoption of these practices cannot depend on a one-size-fits-all approach, says the study's lead author **Sarah Coleman**. Rather, efforts to improve stormwater management should consider the specific needs and motivations of households in the context of their social, physical, and ecological landscape.

Coleman conducted the research while completing her PhD in ecological landscape design and environmental governance in the UVM Department of Plant and Soil Science. While at UVM, she was a graduate fellow of UVM's Gund Institute, and her research was supported by Vermont EPSCoR with funds from the National Science Foundation.

Together with UVM co-authors **Stephanie Hurley**, **Christopher Koliba**, and **Asim**



"Our research shows that students are deeply engaged by having more say in what and how they learn. They find a great sense of agency in doing real work that matters and that holds personal and social significance."

Professor Penny Bishop from an appearance on *The Conversation*. Together with fellow College of Education and Social Services faculty John Downes and Katy Farber, she is co-author of *Personalized Learning in the Middle Grades: A Guide for Classroom Teachers and School Leaders* (Harvard Education Press). Bishop is principal investigator at the Tarrant Institute for Innovative Education.

Zia from the College of Agriculture and Life Sciences and **Donna Rizzo** from the College of Engineering and Mathematical Sciences, she conducted a statewide survey of Vermont residents to evaluate how different factors, including past experience with stormwater and flooding problems, location within different towns and watersheds, and perceived barriers to adoption, impacted their likelihood to implement specific stormwater management practices, such as rain gardens, infiltration trenches, or diverting roof runoff.

The UVM co-authors conducted this research as part of a larger, interdisciplinary Vermont EPSCoR research team, including faculty, postdoctoral, and graduate student researchers from both the social and natural sciences, who study complex questions surrounding adaptation to climate change in the Lake Champlain Basin.

ANALYZING SPINAL CORD INJURIES WORLDWIDE

Taking the pulse of a public health issue is no small task. Just ask **Reuben Escorpizo**, who is heading up the U.S. portion of a twenty-three-country report on the global scale and effects of spinal cord injuries (SCI). "From a public health perspective, there needs to be a connection between what happens at the individual patient level and what is happening at the wider public health level. For us to do that, countries can't isolate their data. This project goes way back to efforts made by the World Health Organization," says the clinical professor of rehabilitation and movement sciences.

The International Spinal Cord Injury Survey (INSCI) asked Escorpizo, a member of the INSCI Scientific Committee, to join the four-year study and coordinate the dissemination, collection, and analysis of surveys across the United States. The surveys measure SCI patients' overall quality of life including physical and mental health, mobility, and social participation. Having completed the U.S. study and presented his findings to the UVM community, Escorpizo and his team of physical therapy doctoral student researchers are eager to see how the U.S. stacks up when it comes to this chronic disease and better understand how livelihoods could be improved.

"We'll be able to compare not only resources for patients, but the disability itself across countries and where it's more and less prevalent, and why," Escorpizo says. "We can learn from other countries, like those that have better transportation systems than the United States, for example. Having that big picture and broad overview allows us to do that."



Helping Small Farms Thrive

VERMONT HAS SEEN STRONG growth in the number of diversified farms and in value-added food production, as many American consumers have become more aware of where their food comes from and how it is produced. At the same time, challenges for small diversified farms continue to mount, from new crop pests and diseases to regulation, changing markets, and climate change.

To address these issues, the U.S. Department of Agriculture's Agricultural Research Service (ARS), in partnership with UVM, has established its first food systems research station designed specifically to study diversified food systems and the small farms that contribute to those systems.

The research station will identify factors that affect economic and environmental sustainability, with the goal of better understanding how small farms survive and thrive, and how consumers can best access local sustainably grown food.

The cooperative agreement, funded at \$3 million for the first year, provides for UVM faculty to collaborate with ARS researchers embedded on the UVM campus. The ARS Food Systems Research

Station agreement will be renewed annually for at least five years. As vice chair of the Senate Appropriations Committee, Senator Patrick Leahy authored language in a 2019 appropriations bill to establish and fund the UVM-ARS collaboration.

The goal of the project is to create tangible information farmers can understand and put to practical use to help them sustain their operations, **Jean Harvey**, interim dean of UVM's College of Agriculture and Life Sciences and a co-director of the project, said when the collaborative research station was announced in October 2019.

UVM faculty, in combination with ARS staff, are ideally suited to that task, Harvey said. "We have agricultural economists, dairy specialists, agronomists, experts who study environmental issues, data modelers, consumer preference specialists, and social scientists—all of them focused on Vermont's small farms and value-added producers," she said. "We believe the end-product of this joint project with ARS will have tremendous value for the small farm sector in Vermont, in the region, and across the country."



COMBATING RURAL ADDICTION

Drawing on the groundbreaking work being done at the University of Vermont and the UVM Medical Center to address opioid addiction in rural America, U.S. Sen. Patrick Leahy authored and included provisions in the fiscal year 2019 Labor-HHS Appropriations Act to provide \$20 million in new funding to establish three "Rural Centers of Excellence on Substance Use Disorders" around the country.

In August, Senator Leahy, vice chair of the Senate Appropriations Committee, announced that UVM will host one of those centers, receiving \$6.6 million from the U.S. Department of Health and Human Services via the Health Resources and Services Administration's Rural Communities Opioid Response Program for Rural Centers of Excellence on Substance Use Disorders.

The University of Vermont Center on Rural Addiction will implement the rollout of three strategic priorities including surveillance, education and outreach, and technical assistance to rural communities. Its principal investigator, **Stacey C. Sigmon**, is a clinical opioid researcher in the Larner College of Medicine who has conducted opioid and other addiction research at UVM for three decades.

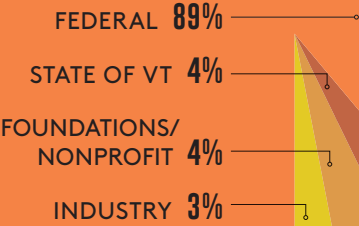
THE NUMBERS

EXTERNAL FUNDING

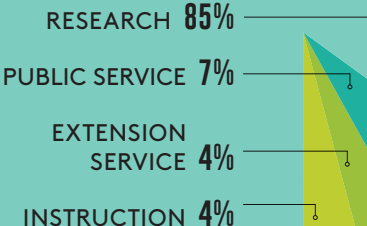
631 AWARDS RECEIVED

\$144M TOTAL FUNDING

AWARDS BY SPONSOR



AWARDS BY PURPOSE



OUR COMMUNITY

FACULTY

1,692

FULL- AND PART-TIME

ENROLLMENT

10,700

UNDERGRADUATE

478

MEDICAL

1,627

GRADUATE

40%

UNDERGRADUATE PARTICIPATION IN RESEARCH

GRADUATE EDUCATION

54

MASTER'S DEGREE PROGRAMS

8

INTERDISCIPLINARY GRADUATE PROGRAMS

26

DOCTORAL PROGRAMS

1

MD PROGRAM

UVM Inquiry 2020: Research, Scholarship, and the Arts at the University of Vermont is a publication of the Office of the Provost and the Office of the Vice President for Research

SURESH GARIMELLA
PRESIDENT

PATRICIA PRELOCK
PROVOST AND SENIOR VICE PRESIDENT

UNIVERSITY OF VERMONT DEANS

COLLEGE OF AGRICULTURE AND LIFE SCIENCES
JEAN HARVEY (INTERIM)

COLLEGE OF ARTS AND SCIENCES
WILLIAM FALLS

COLLEGE OF EDUCATION AND SOCIAL SERVICES
SCOTT THOMAS

COLLEGE OF ENGINEERING AND MATHEMATICAL SCIENCES
LINDA SCHADLER

GROSSMAN SCHOOL OF BUSINESS
SANJAY SHARMA

LARNER COLLEGE OF MEDICINE
RICHARD L. PAGE

COLLEGE OF NURSING AND HEALTH SCIENCES
SCOTT THOMAS (INTERIM)

RUBENSTEIN SCHOOL OF ENVIRONMENT AND NATURAL RESOURCES
NANCY MATHEWS

CONTINUING AND DISTANCE EDUCATION
CYNTHIA BELLIVEAU

GRADUATE COLLEGE
CYNTHIA FOREHAND

UNIVERSITY LIBRARIES
BRYN GEFFERT

EDITOR

THOMAS WEAVER
University Creative Communications

ART DIRECTOR

ELISE WHITEMORE
University Creative Communications

EDITORIAL COMMITTEE

RICHARD GALBRAITH
DAN HARVEY
EDWARD NEUERT
AMANDA WAITE
JEFFREY WAKEFIELD
THOMAS WEAVER
ELISE WHITEMORE

CONTRIBUTING WRITERS

JOSHUA BROWN
KAITIE CATANIA
KEVIN COBURN
DANIEL KIRK
RACHEL LESLIE
JENNIFER NACHBUR
BRIAN OWENS
ARNO ROSENFELD
JEFFREY WAKEFIELD
BASIL WAUGH
THOMAS WEAVER
SARAH ZOBEL

CONTRIBUTING PHOTOGRAPHERS

JOSHUA BROWN
BEAR CIERI
CAT CUTILLO
GERRY DINCHER
ANDY DUBACK
CONSTANZIA HEVIA
IAN THOMAS JANSEN-LONNQUIST '09
SALLY KEITH
CALEB KENNA
PATRICK LANGLOIS '19
SALLY MCCAY
WILLIAM MCDOWELL
LESLIE SINCLAIR
KEITH VAUGHAN





The University of Vermont